

# Protective Predictors of Alcohol Use Trajectories Among Canadian Aboriginal Youth

Jennine S. Rawana · Megan E. Ames

Received: 10 July 2011 / Accepted: 21 September 2011 / Published online: 4 October 2011  
© Springer Science+Business Media, LLC 2011

**Abstract** Some Aboriginal youth are at disproportionate risk of using substances and developing abuse and dependence disorders. However, not all Aboriginal youth misuse substances and limited research has examined the protective factors conferring against substance use among these youth. The present study aimed to identify protective factors related to the alcohol use trajectories from early adolescence to emerging adulthood among off-reserve Canadian Aboriginal youth. Participants ( $N = 330$ ; 50.3% male) aged 12–23 were selected from cycles 2–7 of Statistics Canada’s NLSCY. Multilevel modeling was employed to identify protective factors for two constructs of alcohol use. Participation in weekly activities and optimism were found to be protective for both the frequency of alcohol use and heavy drinking trajectories. Attendance of religious services was also found to be protective for heavy drinking behaviors. In contrast, positive peer relationships were a risk factor for frequency of alcohol use, but not heavy drinking. The results provide preliminary evidence of important developmental factors to integrate into substance use intervention programs targeting Aboriginal youth.

**Keywords** Adolescent development · Indigenous populations · Alcohol drinking patterns · Developmental trajectories

## Introduction

Alcohol use is a common issue among adolescents. For example, approximately 80% of Canadian youth aged 15–24 self-identify as current or past-year drinkers, although 39% of these youth drink fewer than five drinks when alcohol is consumed (Canadian Centre on Substance Use 2007). Adolescents who experiment with alcohol may be vulnerable to increased frequency of use and heavy drinking; however, certain risk factors may exacerbate such vulnerability. In contrast, protective factors work to negate or confer against alcohol abuse and dependence disorder diagnoses or alcohol use related problems (Cicchetti and Cohen 1995; Durlak 1998). Much of the literature has focused on the risk factors associated with adolescent alcohol use; however, there has been an increased focus on identifying protective factors that confer against alcohol use problems, particularly among culturally diverse groups (Cheon 2006; Durlak 1998; Tebes et al. 2007).

Some Aboriginal youth (e.g., defined as Inuit, Métis, Indigenous, Native American, American Indian, and members of First Nations communities) are at disproportionate risk for alcohol use problems, evidenced by higher prevalence rates of alcohol and drug misuse among Aboriginal compared to non-Aboriginal youth (Beauvais et al. 2004; Canadian Centre on Substance Use 2007; Friese and Grube 2008). Moreover, many Aboriginal individuals have had minimal success with mainstream substance use interventions that focus on addressing vulnerabilities and risk factors (McCormick 2000). Nonetheless, it is important to note that not all Aboriginal youth misuse alcohol or develop abuse or dependence disorders (Beebe et al. 2008). It would be beneficial to elucidate the factors that exacerbate or confer against Aboriginal youth substance misuse in order to understand these individual

---

J. S. Rawana (✉) · M. E. Ames  
Department of Psychology, York University, BSB 101,  
4700 Keele Street, Toronto, ON M3J 1P3, Canada  
e-mail: rawana@yorku.ca

differences. Currently, there is a paucity of research in two main areas of adolescent substance use among Aboriginal youth, namely developmental trends and protective factors (Hawkins et al. 2004). Thus, the present study sought to identify the protective predictors of alcohol use trajectories among off-reserve Canadian Aboriginal youth. It is critical to examine these areas in order to build upon emerging research that suggests focusing on protective factors leads to successfully engaging and treating youth with mental health issues (Foltz 2004; LeBel et al. 2003; Nickerson et al. 2004), particularly among Aboriginal youth (Rawana and Norwood in press). The current research is embedded within a developmental psychopathology framework, given the focus on protective factors for alcohol use of the present study.

### The Developmental Psychopathology Perspective

The developmental psychopathology perspective emphasizes a dynamic framework of studying psychopathology and posits that an individual encounters numerous factors throughout their life course that act to promote (i.e., risk factors) or confer (i.e., protective factors) against mental health issues (Cicchetti and Cohen 1995). Throughout the adolescent literature, several risk and some protective factors have been identified for adolescent substance use, including age and gender (Canadian Centre on Substance Use 2007), possessing a sense of optimism (Carver et al. 2010; Patton et al. 2011; Schmid 1998), community and activity involvement (for review see Feldman and Majatsko 2005), and peer relationships (Hotton and Haans 2004; Pires and Jenkins 2007; Wills et al. 1996). For example, research has found age at first use to be a significant predictor for later substance use and other problematic behaviors (Hotton and Haans 2004; McGue and Iacono 2008). Hotton and Haans (2004) found in their study of adolescents aged 12–15 that the risk of being drunk in the past year increased by a factor of 2.1 for every year of age. It also has been reported that using alcohol prior to the age of 15 is a robust predictor of not only adult alcoholism but also other forms of psychopathology (McGue and Iacono 2008). Gender also has been shown to predict substance use during adolescence, with males being more likely to use substances and to use more heavily than females (Biehl et al. 2007; Canadian Centre on Substance Use 2007). In contrast, research has found that adolescents who achieve academically, are involved in their school setting, who are optimistic, who engage in exercise and physical activity, and who attend religious services regularly are at a lower risk of substance use problems (Galliher et al. 2007; Hotton and Haans 2004; Patton et al. 2011; Pires and Jenkins 2007; Terry-McElrath et al. 2011). It is important to note that risk and protective factors are not simply opposites on a

continuum, but that they rather act in separate ways to confer risk and protection (Durlak 1998). It is also key to assess risk and protection independently, as it is unclear how manipulating risk affects protection and vice versa (Durlak 1998).

Optimism has demonstrated particular promise as a protective factor for adolescent substance use, as well as for other mental health problems (Carver et al. 2010; Patton et al. 2011; Schmid 1998). Optimism is associated with taking proactive steps to protect one's health (Carver et al. 2010), which could lead an adolescent to be less likely to engage in substance use. For example, in a prospective 3-wave longitudinal study, Patton et al. (2011) found moderate protective effects of high optimism for adolescent substance use, particularly among females, and also protective effects for other mental health problems (e.g., depression). Moreover, Schmid (1998) found that optimism about future health was a protective factor for the intention to use drugs in their study of Swiss adolescents. It is promising that optimism plays a role in understanding adolescent substance use trends, which can inform interventions (Patton et al. 2011).

Participation in extracurricular activities (e.g., sports, school-based activities and clubs, and volunteering) also has been shown to have positive influences on adolescent development in general, and, in particular, protective for adolescent substance use (for review see Feldman and Majatsko 2005). Participation in extracurricular activities has many benefits for adolescents, including promoting healthy development in terms of prosocial behavior (e.g., sportsmanship, etc.) and also linking the adolescent with positive mentors (e.g., coaches) and peer groups, in turn, decreasing the likelihood of youth engaging in substance use (Feldman and Majatsko 2005). Thus, a number of protective factors for adolescent substance use have been identified in the literature; however, the influence of these factors may vary based on the youth's ethnic background.

### Substance Use Among Aboriginal Youth

As previously mentioned, Aboriginal youth have been identified as an at-risk population for substance use problems, particularly among youth residing on reservations (Beauvais et al. 2004; Canadian Centre on Substance Use 2007; Friese and Grube 2008). Beauvais et al. (2004) investigated the trends in drug use among American Indian adolescents living on reservations and non-Aboriginal adolescents. The authors found the general pattern of use among on-reserve Aboriginal youth to be higher than non-Aboriginal youth, especially regarding higher rates for marijuana use despite the on-reserve Aboriginal sample being considerably younger. Furthermore, the severity of use among Aboriginal youth is evidenced by a higher

likelihood of experimenting with substances at an earlier age, engaging in poly-substance use, and using substances persistently throughout adolescence and into adulthood (Canadian Centre on Substance Use 2007). Higher rates of alcohol and drug use have been found among Aboriginal youth residing on or near reservations compared to those not living on reservations (Beauvais 1992), although Aboriginal youth not living on reservations have still demonstrated higher rates of use than non-Aboriginal samples (Beauvais 1992). It has been suggested that higher rates of use among Aboriginal youth residing on reservations is related to socioeconomic and environmental differences including historical traumas, prejudice, poverty, isolation, and lack of recreational resources and employment opportunities (Beauvais et al. 2004). Little research has been conducted on comparing the alcohol use patterns of on- and off-reserve Aboriginal youth; therefore, it is difficult to ascertain how exactly these subpopulations differ and what factors vary in relation to adolescent substance use. Thus, it is important for alcohol use research involving Aboriginal populations to differentiate between those youth residing on and off reservations. In turn, for the current study, a sample of off-reserve Aboriginal youth was used. Given that off-reserve Aboriginal youth seem to have lower substance misuse rates than on-reserve Aboriginal youth, they may have more salient protective factors and, therefore, may be a better suited sample for preliminary exploration of protective factors among Aboriginal youth, compared to an on-reserve population.

Indeed, not all Aboriginal youth use substances or develop substance abuse or dependence disorders, and few studies have explored the risk and protective factors associated with substance use among Aboriginal youth. For example, Beebe et al. (2008) examined the protective assets of alcohol non-use in a sample of 13–19-year-old inner-city American Indian youth and found that the majority of their sample (almost 79%) reported not using alcohol within the past 30 days. Beebe et al. (2008) also found that engaging in positive leisure activities (e.g., religious activities) were protective assets for alcohol non-use, consistent with past findings that cultural pride/spirituality and religion are protective for alcohol use in adolescence (Yu and Stiffman 2007). Interestingly, Yu and Stiffman (2007) found that religious affiliation moderated the effects of problematic peers and family members within a sample of American Indian youth living both on and off reservations. Waller et al. (2003) examined the protective factors associated with substance use among American Indian youth, living on reservations and attending mainstream urban middle schools, using qualitative analyses. The authors found that participants' cousins and siblings played an important role in their decisions to refrain from using substances. Other studies have found peer deviancy

to be linked consistently to Aboriginal adolescent substance use (Bates et al. 1997; Yu and Stiffman 2007), similar to findings among non-Aboriginal samples (Hotton and Haans 2004; Pires and Jenkins 2007). The role of gender in Aboriginal adolescent substance use may differ from non-Aboriginal samples, such that females have been shown to use drugs at the same rate or frequency as males; however, males may still use more heavily (Beauvais et al. 1989; Novins and Mitchell 1998). It is also unclear how gender interacts with other factors to influence use during this developmental period (Biehl et al. 2007).

In sum, although Aboriginal youth are at disproportionate risk for substance use problems, not all Aboriginal youth develop substance use issues (Beauvais et al. 2004; Canadian Centre on Substance Use 2007; Hawkins et al. 2004). Generally, substance use issues among Aboriginal youth are an understudied area in the research literature, despite their disproportionate risk, and few researchers have examined the risk and protective factors that may elucidate these individual differences. Moreover, to date, the developmental alcohol use trends among Aboriginal youth are unclear and few studies, if any, utilize national, longitudinal samples to understand these trends. Furthermore, there is a growing body of literature surrounding the protective factors salient for adolescent substance use. It is important to investigate whether or not the protective factors conferring against substance use problems identified for adolescents in general are relevant to this cultural group. Such research can inform Aboriginal youth programs that are increasingly adopting a positive or strength-based approach to address mental health prevention and intervention (Rawana and Norwood in press). Given the aforementioned gaps in the literature, the present study sought to explore the potential influence of several key established protective factors identified for adolescent substance misuse on the developmental alcohol use trajectories of Canadian Aboriginal youth, in hopes of identifying protective factors that can be incorporated into clinical practice initiatives for substance use.

### Hypotheses and the Present Study

The current study had two overarching goals. First, examine the *alcohol use developmental trajectories* of Aboriginal youth using a national, longitudinal sample. Second, identify *protective factors* of Aboriginal youth associated with alcohol use trajectories by examining whether the protective factors impact the initial levels and/or rates of change of alcohol use over time. Multilevel modeling (MLM) was used to identify temporal trajectories of frequency of alcohol use and heavy drinking from early adolescence to emerging adulthood, and to identify

predictors of alcohol use by measuring their impact on baseline levels (early adolescence, ages 12–13) and rates of change in alcohol use over time. Interactions of age with gender and the protective factors were studied in order to examine the developmental changes of alcohol use and heavy drinking from early adolescence into emerging adulthood. As this study was exploratory in nature, broadly it was hypothesized that the protective factors identified would be associated with lower levels of alcohol use in early adolescence. It also was expected that these factors would be associated with less steep increases in alcohol use or steeper declines in alcohol use over time. This study focused solely on adolescents from Aboriginal backgrounds residing off reserves and did not include an Aboriginal sample living on reserves or a non-Aboriginal comparison group. Given the relatively recent emergence of research on protective factors for substance use among Aboriginal children and youth in Canada, this preliminary approach can inform future comparative research.

## Method

### Dataset

The present research involved secondary data analysis of Statistics Canada's National Longitudinal Survey of Children and Youth (NLSCY). A brief description of the NLSCY is provided here; however, the NLSCY User Guides provide more detailed information on the survey (e.g., Statistics Canada 2007). The NLSCY is a longitudinal, comprehensive study of Canadian children that includes data from multiple domains of development gathered from birth to early adulthood, based on a large, representative, community sample. The NLSCY consists of a child component completed by the person most knowledgeable (PMK) about the child (e.g., typically the parent), an adult component completed by the PMK, a youth component for youth over the age of 18, and a self-report component completed by adolescents aged 10–17, with parent permission. The first cycle of the NLSCY was carried out in 1994/1995 and children (aged 0–11 at baseline) participated and were surveyed biannually. Cycle 2 participants were surveyed between 1996 and 1997, cycle 3 participants were surveyed between 1998 and 1999, and so forth until the final cycle where participants were surveyed between 2006 and 2007 (cycle 7). The present sample selected participants from cycles 2 to 7.

The NLSCY employed a complex, multi-staged sampling procedure where households came from three possible sources. First, households with children aged 0–11 were selected using demographic variables from Statistics Canada's Labour Force Survey (LFS). The LFS excludes

several populations (e.g., individuals living in the Yukon or Northwest Territories, individuals living in institutions, and individuals living on reserves) due to its sampling frame (Statistics Canada 1995). However, in cycle 1, it was estimated that the exclusions (institutions and Indian Reserves) represented a small portion of Canadian children (i.e., approximately 0.5%) aged 0–11 living in the 10 provinces sampled. Second, in conjunction with the National Population Health Survey (NPHS), a new sample was derived and one individual within each household was randomly selected. If this individual was between the ages of 0 and 11, they were included in the NLSCY. Third, given that the LFS excludes several populations, the NLSCY and NPHS recruited a sample from the Yukon and Northwest Territories drawn from the population of private occupied dwellings. An individual from the household was randomly selected from this additional sample and again, if the individual was between the ages of 0 and 11, they were included in the NLSCY. For each randomly selected child within a household, up to four other children within the same economic family could also be randomly selected. However, due to response burden in cycle 1, a maximum of two children per household were followed for the subsequent cycles.

### Aboriginal Status

In the present study, child ethnic origin (North American Indian, Métis, or Inuit/Eskimo) was used as an indicator of Aboriginal status (e.g., "To which ethnic or cultural group(s) did your ancestors belong... North American Indian? Métis? Inuit/Eskimo?") This question was asked of the PMK for children aged 12–17, and youth aged 18–23 answered this question for themselves in the youth self-report. Participants were included in the study if, for any cycle, it was indicated that they were of Aboriginal ethnic origin.

### Participants

In the present sample, Aboriginal youth who were aged 12 and older were selected from cycles 2 to 7 ( $N = 330$ , 50.3% male). Therefore, youth who became 12 and older in later cycles were included in analyses. The six cycles of the NLSCY were linked by age in order to form a common developmental trajectory across the ages of 12–23; an approach typically used in examining developmental trajectories (Duncan et al. 1996; Miyazaki and Raudenbush 2000; Nguyen et al. 2011). Age (in years) was used to indicate time. As such, this variable was centered to make the intercept of the predictors more meaningful. For example, for the frequency of alcohol use variable, age was centred around 0, corresponding to the lower bound limit of

age 12 for this variable. Thus, the intercept for this trajectory is representative of participants at baseline (age = 12). In order for the estimates of intercepts to be meaningful, the predictors were centered around the grand mean of the sample (Singer and Willett 2003). Therefore, the intercept represents the estimated initial status for a participant with the average value for the predictor.

Sociodemographic characteristics (e.g., age of child, gender of child, family income, ethnic identity) in the PMK questionnaire were collected for each cycle and were used for demographic purposes. Table 1 presents the descriptive statistics of the weighted sample of the 330 participants at baseline (age = 12).

Measures

Alcohol Use

Alcohol use variables were collected for children aged 10 and older for each cycle in the Smoking, Drinking and Drugs module of the youth self-report. For children 12 and older, a comprehensive battery of alcohol use was administered, which allowed the research team to study two important alcohol use constructs (i.e., frequencies of alcohol use and frequency of heavy drinking) for Aboriginal youth. The frequency of alcohol use variable was recategorized for each cycle, as the wording of the response categories varied slightly across cycles (e.g., “a few times a year” vs. “1–2 times a year”). The final response categories were on a five-point Likert scale and are similar to categories created within a previous study that used the NLSCY substance use variables (Pires and Jenkins 2007); 1 (*does not drink alcohol*); 2 (*a few times a year*); 3 (*once or twice a month*); 4 (*1–2 days a week*), and; 5 (*more than 1–2 days a week*). The frequency of heavy drinking was assessed by an item that asked participants to indicate the number of times they had been drunk within the past 12 months. This variable was only available for adolescents over the age of 13, thus baseline for the trajectory was age 13. It was also recategorized across cycles, resulting in the same five-point scale as the alcohol use variable. These constructs were assessed separately to provide information on both normative frequency of alcohol use and heavy drinking across adolescence into emerging adulthood and was methodologically consistent with previous research (Biehl et al. 2007).

Participation in Activities

Youth were asked how frequently they participated in a number of activities, including playing sports with and without a coach, participating in gymnastics or dance, arts, drama, or music, or guides, scouts, and/or other clubs. As the frequency and type of activities varied across cycles,

**Table 1** Characteristics of the study sample (*N* = 330) at baseline (age 12)

Characteristic	<i>M</i> (SD) or <i>N</i> (%) of categorical variables
<i>Demographic variables</i>	
Age	12 (0.0)
Gender	
Male	164 (49.7)
Female	166 (50.3)
Family structure	
Two biological parents (intact)	151 (45.8)
Two-parent non-traditional <sup>b</sup>	49 (14.8)
Single-parent	123 (37.3)
Does not live with parent or other	7 (2.1)
Household income <sup>a</sup>	
Under \$20,000	50 (24.9)
Between \$20,000 and \$40,000	95 (47.2)
Over \$40,000	56 (27.9)
Ethnic origin	
North American Indian	230 (69.7)
Métis	81 (24.5)
Inuit/Eskimo or other	19 (5.8)
Type of setting <sup>a</sup>	
Large urban <sup>c</sup> centre	68 (30.2)
Medium-sized <sup>d</sup> urban centre	37 (16.4)
Small urban <sup>e</sup> centre	81 (36.0)
Rural area	39 (17.3)
Outcome variables	
Frequency of alcohol use	1.12 (.37)
Number of times drunk (baseline at age 13)	2.49 (.78)
Predictor variables	
Participation in activities (at least one activity weekly)	229 (87.37)
Volunteer participation within past 12 months	159 (62.38)
Attendance of religious services	2.67 (1.37)
Positive peer relationships	12.5 (2.39)
Self esteem	12.69 (2.51)
Prosocial behaviours	12.46 (3.61)
Optimism	6.28 (.93)

<sup>a</sup> Household income and type of setting were only introduced in Cycle 4, therefore the sample is not based on the original *N* = 330 beginning in Cycle 2

<sup>b</sup> Step, adoptive, foster

<sup>c</sup> Population of 500,000 or more

<sup>d</sup> Population between 100,000 and 499,999

<sup>e</sup> Under 100,000 people

participants were categorized based on participating in any of the aforementioned activities at least once a week, 0 (*no*) or 1 (*yes*).



### Volunteer Participation

Youth were asked if within the past 12 months they had participated in the following five volunteer activities: volunteering for a cause, fundraising, community volunteering, helping neighbours, or other. Participants were categorized as 0 (*no*) or 1 (*yes*) based on participating in any of the five volunteer activities within the past year.

### Attendance of Religious Services

Youth were asked how frequently they attended religious services within the past year. Responses were reported on a 1 (*never*) to 5 (*more than once a week*) scale. Higher scores reflected higher participation in religious services.

### Positive Peer Relationships

The four items used to measure this variable were taken from the Peer Relations subscale from the Self-Description Questionnaire (SDQ; Marsh and Gouvenet 1989). Youth were asked to rate items on a five-point Likert scale ranging from 1 (*false*) to 5 (*true*). Items included, “I have a lot of friends” and “Most other kids like me.” Cronbach’s alphas for the present sample ranged from .71 to .86 across cycles.

### Prosocial Behaviors

This 10-item subscale of the Behaviors scale from the NLSCY was created by the Montreal Longitudinal Study (MLS) and Weir and Duveen (Statistics Canada 1995). Participants rated their helpful, caring, sympathetic, and supportive interpersonal behaviors on a three-point scale, ranging from 0 (*never or not true*) to 2 (*often or very true*), with higher scores reflecting higher levels of prosocial behavior. Example items include, “I show sympathy to (feel sorry for) someone who has made a mistake” and “I volunteer to help clear up a mess someone else has made.” Cronbach’s alphas for the sample ranged from .84 to .87.

### Self-Esteem

This measure was taken from the General Self scale of the SDQ, which assesses multiple aspects of an adolescent’s self-confidence and satisfaction with themselves as individuals. The NLSCY shortened the original eight-item General Self scale to four items, which included statements such as, “In general I like the way I am” and “A lot of things about me are good.” Items were scored on a five-point scale ranging from 0 (*false*) to 4 (*true*) and total scores were computed, ranging from 0 to 16, with a higher score reflecting a more positive self-image. Cronbach’s alphas in the current study ranged from .80 to .83.

### Optimism

Youth were asked to rate two items, “I feel optimistic about the future” and “The next 5 years look good to me” on a four-point scale ranging from 1 (*strongly disagree*) to 4 (*strongly agree*). The two items were summed to create a total score ranging from 2 to 8, with higher scores reflecting higher levels of optimism. Bivariate correlations for the two items ranged from .43 to .63 across cycles.

### Data Analysis

SAS version 9.2 and SPSS version 18 were used to analyze the data for the present study. All results are based on weighted scores derived from applying longitudinal post-stratification weights provided by Statistics Canada. These weights adjust for survey non-response and the stratification of the sampling design (Statistics Canada 2009). Given that the researchers selected a specific sample from the original NLSCY datasets, a standard procedure was employed to rescale the individual longitudinal post-stratification weights to protect against the inflation of sample size due to the original application of weights. Therefore, each participant’s longitudinal post-stratification score was divided by the average weight of the final sample, as recommended by Statistics Canada and other researchers (Carter et al. 2010; Nguyen et al. 2011; Wang et al. 2000). As the longitudinal post-stratification weights take into account the issue of non-response and the sampling procedures, applying the weights preserved the population’s distribution (Statistics Canada 2009).

As previously discussed, MLM was the primary method of analysis used to test the aforementioned models, as it accounts for the time-varying outcomes and predictors throughout the creation of a common trajectory (i.e., intercept and slope) for the sample (Singer and Willett 2003). MLM also addresses issues inherent in the analyses of complex longitudinal data, such as missing data (Luke 2004). MLM techniques were used to estimate changes in alcohol use trajectories from early adolescence through emerging adulthood. A series of models were tested, which followed the procedures outlined by Singer and Willett (2003). Each series began with the unconditioned model that provides the grand mean of the outcome measure (i.e., frequency of alcohol use and heavy drinking) across the entire sample, regardless of age. The second model determines whether the linear component of age effects the unconditional trajectories and whether a linear model fits the data. It was expected that age would be a significant predictor of frequency of alcohol use and heavy drinking as it has been found to be a robust predictor of substance use (Canadian Centre on Substance Use 2007; Hotton and Haans 2004; McGue and Iacono 2008). The quadratic

component of  $age^2$  was entered into a third model to examine whether a quadratic model fit the data significantly better than the linear model (e.g., does alcohol use increase during early adolescence, then decline later into adolescence?). The next model examined the effect of gender on the trajectories without the consideration of other predictors. As the role of gender has been less clear in terms of frequency of alcohol use and heavy drinking (Biehl et al. 2007; Canadian Centre on Substance Use 2007), particularly for Aboriginal youth (Beauvais et al. 1989; Novins and Mitchell 1998), no definitive hypotheses were made. The following model examined the effect of the selected protective factors on the initial rates of alcohol use and heavy drinking. Again, it was expected that the protective factors identified would be associated with lower levels of frequency of alcohol use and heavy drinking. Each predictor was then independently entered into the model with its interaction with age and  $age^2$ , to test whether or not the protective factor interacted with age and/or  $age^2$ , thus affecting the slope in any way (e.g., steeper or less steep) over time. If the intermediary model for the predictor better fit the data, then it was included in the final model. It was expected that the protective factors would interact with age and/or  $age^2$ , and predict less steep increases in alcohol use and heavy drinking over time. Finally, all components from the previous model and the significant interactions from the intermediary models were entered into a restricted model. This restricted model, including only the significant factors from the previous model, was then tested. The model that best represented the data was then interpreted (for a review of guidelines on MLM model building, see Singer and Willett 2003).

**Results**

**Relationships Among the Variables**

A correlation matrix was completed to assess the relationships among the continuous predictor variables (see Table 2). The results indicated that the correlations among the variables ranged from  $r = -.01, P > .05$ , to  $r = .54$ ,

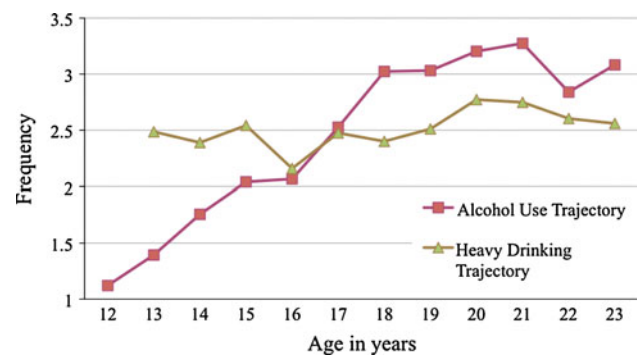
$P < .001$ . Participation in religious services was not related to the other protective factors, which were significantly positively correlated with one another. Multicollinearity was also considered, and given that the zero-order correlations among the variables were less than 0.7, multicollinearity was not deemed an issue in the study (Tabachnick and Fidell 2001).

**Trajectories of Alcohol Use**

Preliminary analyses included plotting the mean scores of the two outcome measures over time (Fig. 1). As expected, the frequency of alcohol use increased throughout adolescence and into emerging adulthood. Interestingly, the heavy drinking variable remained relatively stable over time, with the highest frequency of heavy drinking at age 21 and the lowest at age 16. These analyses implied potential linear and nonlinear trajectories of alcohol use and, therefore, such growth models were fit to the data.

**Trajectories of Frequency of Alcohol Use Across Adolescence**

Table 3 outlines the models tested for the frequency of alcohol use variable. The unconditional means model provided the grand mean for all the participants within the model; the grand mean was equal to 2.078 with a standard error of .037. This suggested that off-reserve Aboriginal



**Fig. 1** Means of the frequency of alcohol use and heavy drinking variables across adolescence and into emerging adulthood

**Table 2** Correlation matrix of the relationships between the continuous predictor variables at baseline (age = 12)

	Religious services	Positive peer relationships	Self-esteem	Prosocial behaviours	Optimism
Religious services	–	–.01	.02	.12	.04
Peer relationships		–	.54***	.27***	.29***
Self-esteem			–	.35***	.53***
Prosocial behaviours				–	.16*
Optimism					–

\*  $P < .05$ ; \*\*\*  $P < .001$

**Table 3** Multilevel models of frequency of alcohol use based on protective predictors

	UMM	UGM linear	UGM quadratic	Model A	Model B	Model C	Model D
Fixed effects							
Initial status, $\pi_{0i}$							
Intercept	$\gamma_{00}$ 2.078*** (.037)	1.241*** (.040)	1.070*** (.034)	1.116*** (.047)	1.112*** (.100)	1.153** (.143)	1.071*** (.124)
Gender	$\gamma_{01}$			-.108 (.069)	-.025 (.093)	-.022 (.092)	.010 (.084)
Participation in activities	$\gamma_{02}$				.003 (.086)	-.042 (.147)	.045 (.128)
Volunteer participation	$\gamma_{03}$				.019 (.057)	.014 (.056)	
Attendance of religious services	$\gamma_{04}$				-.027 (.019)	-.027 (.019)	
Positive peer relationships	$\gamma_{05}$				.028* (.012)	.027* (.013)	.029** (.009)
Self esteem	$\gamma_{06}$				-.015 (.013)	-.014 (.002)	
Prosocial behaviours	$\gamma_{07}$				-.001 (.008)	-.002 (.008)	
Optimism	$\gamma_{08}$				-.101** (.030)	-.102*** (.030)	-.147*** (.022)
Rate of change, $\pi_{1i}$					.218* (.106)	-.123 (.229)	.452*** (.107)
Age	$\gamma_{10}$	.232*** (.010)	.365*** (.024)	.382*** (.033)			
Rate of change, $\pi_{2i}$							
Age <sup>2</sup>	$\gamma_{20}$		-.015*** (.003)	-.020*** (.004)	.044 (.035)	.201** (.077)	-.025 (.021)
Age × gender	$\gamma_{11}$			-.027 (.047)	-.117 (.151)	-.115 (.149)	-.108 (.079)
Age <sup>2</sup> × gender	$\gamma_{21}$			.010 (.005)	.005 (.051)	.006 (.050)	.018 (.016)
Age × activity participation	$\gamma_{13}$					.393 (.237)	-.137 (.113)
Age <sup>2</sup> × activity participation	$\gamma_{23}$					-.184* (.080)	.019 (.022)
Variance components							
Level 1	$\sigma^2_\epsilon$ .900*** (.036)	.484*** (.022)	.379*** (.017)	.379*** (.017)	.065*** (.017)	.062*** (.017)	.273*** (.018)
Goodness-of-fit	5,936.6	5,126.1	4,858.5	4,845.3	1,490.2	1,482.8	3,138.4
Deviance statistic			267.6*** (1)	13.2** (3)	3,355.1*** (7)	7.4* (2)	-1,655.6*** (-4) <sup>a</sup>
$\Delta D$ ( $\Delta df$ )			4,919.8	4,927.1	1,597.1	1,602.3	3,238.1
BIC	5,957.0	5,167.0	.217	0 <sup>b</sup>	.876 <sup>b</sup>	.836 <sup>b</sup>	.280 <sup>b</sup>
Pseudo R <sup>2</sup>		.462					

N = 330

UMM unconditional means model; UGM unconditional growth model

\* P < .05; \*\* P < .01; \*\*\* P < .001

<sup>a</sup> The  $\Delta D$  and ( $\Delta df$ ) values for Model D were obtained by comparing the fit to the data with Model C. Since moving from Model C to D involved removing terms and creating a more restricted model, a significant  $\Delta D$  was interpreted to mean a significantly worse fit to the data

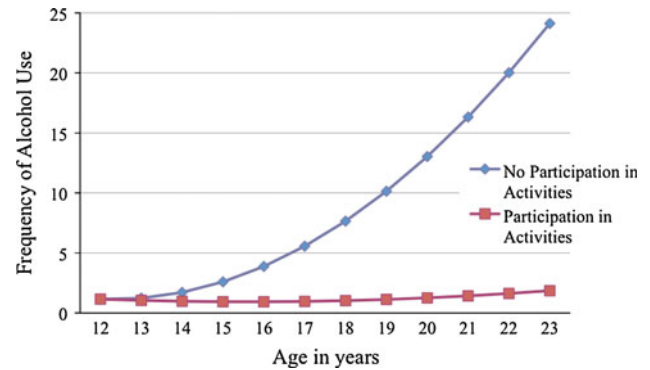
<sup>b</sup> The Pseudo R<sup>2</sup> value for Models A, B, C, and D used the UGM quadratic as a comparison and represents the percentage of variance explained over and above the effect of gender



adolescents and young adults aged 12–23 were, on average, not using alcohol at a high frequency (e.g., a score of 2 refers to drinking *a few times year*). The random variance of the model was significant,  $\sigma\epsilon^2 = .900$ ,  $SE = .036$ ,  $P < .001$ , which suggests that there was significant variability across the sample for frequency of alcohol use. The unconditional nonlinear growth model ( $D = 4,845.5$ ) fit the model significantly better than the linear growth model ( $D = 5,126.1$ ),  $\Delta D = 267.6$ ,  $df = 1$ ,  $P < .001$ ; therefore, the quadratic functional form of the growth model (i.e.,  $\text{age}^2$ ) was retained for the remaining models. The estimated linear slope (i.e., age variable) of the unconditional quadratic model was  $.365$ ,  $P < .001$ , suggesting that frequency of alcohol use increased at age 12. Furthermore, the quadratic estimate was significant,  $\gamma_{20} = -.015$ ,  $P < .001$ , suggesting that the slope of the quadratic decelerated around age 21 (Fig. 1).

Model A tested the effects of gender on the initial level and rate of change of alcohol use over time. Although gender did not have an impact on the initial level,  $\gamma_{01} = -.108$ ,  $P > .05$ , nor the rate of change,  $\gamma_{11} = -.027$ ,  $P > .05$ , overall the model better fit the data,  $\Delta D = 13.2$ ,  $df = 3$ ,  $P < .01$ . Thus, gender was retained within subsequent models to test the impact of the selected predictors over and above the effect of gender. Model B tested the impact of the predictor variables on the initial levels of the frequency of use, while controlling for gender and the interaction between age and gender. Model B significantly better fit the data than Model A,  $\Delta D = 3,355.1$ ,  $df = 7$ ,  $P < .001$ . A number of intermediary models were fit to the data to test the impact of each individual predictor on the rate of change of the trajectory. For each predictor, an intermediate model including the interaction of the predictor with age and  $\text{age}^2$  was entered into Model B. If the model significantly better fit the data, the interactions were retained in Model C. The only predictor that was found to impact the rate of change of alcohol use was participation in activities. Therefore, Model C included the predictors from Model B plus the interaction terms of age and  $\text{age}^2$  with participation in activities. Model C significantly better fit the data than Model B,  $\Delta D = 7.4$ ,  $df = 2$ ,  $P < .05$ . A fourth possible model was fit to the data that included only the significant terms of Model C. Given that Model D was a restricted model and the change in degrees of freedom was negative, a significant  $\Delta D$  represented a significantly worse fit to the data. As such, Model D was found to be a significantly worse fit to the data than Model C. Therefore, Model C was retained as the final model for interpretation.

Estimates from Model C revealed that the average frequency of use score for participants aged 12 was 1.153 with a standard error of .143. In contrast to the unconditioned model, the quadratic term was positive, suggesting that the protective factors interacted with the quadratic term in



**Fig. 2** The effect of participation in activities on the prototypical trajectories of frequency of alcohol use. *Note:* The frequency of alcohol use on the y-axis represents the theoretical range over time and is derived from the estimates of the linear, quadratic, and parameter intercepts from Model C. Thus, the range is not limited to the 1–5 scale used in the study

some way to influence the shape of the trajectory. Controlling for gender and all other time-varying predictors, results showed that the initial rates of frequency of alcohol use were higher for individuals with higher levels of positive peer relationships,  $\gamma_{05} = .028$ ,  $P < .05$ . In contrast, the initial rates of frequency of alcohol use were lower for individuals with higher levels of optimism,  $\gamma_{08} = -.102$ ,  $P < .001$ . Furthermore, participation in activities was associated with the quadratic,  $\gamma_{23} = -.184$ ,  $P < .05$ , but not the linear,  $\gamma_{13} = .393$ ,  $P > .05$ , component of the frequency of alcohol use trajectory, such that the trajectory of individuals who participated in at least one weekly activity had less steep increases in the frequency of use over time than those who did not participate in weekly activities (Fig. 2), suggesting that participation in activities interacted with the  $\text{age}^2$  term, buffering against the increased acceleration of frequency of alcohol use over time.

#### Trajectories of Heavy Drinking Across Adolescence

The models tested for the frequency of heavy drinking variable are described in Table 4. The unconditional means model revealed that the grand mean of the frequency of heavy drinking was 2.493 ( $SE = .041$ ), which suggests that overall, youth aged 12–23 were not frequently drinking heavily. The random variance of the model was significant,  $\sigma\epsilon^2 = .801$ ,  $SE = .045$ ,  $P < .001$ , suggesting that there was significant variability across the sample for the frequency of heavy drinking variable. The unconditioned nonlinear growth model ( $D = 2,750.3$ ) was again a significantly better fit to the data than the linear growth model ( $D = 2,788.9$ ),  $\Delta D = 38.6$ ,  $df = 1$ ,  $P < .001$ ; therefore, the  $\text{age}^2$  term was retained for subsequent models. The estimated linear slope of the unconditioned nonlinear

**Table 4** Multilevel models of frequency of heavy drinking based on protective predictors

	UMM	UGM linear	UGM quadratic	Model A	Model B	Model C
Fixed effects						
Intercept	$\gamma_{00}$ 2.493** (.041)	2.276*** (.080)	2.203*** (.107)	2.504*** (.136)	2.473*** (.204)	2.406*** (.180)
Gender	$\gamma_{01}$			-.660** (.203)	-.199 (.269)	-.328 (.249)
Participation in activities	$\gamma_{02}$				-.265* (.122)	-.236* (.116)
Volunteer participation	$\gamma_{03}$				-.082 (.102)	
Attendance of religious services	$\gamma_{04}$				-.105** (.035)	-.132*** (.034)
Positive peer relationships	$\gamma_{05}$				.000 (.021)	
Self esteem	$\gamma_{06}$				.019 (.021)	
Optimism	$\gamma_{07}$				-.114* (.049)	-.068 <sup>+</sup> (.041)
Rate of change, Age	$\gamma_{10}$	.050** (.016)	.097 (.049)	-.042 (.065)	.177 (.134)	.164 (.130)
Rate of change, Age <sup>2</sup>	$\gamma_{20}$		-.005 (.005)	.005 (.001)	-.037 (.029)	-.036 (.028)
Age × gender	$\gamma_{11}$			.304** (.095)	.076 (.226)	.190 (.220)
Age <sup>2</sup> × gender	$\gamma_{21}$			-0.023* (.010)	.001 (.047)	-.013 (.047)
Variance components						
Level 1	$\sigma^2$	.801*** (.045)	.619*** (.044)	.528*** (.045)	.140*** (.037)	.130*** (.034)
Goodness-of-fit	Deviance statistic	2,840.4	2,788.9	2,734.8	906.1	949.3
$\Delta D$ ( $\Delta df$ )			51.5*** (1)	15.5*** (3)	1,828.7*** (6)	-43.2*** (-3) <sup>a</sup>
BIC		2,860.8	2,829.7	2,823.4	1,009.9	1,034.2
Pseudo R <sup>2</sup>			.227	0 <sup>b</sup>	.735 <sup>b</sup>	.754 <sup>b</sup>

N = 330

UMM unconditional means model, UGM unconditional growth model

+ P < .10; \* P < .05; \*\* P < .01; \*\*\* P < .001

<sup>a</sup> The  $\Delta D$  and ( $\Delta df$ ) values for Model C were obtained by comparing the fit to the data with Model B. Since moving from Model B to C involved removing terms and creating a more restricted model, a significant  $\Delta D$  was interpreted to mean a significantly worse fit to the data

<sup>b</sup> The Pseudo R<sup>2</sup> value for Models A, B, and C used UGM quadratic as a comparison and represents the percentage of variance explained over and above the effect of gender

growth model was 2.203,  $P < .001$ , suggesting that the frequency of heavy drinking increased at age 13, although it was apparent from Fig. 1 that the increase was not steep. The quadratic effect was not significant for any of the models,  $ps > .05$ , suggesting that frequency of heavy drinking had a relatively stable relationship across time (Fig. 1).

Model A tested the effects of gender on the initial level and rate of change of the frequency of heavy drinking over time. Gender impacted the initial level,  $\gamma_{01} = -.660$ ,  $P < .001$ , and the rate of change,  $\gamma_{11} = .304$ ,  $P < .01$ ; therefore, the model better fit the data than the unconditional means model,  $\Delta D = 15.5$ ,  $df = 3$ ,  $P < .001$ . The interaction of age<sup>2</sup> and gender in Model A suggests that although females had higher initial levels of the frequency of heavy drinking at baseline, males had steeper increases in heavy drinking over time,  $\gamma_{21} = -.023$ ,  $P < .05$ . However, gender, along with its interaction with both age and age<sup>2</sup>, became non-significant in the subsequent models, suggesting that the protective factors accounted for more variance within the models and that the protective factors interacted with gender in some way to negate its unconditioned effects.

Again, gender was maintained within subsequent models to test the impact of the predictors over and above that of gender. Model B was a significantly better fit than Model A,  $\Delta D = 1,828.7$ ,  $df = 6$ ,  $P < .001$ . None of the intermediary models better fit the data; thus, none of the predictors were found to impact the rate of change of the frequency of heavy drinking over time. Therefore, Model C was the restricted model and included only the significant terms of Model B. Model C was a significantly worse fit to the data; thus, Model B was retained as the final model for interpretation. Estimates from Model C revealed that the average frequency of heavy drinking score for participants aged 13 was 2.473 with a standard error of .204. Controlling for gender and all other time-varying predictors, results demonstrated that initial rates of the frequency of heavy drinking were lower for individuals who participated in weekly activities,  $\gamma_{02} = -.265$ ,  $P < .05$ , those with higher levels of attendance of religious services,  $\gamma_{04} = -.105$ ,  $P < .01$ , and those with higher levels of optimism,  $\gamma_{07} = -.114$ ,  $P < .05$ . As none of the intermediary models better fit the data than Model B, none of the predictors impacted the rate of change in the frequency of heavy drinking over time.

## Discussion

Although experimentation with alcohol is common in adolescence (Canadian Centre for Substance Use 2007), adolescents have been shown to be particularly vulnerable

to increased frequency of use of alcohol and heavy drinking, possibly leading to a multitude of negative outcomes. A vast amount of research has focused on the risk factors associated with alcohol use trajectories among adolescents; however, there has been a modest shift to focusing on the protective factors that decrease the probability of alcohol use problems, which can inform the treatment and prevention of alcohol use among this population. Aboriginal youth have been identified as an at-risk population for alcohol use (Beauvais et al. 2004; Canadian Centre on Substance Use 2007; Friese and Grube 2008); however, not all Aboriginal youth share the same profile of risk and protection in terms of alcohol use, and there is little understanding of what protective factors are relevant for this understudied population. Furthermore, few, if any, studies have examined this issue using developmental trajectories and national samples. Thus, the present study examined the relationship between potential protective factors and the baseline levels and changes in two meaningful alcohol use variables (i.e., frequency of alcohol use and heavy drinking) from early adolescence to emerging adulthood among a national sample of off-reserve Aboriginal youth.

## Summary of Present Findings

As expected, the frequency of alcohol use increased with age (see Fig. 1). This finding is consistent with longitudinal studies of alcohol use during adolescence (Biehl et al. 2007). Surprisingly, the frequency of heavy drinking remained relatively stable over time (see Fig. 1). It may be that the same individuals who drink heavily earlier in adolescence continue to drink heavily into emerging adulthood, but that this is only true for a limited number of individuals, given the overall low frequency of heavy drinking across time ( $\gamma_{00} = 2.493$ ). Overall, the grand means of both models were relatively low given the scale ranged from 1 to 5, with lower values indicating lower frequencies (e.g., alcohol use  $\gamma_{00} = 2.078$ ,  $SE = .037$ ; heavy drinking  $\gamma_{00} = 2.493$ ,  $SE = .041$ ), suggesting that the average frequency of alcohol use and heavy drinking among Aboriginal adolescents and emerging adults is consistent with previous research (Beebe et al. 2008; Canadian Centre on Substance Use 2007). This study also demonstrated that the trajectories for the frequency of alcohol use and the frequency of heavy drinking change across adolescence and emerging adulthood, but that, in general, off-reserve Canadian Aboriginal adolescents and emerging adults are using alcohol at normative rates. It is unclear whether these rates would be similar for Aboriginal youth living on reserves or that of Canadian youth in general, as this study did not seek to be comparative in nature; however, these would be interesting research questions for future research.

For the frequency of alcohol use outcome variable, several factors emerged as important predictors. In contrast to hypotheses, positive peer relationships negatively predicted the frequency of alcohol use in early adolescence, such that higher levels of positive peer relationships predicted higher initial levels of frequency of alcohol use. Consistent with the hypotheses, higher levels of optimism were found to be protective of alcohol use, such that higher levels of optimism predicted lower levels of alcohol use in early adolescence. Finally, participation in weekly activities was found to influence the rate of change in the frequency of alcohol use over time (i.e., interaction with age<sup>2</sup>), such that participation in weekly recreational activities was protective and led to less steep increases in frequency of alcohol use across adolescence and into emerging adulthood (Fig. 2). With regard to the model of the frequency of heavy drinking, again participation in activities and optimism were found to be predictive of adolescent heavy drinking behaviors. These results suggest that participation in at least one weekly recreational activity was associated with lower levels of heavy drinking. Similarly, higher levels of optimism were related to lower levels of heavy drinking. Furthermore, a higher level of attendance of religious services was related to lower levels of heavy drinking among early adolescents. These findings suggest that the trajectories of alcohol use and heavy drinking differ in relation to protective factors and are important to consider separately. Each of these findings and its relationship to the current literature of adolescent alcohol use is described next.

As hypothesized, higher levels of optimism were associated with lower frequencies of both alcohol use and heavy drinking in early adolescence and across adolescence and into emerging adulthood. This finding is consistent with previous research that has demonstrated the protective effects of optimism for not only substance use, but other mental health risks (Carver et al. 2010, Patton et al. 2011; Schmid 1998). The results of the current study suggest that Aboriginal youth who are hopeful about their future have lower levels of alcohol use and heavy drinking during adolescence and into emerging adulthood. To date, there have been few, if any, studies exploring the protective role of optimism among Aboriginal youth and, given its significant role in predicting both the frequency and intensity of consuming alcohol, warrants further study in this area.

Similarly, research has found participation in activities to be protective for substance use among adolescents (Feldman and Majatsko 2005). The present study found that participation in activities had an effect on the rate of change in frequency of alcohol use over time and effect on the initial status of the heavy drinking trajectory, with participation in at least one weekly activity being advantageous. In a cross-sectional study, Beebe et al. (2008)

included use of time in groups and sports as a predictor in their odds ratio analyses of alcohol and drug non-use in a sample of American Indian youth aged 13–19. In contrast to the present findings, the authors did not find participation in activities to be associated with alcohol or drug non-use. This discrepancy may reflect the differences of sample characteristics, and the fact the present study was longitudinal in nature. Future research could more carefully examine the types of activities (e.g., sports, social groups, etc.) that are most protective. It also would be beneficial to use participation in activities as a continuous variable to examine the threshold of protectiveness (e.g., is higher frequency of participation or participation in a number of different activities more advantageous?), as the amount of time in extracurricular activities has been found to be associated with substance use (Zill et al. 1995). Unfortunately, given the inherent issue of inconsistency of activity choices across cycles, the present study examined participation in activities in a dichotomous manner and thus was not able to address this research question.

The finding that higher levels of attendance of religious services predicted lower frequencies of heavy drinking is consistent with findings that attendance of religious services is a protective factor in relation to adolescent substance use (Galliher et al. 2007; Hotton and Haans 2004). This finding is consistent with Beebe et al. (2008) finding that church attendance and participation in church services is significantly associated with non-use of alcohol among Aboriginal youth. Further, Yu and Stiffman (2007) found religious affiliation to moderate the negative effects of problematic peers and family members. The present findings provide further evidence that attendance of religious services is a protective factor for heavy drinking trajectories among Aboriginal youth.

Unexpectedly, positive peer relationships were associated with increased alcohol use in early adolescence, such that individuals with high levels of positive peer relationships reported consuming alcohol more often compared to those with lower levels of positive peer relationships. This finding is in contrast to Waller et al. (2003) study that found that positive peer and sibling relationships contribute to adolescents refraining from using substances. The present finding that positive peer relationships predicted higher initial levels of alcohol use may be due to normative experimentation with alcohol within a peer group. As alcohol use is typical in adolescence, it consistently has been shown that peer influence plays an important role in adolescent alcohol use behaviors (Hotton and Haans 2004; Pires and Jenkins 2007; Wills et al. 1996). If an individual does not have peers who are engaging in alcohol use, they may be less likely to experiment with alcohol. Thus, those with better peer relationships and peers who may be experimenting with alcohol, may be more likely to, and

may feel more pressure to, experiment with alcohol. Although this measure assesses positive peer relationships, it does not directly assess peer influence, alcohol use, or deviancy, all important factors relating to alcohol use of Aboriginal youth (Bates et al. 1997; Yu and Stiffman 2007). Of note, positive peer relationships was not predictive of the frequency of heavy drinking trajectory, suggesting that positive peer relationships may not be associated with heavy alcohol use in adolescence.

In contrast to hypotheses, a number of predictor variables were not found to be associated with the frequency of alcohol use or heavy drinking trajectories of Aboriginal youth. Of important note, gender did not influence the initial status or rate of change in either alcohol use outcomes in the best fitting models. However, for the frequency of heavy drinking model, gender was a significant predictor when the other protective factors were not included in the model. This suggests that the protective factors account for the variance explained by gender and that these factors could be considered mediators or mechanisms that explain the gender difference. Results from the final, interpreted models suggest that females and males in this sample have similar levels of alcohol use in early adolescence and develop in a similar manner over time when protective factors are considered. Results from the unconditioned model for frequency of heavy drinking are somewhat similar to previous research that has found males have higher levels of heavy drinking than females over time (Biehl et al. 2007). However, the literature concerning the influence of gender on adolescent substance use is less clear, particularly among Aboriginal youth (Beauvais et al. 1989; Novins and Mitchell 1998). Therefore, the present findings provide some evidence that gender does not affect the alcohol use trajectories of off-reserve Aboriginal youth when protective factors are considered; however, future research should aim to replicate this finding and explore the potential interactions of gender with predictors. In addition, participants' prosocial behaviors were not associated with either alcohol use trajectory. Given the inconsistent use of this measure across cycles, it could not be included in the heavy drinking model, and a consistent measure of prosocial behaviours could have led to more substantial findings. Finally, self-esteem was not found to be predictive of alcohol use or heavy drinking in the present sample. As optimism and self-esteem were significantly positively correlated, optimism accounted for more variance in the models, possibly negating the potential effects of self-esteem within the present models.

#### Strengths, Limitations, and Future Directions

The present study demonstrates a number of strengths that contribute to the empirical and practical significance of the

findings. First, this is the first known study that consists of a population-based, longitudinal sample of Aboriginal youth, which increases the generalizability of the findings. Second, a breadth of protective factors was included in the analyses in order to better understand factors that confer against substance use among this cultural sample. The results provide a clearer understanding of the factors that are important for both the alcohol use and heavy drinking trajectories among Aboriginal adolescents and emerging adults. Finally, there is a clinical shift to fostering strengths in the treatment of adolescent substance use (Cheon 2006; Tebes et al. 2007). The present study provides clinicians with preliminary evidence of important protective areas to focus on in the treatment of alcohol use problems within this population and contributes to a burgeoning area of research that can inform the development and promotion of policies related to strength-based interventions.

Inevitably, there are a number of inherent limitations of the present study given the nature and complexities of secondary data analysis. For example, item measurement issues were present within the NLSCY dataset. More specifically, additional questions addressing alcohol use, including variables assessing how many drinks participants consume, would be useful in providing a more concise picture of alcohol use during this developmental period. Also, the gap between the response categories of “*a few times a year*” to “*once or twice a month*” is substantial, and additional response options between these two categories would be preferable. Additionally, only off-reserve Aboriginal youth were sampled given the sampling procedures of the LFS; thus, the findings are not generalizable to Aboriginal youth living on reservations who may have different trajectories of alcohol use and heavy drinking.

The present study provides preliminary evidence of important protective factors affecting the alcohol use and heavy drinking trajectories of Aboriginal youth. Future research could conduct prospective, longitudinal studies that more carefully examine the relationship between protective factors and alcohol use among adolescents, and also expand to include other substances use outcome measures (e.g., inhalants, marijuana, and illicit drug use) and protective predictors (e.g., positive schemas, life satisfaction, happiness). Indeed, the present study focused on alcohol use, since it is expected that other substances would be relatively uncommon among early adolescents and large sample sizes are required for the release of NLSCY data and results from Statistics Canada. As the present sample focused on normative adolescent alcohol use and heavy drinking, clinical samples may provide further information about the protective factors related to alcohol abuse and dependence in hopes of better servicing youth who may be challenging to engage in treatment. Lastly, future research could examine the efficacy of



programs that integrate protective factors into traditional treatment approaches of substance use problems in adolescence, such as cognitive behavioral paradigms.

## Conclusions

The present study was grounded within a developmental psychopathology perspective, which highlights the dynamic interplay of risk and protective factors that influence the development of mental health issues. This study utilized a population-based, longitudinal sample of off-reserve Canadian Aboriginal youth and sophisticated methodologies to identify important protective factors that influence the alcohol use and heavy drinking trajectories of Aboriginal youth. The present findings suggest that a sense of optimism and participation in weekly recreational activities reduce the likelihood of frequent alcohol use and heavy drinking from early adolescence to emerging adulthood among Aboriginal youth. Furthermore, attendance of religious services was protective for heavy drinking across development. These findings contribute to the literature by providing evidence of some key protective factors of Aboriginal adolescent alcohol use patterns that can be incorporated into existing treatment programs for this at-risk population. Namely, facilitating the development of one's optimism for the future, encouraging participation in weekly recreational activities, and encouraging religious or spiritual exploration, which may include Aboriginal traditions and customs. The current study emphasizes the importance of using national, longitudinal data when examining protective factors associated with developmental trajectories and sets the stage for continued culturally-sensitive and sophisticated research in the area of Aboriginal youth mental health issues.

## References

- Bates, S. C., Beauvais, F., & Trimble, J. E. (1997). American Indian adolescent alcohol involvement and ethnic identification. *Substance Use and Misuse*, *32*, 2013–2031.
- Beauvais, F. (1992). Indian adolescent drug and alcohol use: Recent patterns and consequences [Special Issue]. *American Indian and Alaska Native Mental Health Research*, *5*, v-78.
- Beauvais, F., Jumper-Thurman, P., Helm, H., Plested, B., & Burnside, M. (2004). Surveillance of drug use among American Indian adolescents: Patterns over 25 years. *Journal of Adolescent Health*, *34*, 493–500. doi:10.1016/j.jadohealth.2003.07.019.
- Beauvais, F., Oetting, E. R., Wolf, W., & Edwards, R. W. (1989). American Indian youth and drugs, 1976–1987: A continuing problem. *American Journal of Public Health*, *79*, 634–636.
- Beebe, L. A., Vesely, S. K., Oman, R. F., Tolma, E., Asby, C. B., & Rodine, S. (2008). Protective assets for non-use of alcohol, tobacco and other drugs among urban American Indian youth in Oklahoma. *Journal of Maternal and Child Health*, *12*, S82–S90. doi:10.1007/s10995-008-0325-5.
- Biehl, M. C., Natsuaki, M. N., & Ge, X. (2007). The influence of pubertal timing on alcohol use and heavy drinking trajectories. *Journal of Youth and Adolescence*, *36*, 153–167. doi:10.1007/s10964-006-9120-z.
- Canadian Centre on Substance Use. (2007). *Substance use in Canada: Youth in focus*. Ottawa, ON: Canadian Centre on Substance Use.
- Carter, M. A., Dubois, L., & Ramsay, T. (2010). Examining the relationship between obesity and math performance among Canadian school children: A prospective analysis. *International Journal of Pediatric Obesity*, *5*, 412–419.
- Carver, C. S., Scheier, M. F., & Segerstrom, S. C. (2010). Optimism. *Clinical Psychology Review*, *30*, 879–889.
- Cheon, L. W. (2006). Best practices in community based prevention for youth substance reduction: Towards strengths-based positive development policy. *Journal of Community Psychology*, *36*, 761–779.
- Cicchetti, D., & Cohen, D. J. (1995). Perspectives on developmental psychopathology. In D. Cicchetti & D. J. Cohen (Eds.), *Developmental psychopathology, Vol. 1: Theory and methods* (pp. 3–20). Oxford, England: Wiley.
- Duncan, S. C., Duncan, T. E., & Hops, H. (1996). Analysis of longitudinal data within accelerated longitudinal designs. *Psychological Methods*, *1*, 236–248.
- Durlak, J. A. (1998). Common risk and protective factors in successful prevention programs. *American Journal of Orthopsychiatry*, *68*, 512–520.
- Feldman, A. F., & Majatsko, J. L. (2005). The role of school-based extracurricular activities in adolescent development: A comprehensive review and future directions. *Review of Educational Research*, *75*, 159–210.
- Foltz, R. (2004). The efficacy of residential treatment: An overview of the evidence. *Residential Treatment for Children and Youth*, *22*, 1–19.
- Friese, B., & Grube, J. (2008). Differences in drinking behavior and access to alcohol between Native American and White adolescents. *Journal of Drug Education*, *38*, 273–284. doi:10.2190/DE.38.3.e.
- Galliher, R. V., Evans, C. M., & Weiser, D. (2007). Social and individual predictors of substance use for Native American youth. *Journal of Child and Adolescent Substance Abuse*, *16*, 1–16. doi:10.1300/J029v16n03\_01.
- Hawkins, E. H., Cummins, L. H., & Marlatt, G. A. (2004). Preventing substance abuse in American Indian and Alaska Native youth: Promising strategies for healthier communities. *Psychological Bulletin*, *130*, 304–323. doi:10.1037/0033-2909.130.2.304.
- Hotton, T., & Haans, D. (2004). Alcohol and drug use in early adolescence. *Health Reports*, *15*, 9–19.
- LeBel, J., Stromberg, N., Duckworth, K., Kerzner, J., Goldstein, R., Weeks, M., et al. (2003). Child and adolescent inpatient restraint reduction: A state initiative to promote strength-based care. *Journal of the American Academy of Child and Adolescent Psychiatry*, *43*, 37–45.
- Luke, D. A. (2004). *Multilevel modeling*. London, UK: Sage Publications.
- Marsh, H. W., & Gouvenet, P. J. (1989). Multidimensional self-concepts and perceptions of control: Construct validation of responses by children. *Australian Journal of Psychology*, *81*, 57–69.
- McCormick, R. M. (2000). Aboriginal traditions in the treatment of substance abuse. *Canadian Journal of Counselling*, *34*, 25–32.
- McGue, M., & Iacono, W. G. (2008). The adolescent origins of substance use disorders. *International Journal of Methods in Psychiatric Research*, *17*, S30–S38.

- Miyazaki, Y., & Raudenbush, S. W. (2000). Test for linkage of multiple cohorts in an accelerated longitudinal design. *Psychological Methods*, 5, 44–63.
- Nguyen, H., Rawana, J. S., & Flora, D. B. (2011). Risk and protective predictors of depression trajectories among adolescents from immigrant backgrounds. *Journal of Youth and Adolescence*. Advance online publication. doi:10.1007/s10964-011-9636-8.
- Nickerson, A. B., Salamone, F. J., Brooks, J. L., & Colby, S. A. (2004). Promising approaches to engaging families and building strengths in residential treatment. *Residential Treatment for Children and Youth*, 22, 1–18.
- Novins, D. K., & Mitchell, C. M. (1998). Factors associated with marijuana use among American Indian adolescents. *Addiction*, 93, 1693–1702.
- Patton, G. C., Tollit, M. M., Romaniuk, H., Spence, S. H., Sheffield, J., & Sawyer, M. G. (2011). A prospective study of the effects of optimism on adolescent health risks. *Pediatrics*, 127, 308–316.
- Pires, P., & Jenkins, J. M. (2007). A growth curve analysis of the joint influences of parenting affect, child characteristics and deviant peers on adolescent illicit drug use. *Journal of Youth and Adolescence*, 36, 169–183. doi:10.1007/s10964-006-9127-5.
- Rawana, J. S., & Norwood, S. J. (In press). A mixed-method evaluation of a strength-based bullying prevention program. *Canadian Journal of School Psychology*.
- Schmid, H. (1998). Swiss adolescent drug users' and nonusers' optimism about their future. *Journal of Applied Social Psychology*, 28, 1889–1902.
- Singer, J. D., & Willett, J. B. (2003). *Applied longitudinal data analysis: Modeling change and event occurrence*. New York, USA: Oxford University Press.
- Statistics Canada. (1995). *NLSCY microdata user guide cycle 1*. Ottawa, CA: Human Resources Development Canada.
- Statistics Canada. (2007). *National longitudinal survey of children and youth: Survey overview for the 2006/2007 data collection, cycle 7*. Ottawa, Ontario, Canada: Statistics Canada.
- Statistics Canada. (2009). *National longitudinal survey of children and youth: Survey overview for the 2008/2009 data collection, cycle 8*. Ottawa, Ontario, Canada: Statistics Canada.
- Tabachnick, B. G., & Fidell, L. S. (2001). *Using multivariate statistics* (4th ed.). Needham Heights, MA: Allyn and Bacon.
- Tebes, J. K., Feinn, R., Vanderploeg, J. J., Chinman, M. J., Shepard, J., Brabham, T., et al. (2007). Impact of a positive youth development program in urban after-school setting on the prevention of adolescent substance use. *Journal of Adolescent Health*, 41, 239–247.
- Terry-McElrath, Y. M., O'Malley, P. M., & Johnston, L. D. (2011). Exercise and substance use among American Youth, 1991–2009. *American Journal of Preventative Medicine*, 40, 530–540.
- Waller, M. A., Okamoto, S. K., Miles, B. W., & Hurdle, D. E. (2003). Resiliency factors related to substance use/resistance: Perceptions of Native adolescents of the southwest. *Journal of Sociology and Social Welfare*, 30, 79–94.
- Wang, P., Elsbett-Koeppen, R., Geng, G., & Badley, E. M. (2000). Arthritis prevalence and place of birth: Findings from the 1994 Canadian national population health survey. *American Journal of Epidemiology*, 152, 442–445.
- Wills, T. A., McNamara, G., Vaccaro, D., & Hirky, A. E. (1996). Escalated substance use: A longitudinal grouping analysis from early to middle adolescence. *Journal of Abnormal Psychology*, 105, 166–180.
- Yu, M., & Stiffman, A. R. (2007). Culture and environment as predictors of alcohol abuse/dependence symptoms in American Indian youths. *Addictive Behaviors*, 32, 2253–2259. doi:10.1016/j.addbeh.2007.01.008.
- Zill, N., Nord, C. W., & Loomis, L. S. (1995). *Adolescent time use, risky behavior, and outcomes: An analysis of national data*. Rockville, MD: Westat.

## Author Biographies

**Jennine S. Rawana** is an Assistant Professor in the Clinical Developmental Program in the Department of Psychology at York University, Toronto, Canada. She received her Ph.D. in 2006 from Lakehead University in Thunder Bay, Canada. Dr. Rawana's research interests are studying the emergence of normative and atypical emotional development from early adolescence to emerging adulthood, as well as mental health prevention.

**Megan E. Ames** is a doctoral student at York University whose research interests relate to risk and protective factors among at-risk adolescent and emerging adult populations. She received her M.A. in 2009 from York University in Toronto, Canada.