

Polysubstance Use and School Engagement: A Longitudinal Investigation

by

Jennifer Zadorozniak  
B.Sc. University of Saskatchewan, 2006

A Thesis Submitted in Partial Fulfillment  
of the Requirements for the Degree of

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### **Supervisory Committee**

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## ABSTRACT

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Youth substance use is a major social problem and concurrent experimentation with alcohol and other substances is becoming more common. In this investigation, a secondary analysis was performed on a Canadian database of 580 youth. The purpose of this study was to examine the relationships between sociodemographic factors, parenting practices, peer affiliation patterns, and school engagement in predicting the trajectory of polysubstance use in a sample of Victoria youth. In this study, polysubstance use (PSU) is the use of at least two substances in the same time period. Data were extracted from the Healthy Youth Survey, and the prevalence and predictors of polysubstance use were investigated through correlational and structural equation modeling techniques. Polysubstance users tended to be older, be less engaged with school, and report having friends who took part in risky activities such as drinking or doing drugs. School engagement protected against all forms of substance use and over time most strongly protected against polysubstance use.

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## INTRODUCTION

Youth substance use is a major social problem and concurrent experimentation with alcohol and other substances is becoming more common. Understanding youth substance use is important because of the relationship between substance use and youth connectedness to the major social institutions of school and work, and also because of the importance of substance use in understanding youth health. For adolescents, school engagement, which includes attitudes towards school and academic performance, may be an important protective factor in reducing the use of alcohol and other substances. The possible role of school engagement as a protective factor for polysubstance use (PSU) is not as well understood. Specifically, the relationships between school engagement and peer and parent influences, and the rate of increase in polysubstance use warrant further investigation.

### *Rationale*

Adolescence is a period of development when some youth begin to take risks and experiment with substances. Comprehensive research has established relationships between substance use and problem behaviors in youth (Jessor, Donovan, & Costa, 1991; Jessor & Jessor, 1977). Early substance use and school leaving are both associated with higher risks of substance use in adulthood, resulting in major health care and judicial problems including consequences for both the individual and society (Canadian Centre on Substance Abuse, 2007). This suggests that understanding the relationship between school engagement and substance use is relevant and necessary for researchers and practitioners invested in promoting the healthy development of youth into the future.

Previous studies have suggested school engagement acts as a protective factor in delaying the onset of smoking and drinking in early adolescence (Bond et al., 2007; McNeely & Falci, 2004; Simons-Morton, 2004). “School engagement is the reciprocation by the students of teacher support and the extent to which students are invested in and committed to their relationships with their teachers” (McNeely & Falci, 2004, p. 291). In a recent study conducted by Carter, McGee, Taylor, and Williams (2007), school engagement was strongly related to youth attitudes towards school and low levels of health compromising behaviors such as drug use. Their findings reinforce the importance of school as a support network for young people; however, the mechanisms between school engagement and substance use are less clear.

Various researchers have operationalized school engagement by investigating student's attitudes towards school. For example, Jessor et al. (1991) report that youth with positive attitudes towards school are more likely to be motivated to achieve academically, and not use drugs because conventional behavior buffers against risky behaviors. Consistent with this, Butters (2005) found a significant relationship between negative school attitudes, poor academic performance, and high marijuana use. Crosnoe (2006) sought to determine whether academic disengagement was a risk factor for adolescent drinking, or vice versa, by using cross-lagged models. It was found that the number of classes failed in one year predicted alcohol use a year later more than early alcohol use predicted later school disengagement. In other recent research, Benner, Graham, and Mistry (2008) found that greater school engagement at the start of grade nine was associated with higher grades at the end of the end of the grade, which was explained by family support and positive attitudes towards school.

In addition to the school context, the family and peer group account for a substantial portion of the influence on adolescent behavior. Family disruption, neglectful and abusive parenting, and family deviance have been shown to be specific risk factors for adolescent substance use (Smith, Lizotte, Thornberry, & Krohn, 1995). Research has shown that associating with drug using peers is among the strongest predictors of substance use among youth (Barnes, Hoffman, Welte, Farrell, & Dintcheff, 2007; Barnes, Hoffman, Welte, Farrell, Dintcheff, 2006; Donovan, 2004). Since there is disagreement concerning the relative importance of different social environment influences on youth behavior (e.g., Harris, 1995) it is important to examine the simultaneous effects of school, parent, and peer socialization processes on behavior as it occurs during adolescent development.

Developing a better understanding of the risk and protective factors during adolescence that have the potential to lessen the upward trajectory of polysubstance use is important for prevention, intervention, and social policy. Existing research suggests school engagement is one protective factor that protects against or delays substance use involvement. However, school engagement and its relation to polysubstance use has not recently been investigated long-term or in a Canadian context. The present investigation will contribute to the existing knowledge base on the relations held between school engagement and substance use in a Victoria, British Columbia sample by examining longitudinal relationships (over two years) between school engagement and polysubstance use. In addition, this study utilizes a younger general population sample (12 to 18 years) whereas previous studies typically begin studying youth aged fourteen and older.

Current patterns of substance use among youth show increased involvement in the use of multiple substances both over time and on the same occasion (Stockwell, 2007). In the literature, two forms of PSU use are distinguished: concurrent and simultaneous. For this study, concurrent polysubstance is investigated. Concurrent PSU is the use of at least two substances in the same time period, for instance the previous four weeks. This pattern of use is concerning because polysubstance use can affect intoxication, psychomotor impairment, and health in an additive or synergistic manner (Martin, Clifford, & Clapper, 1992). In my investigation, PSU will be the focus of the substance use and school engagement relationship. Polysubstance use is considered an extreme form of substance use that increases already existing risks for long-term consequences associated with substance use and Collins, Ellickson, and Bell (1998) suggest PSU patterns appear to be established by late adolescence. Within the school context, polysubstance use is a more significant risk for students who have fewer protective factors, suggesting a further need for study.

### *Research Objectives*

I will investigate the relationship between school engagement and polysubstance use and examine youth during the period of maximum risk for substance use and early school leaving (12 to 18 years), while controlling for important factors such as parental education and sociodemographic background. A more comprehensive understanding of adolescent polysubstance use behavior will help researchers and educators develop more suitable tools for targeting, preventing, and intervening in health jeopardizing behaviors. Specific research objectives are:

1. To examine the prevalence of polysubstance use among youth living in Victoria.

2. To examine the relationships between sociodemographic factors, parenting, peer affiliation patterns and school engagement.
3. To examine the roles of risky and protective parenting on polysubstance use.
4. To examine the influence of peers on polysubstance use.
5. To examine the role of school engagement on polysubstance use.
6. To examine the combined effects of sociodemographics, parenting, peers, and school engagement on the trajectory of polysubstance use and build a predictive model that best explains the trajectory of polysubstance use patterns.

## LITERATURE REVIEW

This section is a review of substance use literature and focuses on the issues examined in research. Included is an overview of the theoretical perspectives that have been used in previous research on the relationships between sociodemographic characteristics, social environments, individual level variables and substance use patterns, as well as a more detailed presentation of the theoretical model employed in this study.

The general search of literature was conducted using the University of Victoria library gateway databases: PsycInfo, Education Resources Information Centre, and Social Sciences Index. A variety of articles emerged related to youth regarding specific drug issues, social environments, and their experiences with school. I only selected literature that communicated, in some way, content that would inform my understanding of how adolescents' substance use is influenced by social environments. Much of the literature was published in North America and Europe and the most recent research came from the United States and Canada.

### *Prevalence of substance use*

Recent Canadian surveys reflect that tobacco, alcohol, and cannabis are the substances most frequently used by the adolescent population. In 2004, Canadian studies showed that the average age of first tobacco use was about 12 years old, the first alcohol use and first intoxication was about 13 years old, while the first use of cannabis and other drugs typically occurred at 14 years old (Hotton & Haans, 2002). More recently in British Columbia, the McCreary Centre Society's Adolescent Health Survey (AHS) revealed that smoking rates have decreased (down from 56% in 1998 to 26% in 2008), and that alcohol

and marijuana use have declined, as did the use of some drugs such as cocaine, amphetamines and mushrooms (Smith et al., 2009).

Although substance use rates have been falling among youth, they are still a concern because more risky forms of substance usage have emerged. Youth who had tried smoking were smoking more regularly than their peers in the 2003 AHS survey and this trend was seen across genders (Smith et al., 2009). Heavy drinking, defined as five or more drinks within a couple of hours, steadily increased among male and female adolescents. For marijuana, rates of frequent use defined as three or more occasions in the previous month increased with more males being users and starting before the age of nine (from 1% in 2003 to 3% in 2008). Smith and colleagues (2009) also reported a rise in the use of hallucinogens, non-prescribed drugs, and steroids. Since 2003, there was also a slight rise in heroin use and the percentage of BC youth who had ever injected an illegal drug.

Research suggests a substantial proportion of adolescents use more than one substance and early use of one substance has been well established to increase the risk of using another substance. For instance, adolescents are unlikely to experiment with marijuana without prior use of alcohol or cigarettes, and very few adolescents try hard drugs such as cocaine without prior use of marijuana (Zapert, Snow, & Tebes 2002). Current patterns of substance use among youth show increased involvement in the use of multiple substances both over time and on the same occasion (Stockwell, 2007). This concurrent multiple substance use, also known as polysubstance use, has been considered a type of drug abuse because of the unknown consequences for the health and behavior of the individual. Many studies have noted that cumulative multiple substance use is

associated with poorer physical health, greater likelihood of addiction, and other social and mental health problems (Bachman & Peralta, 2002). For youth who are physically developing, polysubstance use is problematic especially when the additive and harmful effects of multiple substances are considered.

### *Demographics of substance use*

Sociodemographic variables such as age, gender, and family background have been shown to be strong predictors of adolescent substance use. However, the relationships are not straightforward across all substances or patterns of use, and additional research is needed to assess the effects of sociodemographic factors on health risk behaviors among youth.

*Gender.* Differences in substance use for males and females have been reported, but results are inconclusive. Cross-sectionally, Barnes, Welte and Hoffman (2002) investigated the relationship of alcohol use to delinquency and illicit drug use by examining gender. Males showed higher levels of alcohol consumption, binge drinking, and overall higher rates of illicit drug use than females, which O'Malley, Johnston, and Bachman (1998) also reported. In Canada, Barnes, Mitic, Leadbeater, and Dhimi (2009) reported that male youth in the Victoria Healthy Youth Survey reported higher alcohol consumption patterns compared to female youth.

When patterns of substance use are investigated, Zapert and colleagues (2002) found that females were more often late starters and high escalators when compared to males. When polydrug use was examined, Collins, Ellickson and Bell (1999) found female adolescents were far less likely to combine marijuana and alcohol than male

adolescents. They suggest that females may view the consequences of polydrug use more negatively than males, and that this could account for females' lower levels of combination drug use.

*Age.* Adolescents are more likely to use drugs and more types of drugs as they get older (Pires & Jenkins, 2007). Polydrug use was studied by Smit, Monshouwer and Verdurmen (2002) among Dutch secondary students. They found that age was a general risk factor for being a polydrug user and as the age of the student increased, the risk of being a hard polydrug user (e.g., amphetamines in addition to alcohol, tobacco, and cannabis) tended to increase. Collins et al. (1999) also found polydrug use was a significant problem for older youth.

*Ethnicity.* Investigations report inconsistent findings when ethnic differences are examined. Some research shows that African Americans have lower usage rates on both alcohol and illicit drugs than Caucasian and Hispanic youth (O'Malley et al., 1998), whereas other studies report mixed findings such as Asian and African American youth have the lowest substance use levels, while Hispanic youth use more illicit drugs than Caucasian youth (Barnes et al., 2002; Collins, 1999). In British Columbia, the McCreary Centre Society (1999) investigated the health of Chinese youth in grades seven through twelve and found that Chinese students were less likely than non-Chinese youth to engage in substance use. For instance, Chinese youth were less likely than non-Chinese youth to have ever tried alcohol (31% versus 67%) or marijuana (9% versus 44%).

*Family background.* Disadvantaged life circumstances are difficult to ignore when understanding adolescent development. Sociodemographic correlates of substance use have been identified in past research including investigations on family composition and

income. For example, young people who reported using cannabis on ten or more occasions were more likely to have come from socially disadvantaged backgrounds (Fergusson & Horwood, 1997). Findings from several studies suggest family income is the highest single indicator of academic achievement and low involvement in risky behaviors such as drug use, followed next by parental occupation, and parental education (Grunbaum et al., 2004; McLoyd, 1998; Brook, Brook, Gordon, Whiteman, & Cohen, 1990).

There is a greater risk of substance use for adolescents living in step-parent or blended families. Barnes and colleagues (2002) found that adolescents from nuclear families had significantly lower levels of delinquency and illicit drug use than those with single parents or who had other living arrangements. Research by Collins et al. (1999) and by Zapert et al. (2002) found adolescents from single parent and from blended families reported higher substance use than did adolescents from intact nuclear families. More recently, a province wide survey of marginalized youth in BC showed that rates of alcohol and other drug use were significantly higher among youth who reported street-involvement and/or homelessness than youth who attended school and lived in their parents' home (Smith et al., 2009).

### *Social Environment*

The cultural and social environment significantly influences adolescent substance use. Smith and colleagues (2009) maintain that increasing protective social environment factors such as family, peer, and school connectedness can help the most vulnerable

youth in overcoming negative experiences, can help young people make healthier choices, and can contribute to more positive health outcomes.

### *Parental influence*

The impact of parenting on children's developmental outcomes has been the focus of considerable research. A number of studies have shown a relationship between adolescent substance use and the family environment including parenting practices and parent-child relations. Greater connectedness to family has been associated with better psychological health, fewer negative life events, increased physical activity, and higher school engagement for adolescents (Carter, McGee, Taylor, & Williams, 2007; Benner, Graham, & Mistry, 2008).

*Defining parenting practices.* Effective parenting practices are often characterized by adequate involvement with children in terms of supervision, monitoring, and communication. Parental support and control have been found to be critically important in family socialization because they are viewed as factors that influence multiple youth behaviors (Barnes, Hoffman, Welte, Farrell, & Dintcheff, 2006). Parental support is defined as a protective parental behavior toward the child such as praising, encouraging, and giving affection, which conveys to the child that she or he is valued and loved. In contrast, parental control includes parental behaviors such as monitoring the child and enforcing curfews, which are intended to direct the child's behavior in a manner acceptable to the parent (Barnes et al., 2006).

*Gender differences.* In the British Columbia Adolescent Health Survey IV, Smith and colleagues (2009) found that male youth reported higher connectedness to both caregivers than females. Both males and female youth reported feeling more connected to

their mothers than to their fathers. Results from another Canadian study of grade seven students conducted by Duchesne and Larose (2007) echo these results. It was also found that the more adolescents perceived the relationship with their mothers as positive, the more the relationship with their fathers was also perceived positively. In other research, females reported that they were monitored by their parents to a greater extent than males (Cohen, Richardson, & LaBree, 1994), while younger youth reported being monitored more closely than older youth (Barnes et al., 2000). Female youth also reported higher levels of connectedness to their friends than male youth did (Carter et al., 2007).

*Effects of parenting practices.* Family cohesion and support are related to adolescent levels of substance use. In their six-wave general population study of New York youth, Barnes and colleagues (2006) studied parental and peer socialization influences on the development of risky health behaviors during adolescence. Family support included measures of maternal nurturance, family cohesion, and communication with the mother. Adolescents who had more family support and who were monitored more had lower alcohol misuse and delinquency at wave one as compared with adolescents with lower levels of support and monitoring. Over time, adolescents who were monitored more had lower rates of increase in alcohol misuse, illicit drug use, and delinquency. Parental monitoring protected against the negative effects of peer deviance on alcohol misuse and delinquency.

Simons-Morton (2007) also assessed social influences on youth substance use over time by examining peers' substance use and parenting practices. American students were surveyed five times, from sixth to ninth grade, reporting their smoking, drinking, and marijuana use, in addition to the number of substance using friends they had, and the

practices of their parents. Parenting practices included indices measuring how much their parents knew about them, their parents' expectations for the youth's behavior, and the extent to which the youth was monitored. The data showed youth drinking and smoking stages, substance use, and the number of substance using friends increased over time, and having more substance using friends predicted the youth's own substance use. Cross-sectional and longitudinal associations between youth substance use and parenting practices were negative, showing strong protective effects of parenting practices. Further, the relationship between each parenting practice and the growth in adolescent smoking and drinking were mediated by the number of friends who smoke or drink.

In the same way, Steinberg and Fletcher (1994) found that American youth who reported less parental monitoring were more likely to be involved in substance use. Over time, males tended to move toward their peers' patterns of substance use regardless of how carefully their parents monitored them. In mixed peer groups, parental monitoring was more effective in preventing adolescent substance use than in groups that were primarily made up of heavy users.

In a different investigation, Barnes and colleagues (2000) investigated family influences on the development of adolescent alcohol misuse. Effective parenting was shown to be an important factor in preventing alcohol misuse. Specifically, high parental monitoring resulted in low initial levels of adolescent alcohol misuse and diminished the upward trajectory of alcohol misuse throughout adolescence. Parental alcohol abuse was also examined and no direct effect of parental alcohol abuse was found for adolescent alcohol misuse. However, Coffelt and others (2006) report conflicting findings. As maternal alcohol problems increased, the likelihood of adolescent alcohol misuse

increased. Interestingly, paternal alcohol problems were associated with an increased likelihood of alcohol use for females, suggesting females were more sensitive to disruptions in the home environment.

In Canada, Pires and Jenkins (2007) used three waves of national longitudinal data to study the influences of parenting and deviant peers on adolescent illicit drug use. Parental rejection included items measuring how often parents threaten or hit their child; whereas parental warmth measured how often parents expressed appreciation for their child. As the child matured the effects of parental rejection and warmth changed. In particular, when children were younger, higher parental warmth was associated with greater drug use, and when children were older, higher parental warmth was associated with lower levels of drug use.

Simons-Morton (2004) investigated drinking expectancies and parent expectations over time among American middle school students. Parental expectations were assessed by asking youth to report how upset their parents would be if the parents found out they were drinking. Across genders, youth with low parental expectations for their behavior were nearly three times more likely to start drinking than those youth with parents having high expectations for their behavior, demonstrating that parental expectations and anticipated consequences moderate drinking initiation.

The development of adolescent health risk behaviors have also been examined by looking at adolescents' use of time. Barnes, Hoffman, Welte, Farrell, and Dintcheff (2007) examined adolescent time by looking at: time spent on homework, time spent with family and peers, and time spent on extracurricular activities. The results indicate the most important predictors of risky health behaviors were family time and peer time.

Family time defined as hours per week spent with parents doing things for fun or going places, served as a protective factor against all five risk behaviors including heavy alcohol use, cigarette smoking, illicit drug use, delinquency and sexual activity. In contrast, peer time defined as hours per week spent with friends, was a highly significant risk factor for all five problem behaviors.

### *Peer influence*

One of the most powerful and consistent predictors of risky youth behavior is whether an individual has friends who also engage in the same behavior. The majority of studies on adolescent peer influence ask youth to report how many friends have performed a specific risk behavior and researchers correlate this value with the youth's reported risk behavior, generating measures of peer influences (Jaccar, Blanton, & Dodge, 2005).

*Peer effects on substance use.* When substance use is examined, many studies demonstrate a link between adolescents' friends' substance use and their own use. Adolescents who use drugs typically have friends who are users (Ludden & Eccles, 2007). Peers are likely to be the major suppliers of substances and act as role models, and peer patterns of substance use may act as determiners in the selection of friends. Hawkins and colleagues (1992) have shown that youth who use cigarettes, alcohol and marijuana are more likely to have friends who also use substances, which some researchers suggest is due to selection and socialization effects (Simons-Morton & Chen, 2006; Newcomb & Bentler, 1989).

*Characteristics and influences of peer groups.* Harris (1995) suggests children learn to behave outside the home by identifying with a group of others they perceive to be

similar to themselves and by taking on the shared behaviors and attitudes of their peer group. In a Dutch longitudinal study, Verkooijen, de Vries, and Nielsen (2007) examined the impact of group identity on adolescent tobacco, alcohol, and marijuana use. Their results showed that involvement with the pop, skate/hip-hop, techno, and hippie subgroups was associated with higher levels of substance use, whereas involvement with the sporty, quiet, computer nerd, and religious subgroups was associated with lower levels of substance use. The likelihood of smoking, using marijuana, and drinking to intoxication decreased significantly with the number of identifications with low-risk subgroups, whereas marijuana use and drinking to intoxication significantly increased with the number of high-risk group identifications.

In Victoria BC, risk and protective factors for adolescent substance use and mental health symptoms were investigated by Barnes et al. (2009). Youth reporting lower substance use rated their parents and peers as being more protective, while youth who had higher substance use, scored higher on the risky peer affiliations index. The risky peer affiliations index measured the extent to which youth had friends that were engaged in activities including smoking, drinking, doing drugs, gang related activities, and skateboarding. Risky peer affiliations were significantly associated with internalizing and externalizing mental health symptoms and were most strongly associated with illicit drug use.

An Icelandic survey conducted by Thorlindsson and Bernburg (2006) reported similar findings on peer groups and substance use when leisure activities were examined. Youth who participated in leisure activities such as organized teams and social clubs were less likely to use alcohol and drugs and the relationship was stronger with increased

involvement in pro-social activities. In contrast, peer influence increased with rising involvement in the party lifestyle which included using alcohol and other substances, being downtown, going to parties, and hanging out at malls or in arcades.

### *School environment*

The following section examines factors associated with substance use and school engagement. These factors have found support in the literature and guided the development of the objectives tested in this study. This discussion will focus on: conceptions of school engagement, related demographic variables, related phenomenological factors and outcomes of school engagement, and their relationships to substance use.

*Defining school engagement.* School engagement has been described by Newmann, Wehlage, and Lamborn (1992) as the “psychological investment in and effort directed toward learning, understanding, or mastering the knowledge, skills, or crafts that academic work is intended to promote” (p. 12). Definitions of school engagement vary and overlap across the literature. Researchers and theorists apply different terms to a range of behavioral and attitudinal measures dealing with school engagement. For example, student engagement, academic engagement, school attachment, school bonding, positive orientation to school, and school connectedness have been used synonymously with school engagement.

Researchers differ in how school engagement is conceptualized because a range of behaviors and attitudes are often considered. Some studies (e.g., Marks, 2000) treat school engagement as a single dimension such as engagement in instructional activity, while others treat the concept as multi-dimensional treating behavioral and psychological

components differently. Woolley and Bowen (2007) conceptualize school engagement as a continuum of proximal school outcomes including social (making friends), behavioral (managing anger), and psychological (motivation to learn) aspects that have been found to be predictive of more distal school outcomes such as grades. In contrast, Manlove (1998) conceptualized school engagement as academic performance which included hours spent doing homework, test scores, and being retained in a grade. Glanville and Wildhagen (2007) state that combining different school engagement components into one index can result in an incomplete understanding of school engagement antecedents and makes identifying which aspects of school engagement are most important for preventing early school leaving more challenging.

After undertaking an extensive review of the existing literature, Fredricks, Blumenfeld, and Paris (2004) found many studies used behavioral, psychological/emotional, and cognitive components to measure school engagement. Behavioral measures which Finn (1993) claims are necessary to achieve positive school outcomes include: attendance, preparation, and involvement in academic, social, or extracurricular activities. Psychological engagement refers to positive and negative reactions or attitudes in the classroom, including interest, boredom, happiness, sadness, and anxiety. Some researchers define psychological school engagement as identification with the school or feeling important to the school (Fredricks et al., 2004; Finn, 1993), while others consider positive and negative affect and alienation psychological components (Kalil & Ziol-Guest, 2008). Cognitive engagement includes commitment, thoughtfulness, and willingness to exert the necessary energy to understand complex material and master the curriculum (Hawkins, Guo, Hill, Battin-Pearson, & Abbott,

2001). Many studies use a variety of these measures in their designs, which makes interpreting results difficult and prevents establishing a comprehensive understanding of school engagement.

*Measuring school engagement.* Several instruments are used to measure school engagement components. The majority of studies employ student and/or teacher questionnaires to measure school engagement as a multi-dimensional construct and a composite score is usually generated from behavioral, emotional, and cognitive measures. One commonly used instrument that measures both behavioral and psychological school engagement is the Rochester School Assessment Package (Welborn & Connell, 1987), while Goodenow's (1993) Psychological Sense of School Membership measures attachment, commitment, involvement and beliefs of students. In the Motivated Strategies for Learning Questionnaire (Pintrich & DeGroot, 1990) classroom behavior is examined. Behavioral school engagement can be measured by items such as: "Since school started this year, how often have you had trouble: (i) Getting along with your teachers? (ii) Paying attention in school? (iii) Getting your homework done?" Psychological school engagement often includes measures asking: "Do you feel close to people at your school?" and "Do the teachers at your school treat students fairly?" Cognitive school engagement is measured by items such as: (i) "How often do you go over things you don't understand?" and "How often do you skip the hard parts?"

*Substance use and social environments.* In a recent Canadian study, Hotton and Haans (2006) investigated drug use in 12 to 15 year old youth by examining peer behavior, parenting practices and school factors. Commitment to school was measured by psychological and behavioral items such as participation, value in school, and readiness

to learn. Drug use was highest among youth whose friends used alcohol or drugs, whose friends were often in trouble, whose parents had a hostile and ineffective parenting style, and who reported low commitment to school. The odds of drinking to intoxication in the past year were more than two times higher for youth who reported doing poorly in school, compared with those who had good grades. However, school commitment and school performance were not associated with early drug use. Comparable research from England also found that excessive drinking was related to low educational aspirations and was associated with cigarette smoking, use of cannabis, and positive attitudes towards illicit drugs (Best, Manning, Gossop, Gross, & Strang, 2006).

In New Zealand, Carter and colleagues (2007) studied health outcomes among teens by investigating associations to family, friends, and school engagement. Males and females reported similar levels of school engagement and adolescents reporting higher levels of connectedness to their family also reported higher levels of school engagement. School engagement showed the strongest and most pervasive associations across both health compromising behaviors (smoking, alcohol bingeing, and cannabis use) and health promoting behaviors (physical activity and nutrition). Adolescents who reported their school climate was one of fairness, care, and one with which they felt emotionally engaged were significantly more likely to report less substance use.

Studying similar domains, Dornbusch, Erickson, Glasgow, Laird, and Wong (2001) examined the relationship between family and school attachment to youth deviance, using cross-sectional data from the US National Longitudinal Study of Adolescent Health. Attachments to family and school tended to reduce the overall frequency, prevalence, and intensity of cigarette smoking, alcohol use, marijuana use, and

other deviant behavior regardless of community context, gender, or ethnic group. Ties to school operated to deter adolescents from engaging in these behaviors, but once deviance had occurred, the relative strength of school connectedness as an influence on deviant behaviors tended to be weaker. Research from McNeely and Falci (2004) also examined social support in schools and found teacher support (fairness and concern for students) was a protective factor for initiating cigarette smoking and binge drinking, and transitioning into regular use of marijuana, but had little effect on the reduction or cessation of substance use once initiated.

### *Longitudinal studies*

*School outcomes and substance use.* In Australia, Bond and colleagues (2007) investigated predictors of substance use and school outcomes in secondary school students. School and social connectedness reported in grade eight were associated with the best outcomes four years later. School connectedness covered commitment to school, relationships with teachers and peers, participation, and student autonomy, while social connectedness examined supportive peers. Young people who were socially connected to peers, yet not connected with school were more likely to become regular smokers and use marijuana in later years. Again, school connectedness was an important protective factor for adolescent substance use.

In an impressive longitudinal Finnish study, Pitkanen, Kokko, Lyyra, and Pulkkinen (2008) studied antecedents (family background, social behavior, and drinking history) of adult drinking from fourteen to forty-two years of age. Poor school success at fourteen years of age, social behavior problems, and maladaptation to school in early

adolescence was related to later problem drinking in both genders. Comparable results were reported by Crum, Ensminger, Ro, and McCord (1998) in their twenty-five year longitudinal study of African American children. Underachievement in first grade, leaving school early, and poor school adaptation were associated with risk for alcohol use disorders in adulthood.

Using six years of data from the American Monitoring the Future study, Bryant, Schulenberg, Bachman, O'Malley, and Johnston (2003) examined school-related factors and adolescent substance use. Low levels of academic achievement early in adolescence were associated with higher reports of concurrent substance use (cigarette and marijuana use) over time. In contrast, higher levels of school interest, effort, and school bonding, decreased the likelihood of concurrent cigarette and alcohol use at twenty years of age.

In an Australian sample, Bergen, Martin, Roeger, and Allison (2005) examined adolescent academic performance in relation to substance use. Self-rated academic failure predicted more weekly alcohol and tobacco use at age 15 and progression to early use of double (6- to 8-fold) and triple (12- to 15-fold) combinations of alcohol, tobacco and marijuana to more frequent use. Crosnoe (2006) also explored the effects of academic failure. The number of classes failed in one year predicted alcohol use a year later more than early alcohol use predicted later class failures. Over time, failure in school lead to increased rates of drinking through weakened bonds to institutions and supportive adults.

*Substance use and early school leaving.* In the United States, Ellickson, Tucker, and Klein (2001) compared high risk behaviors associated with early smoking at grade seven and grade twelve. After five years, early smokers were at least three times more likely than non-smokers to regularly use tobacco and marijuana, use hard drugs, sell

drugs, have multiple drug problems, and leave school early. Grade seven smokers were at higher risk of low academic achievement and behavioral problems at school such as being sent out of class, repeating a grade, and missing school. Comparisons for boys and girls yielded the same pattern of results. In an earlier study carried out by Ellickson, Bui, Bell, and McGuigan (1998), the frequency of cigarette use during seventh grade predicted dropping out of high school for Asians, African Americans, and Caucasians, but not for Latinos. However, early marijuana use only predicted early school leaving for Latinos.

Using ten waves of data from the Rochester Youth Development Study, McCluskey, Krohn, Lizotte, and Rodriguez (2002) examined the relationship between early substance use and school completion in males. Early alcohol and drug use exerted an independent influence on the failure to complete high school beyond any impact of family and school variables, including school involvement, grade average, and achievement test performance. In a comparable study, Zimmermann and Schmeelk-Cone (2003) investigated substance use and school motivation among African American youth over five waves. School motivation was related to subsequent alcohol use throughout high school and marijuana use early in high school. The use of alcohol and marijuana were related to a lower likelihood of completing high school.

In Ireland, McCrystal, Percy, and Higgins (2007) analyzed data from the longitudinal Belfast Youth Development Study and found school excludees had higher levels of drug use after four years compared to the mainstream school sample. Nine out of ten school excludees smoked everyday by the age of fifteen and reported more anti-social behavior, lower levels of communication with their parents, and more contact with the criminal justice system. In contrast, Cook and Hutchinson (2006) found no direct

implications that smoking caused early school leaving. They speculate that smoking is a signal of being off track for high school students, and that most youth do not want to be viewed by their peers as being on the wrong track.

In their review of the effects of cannabis use on educational attainment, Lynskey and Hall (2000) found that early use was influenced by the social environment. Early cannabis use was associated with the adoption of an anti-conventional lifestyle characterized by affiliations with substance using peers, leaving the parental home, and early school leaving. In Canada, Smith and colleagues (2009) also reported marijuana use was linked to school disengagement. Compared to students who had never tried marijuana, students who had were over three times more likely to have skipped school in the past month (53% vs. 17%), were less likely to feel that the activities they were involved in meant a lot to them (32% vs. 37%), and reported lower levels of school connectedness (Smith et al., 2009).

### *Theoretical Perspective*

Comprehensive research reports on adolescent problem behaviors, including substance use and early school leaving, and examines predictors across multiple developmental contexts including biological, social, and environmental factors (Hawkins, Catalano, & Miller, 1992). Developmental theorists are interested in the relationships between personal characteristics and environmental factors, and their combined impact on children's behavior. Developmental theories that have been used to explain childhood development include: Bronfenbrenner's ecological systems theory, Jessor's problem behavior theory, Hirschi's social control theory, and Harris' group socialization theory.

For the current study, group socialization theory (GS theory) was selected as being the most suitable theory for examining the longitudinal relationships between school engagement, other social influences, and the trajectory of polysubstance use.

*Group socialization theory*

Harris' (1995) group socialization theory is based on findings from behavioral genetics, sociology, primate evolution, and developmental psychology. Harris proposes that learned behavior is tailored to fit specific relationships and contexts. Six domains compose GS theory including: (1) context-specific socialization and personality development; (2) sources of outside-the-home socialization; (3) transmission of culture via group processes; (4) between-group processes that widen differences between groups; (5) within-group processes that widen differences among individuals; (6) assimilation and differentiation. For each domain assumptions are made such as children learn separately how to behave in the home and outside of the home, and children move away from inside-the-home behavioral system towards the outside-the-home system (i.e., the peer group).

According to GS theory, peer groups make children more alike. Children learn to behave outside the home by identifying with a group of others they perceive to be similar to themselves (same age and/or sex) and by taking on the shared behaviors and attitudes of their peer group. Differences in personality and upbringing may create differentiation within groups. In addition, schools, neighbourhoods, the media, and parents (as a group) may have effects on individual children through their effects on the norms of their peer group. Harris (1995) reasons that if parenting behaviors have lasting effects, those effects are specific to the context in which the behaviors were experienced, namely in the home.

Further, she argues children are destined to play out their adolescent and adult lives in contexts outside-the-home, so what is learned in these other contexts (i.e. school and work place) will be more important in the long run in the development of children.

*Application of theory.* Investigators of group and context-specific socialization processes have found that family, peer, and school socialization processes are all related to adolescent behavior patterns. A predictive model (see Figure 1) influenced by Harris' (1995) group socialization theory will be used to examine the relationship between school engagement and polysubstance use. My model adapted from this theory places the individual within broader social influences including parents, peers, and school, and identifies factors that predispose youth to negative development outcomes. The impact that school engagement has on long-term youth polysubstance use will be better understood using this model and theory.

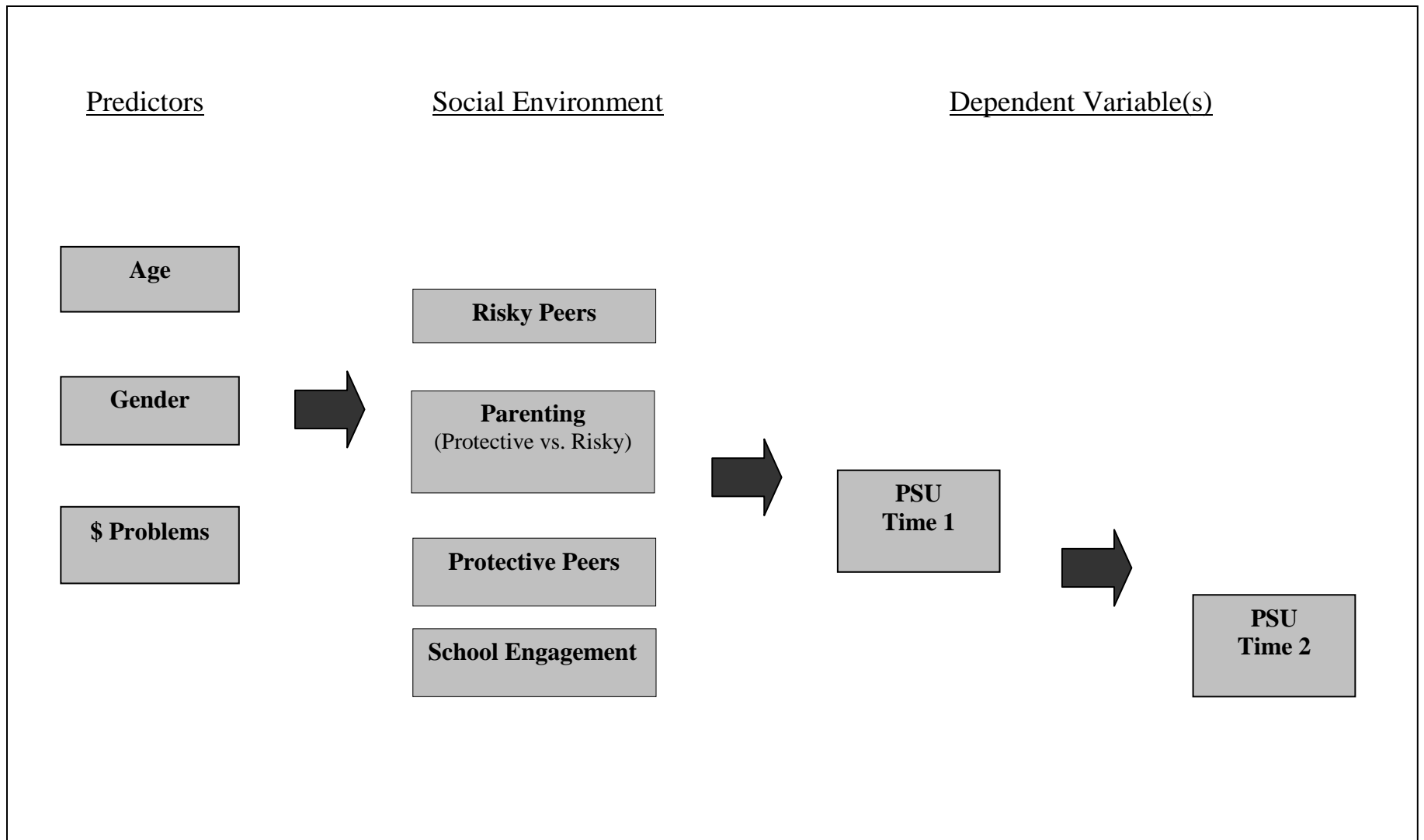


Figure 1. Hypothetical relationships between predictive factors and polysubstance use (PSU) that will be investigated.

## METHOD

This section examines the methodology employed in this study. The data analysed were part of a larger data set derived from the respective 2003 and 2005 Healthy Youth Surveys, therefore the methodology for this study is reflective of the methodology of the primary study. Sample selection and description, procedure for data collection, instruments and variables, and methods of data analyses used are described below.

### *Design*

To analyze the longitudinal effects of parenting, peers, and school engagement on differences in polysubstance use, a multivariate panel survey design was employed. The most important advantage to undertaking longitudinal studies is the opportunity to statistically test the relationship between risk and resilience indicators observed early on in a child's development and outcomes observed at a later point in his or her development. There are three important consequences of using this design. First, by using multi-level modeling, it is possible to analyze the strength and direction of the independent impact of different social and personal influences on adolescent problem behaviors, thus this design goes beyond studies that are limited by a single variable or domain. Second, the longitudinal data analysis allows for a powerful test of the causal link between temporally separated variables. Third, with this increased complexity, I am better able to explore the mediated relationships among potential predictor variables and adolescents' health risk behaviors.

*Procedure*

To carry out this investigation, I used data from a recent longitudinal research project conducted in Victoria, British Columbia. The Healthy Youth Survey (HYS) is a panel survey designed to contribute to the knowledge base concerning youth health risks and injuries. The University of Victoria's Human Research Ethics Board granted the HYS ethical approval and I was given permission to use anonymized data.

Data for the current investigation are based on the first and second waves of the study using data collected in the spring of 2003 and in the spring of 2005. Participants were recruited through general population screening and selection, and both parents or guardians and youth were asked for consent.

Participants were first contacted by a telephone marketing company that was hired by the research project. Initially, 9500 random residential listings were phoned and from this list, 1036 households were identified as having eligible youth. Of these eligible households, 185 parents or guardians (17.9%) did not consent to allowing their child to participate, while 187 youth (18.1%) declined to participate. In 2003, complete data were available from 664 youth (51.7% female) and in 2005 complete data were available from 580 youth. In 2005, 87.3% of the original sample participated.

The survey was administered in-person by trained interviewers in youth's homes or in other safe environments. Youth answered a two-part questionnaire; the first part was administered and recorded by the interviewer, and the second part was recorded by the youth in order to enhance privacy and confidentiality. Remuneration in the form of a twenty-five dollar gift certificate was given to participants. For additional information on the methodology for this study see Jansson, Mitic, Russell, and Dhimi (2006).

Youth who were enrolled in middle school or high school during waves one and two of the data collection and their self reports, during this time in their development, are the focus of my investigation. Complete data on 351 participants are available and are used to conduct my analyses. These participants were fairly evenly divided among school grades (8 through 12), with a few more (27%) in 12th grade and the least (5%) in 8th grade. At wave one, the mean age of the sample was 15.5 years and at wave two the mean age was 17.6 years. The majority of HYS participants were of Caucasian decent.

### *Measures*

The HYS included items on sociodemographics, family, peer, and school environments, as well as substance use. A summary of the measures that were used as independent and dependent variables including the scale reliabilities is provided in Table 1. The development of some of these measures is described below.

#### *Demographic domain*

In each wave, respondents reported their gender and their date of birth. The difference between this date and the date of the interview was used to estimate age in months.

#### *School and socioeconomic status*

Youth were asked whether or not they were enrolled in middle or high school. Family's socioeconomic status was measured using three questions about ability to pay for basic necessities, things for school, and things the youth liked to do. Answers were provided using a three point scale (often, sometimes, never). Responses were summed to get an overall measure of economic strain.

*Social environments*

To measure the type of activities engaged in by the peers of the respondent, the HYS team of researchers created two different measures of risky and protective peer activities. Six dichotomous items were used to estimate each measure. Examples of indicators of risky activities included the questions: “Are your close friends into drinking or doing drugs?” and “Are your close friends into asking for money downtown (pan-handling)?” Examples of indicators of protective peer activities included the questions: “Are your close friends into working hard for high grades in school?” and “Are your close friends into performing in drama, music, or band?” Each of the two measures was estimated by generating an aggregate score based on the six indicators.

*Scale reliability.* Reliability was tested by Cronbach’s Alpha coefficients, which tested the proportion of variance due to common factors among the items in the scales. The reliability coefficients that result from the correlations of two sets of similar measurements will range between 0 and 1. A coefficient of 0.70 implies that 70 percent of the measured variance is reliable and 30 percent is due to random error. In other words, the lower the reliability coefficient the less reliable the measure. A coefficient of 0.70 or better would be needed in order that the scale is considered at least moderately reliable (Cronbach, 1951). Listed below are the scale characteristics and reliability coefficients for the measures put to the test of reliability.

Parenting was assessed with two positive parenting scales, two negative parenting scales, and one parental supervision scale. The term parent refers to any adult caregiver who the youth considers to have assumed their long-term responsibility during the years the survey was administered. A positive parenting score was calculated for each parent,

mother and father respectively. Each measure is based on 5 items adapted from Schaefer's (1965) *Inventory of Children's Reports of Parental Behavior*. Alpha for these two measures are .75 for mother and .77 for father. Negative parenting was assessed by Mother Psychological Control (8 items) and Father Psychological Control (8 items). These items are adapted from Barber's (1996) *Parental Psychological Control* construct. A separate five item scale was used to assess parental supervision based on Barber (1996) with an Alpha of .72. These five scales were combined to create an aggregate score for parenting by adding the two positive parenting scales and the parental supervision scale, and subtracting the two psychological control scales. A higher score is indicative of more parental support and more parental supervision.

To measure school engagement, participants were asked about their attitudes towards school and teachers. Youth were asked how often they agreed or disagreed with the following statements: "My teachers care about how I'm doing, My teachers like me, I feel satisfied with school because I am learning a lot, and I care what most of my teachers think of me." These school engagement items only assessed psychological or emotional aspects of school engagement. The four items, with five response categories (strongly disagree to strongly agree) were adapted from Wehlage, Rutter, Smith, Lesko, and Fernandez (1989). Alpha for this scale was .72 at time one and .71 at time two. The test-retest correlation for the school engagement variable at wave one and wave two is 0.37 (n=347,  $p < .01$ ).

Table 1. Description of measures.

Independent Variables with Description (# and format of items; Cronbach $\alpha$ T1; T2)	Example item(s)
<b>Demographics</b>	
1. <i>Age</i> (1, Month/Day/Year)	What is your birth date?
2. <i>Gender</i> (1, Yes/No)	Are you male or female?
3. <i>Attending school</i> (1, Yes/No)	Are you currently enrolled in school?
4. <i>Money problems</i> (3, 4-point Likert; .51; .39)	How often does your family have problems paying for basic necessities?
<b>Social Environment</b>	
1. <i>Parental Supervision</i> (6, 3-point Likert; .72)	How much do your parents really know what you do with your free time?
2. <i>Risky Peer Affiliations</i> (6, Yes/No)	Are your close friends into drinking or doing drugs?
3. <i>Protective Peer Affiliations</i> (5, Yes/No)	Are your close friends into working hard for high grades in school?
4. <i>School Engagement</i> (4, 5-point Likert; .72; .71)	I feel satisfied with school because I am learning a lot.
<b>Dependent Variables</b>	
<i>1. Polysubstance Use Aggregate of:</i>	
a. <i>Smoking</i> (3, 3-point)	At the present time, how often do you smoke cigarettes?
b. <i>Alcohol</i> (3, 5-point Likert)	During the past 12 months, how often did you drink?
c. <i>Marijuana</i> (1, 5-point Likert)	How often have you used marijuana in the past 12 months?
d. <i>Illicit drugs minus tobacco and cannabis</i> (7, 5-point Likert)	How often have you used club drugs/cocaine/heroin in the past 12 months?

*Polysubstance use*

Each participant was given a score based on a frequency of using: (i) alcohol, (ii) tobacco, (iii) marijuana, and (iv) hallucinogens, amphetamines, club drugs, inhalants, cocaine, and heroin. Tobacco use was measured by responses on a three point scale (not at all, occasionally, or daily) to the question “At the present time, how often do you smoke cigarettes?” This three point scale was transformed into a five point scale. The frequency of using alcohol, marijuana, and other illicit drugs was based on respective scales ranging from “never” to “more than once a week” when asked about the frequency of use in the past 12 months. These individual substance scales were also transformed into a five point scale if the original scale differed from this format. The frequency of use of the other illicit substances was calculated as the average frequency of all other substances (i.e., hallucinogens, amphetamines, club drugs, inhalants, cocaine, and heroin). Overall polysubstance use was calculated as the simple arithmetic mean of the four substance use categories (See Table 1). For my purposes, I only investigated the substances mentioned above. Noteworthy is that prescribed medications were not included in the polysubstance measure or in the remainder of the survey.

*Data Analysis*

Data in this study were analysed using the Statistical Package for the Social Sciences (SPSS) version 16.0 and the Structural Equation Modeling (SEM) software package EQS version 6.1 (Bentler, 1982). One benefit of using SEM is the ability to simultaneously test for direct and indirect (i.e. mediated) effects, which is not possible with an ordinary least squares regression method. Data were analysed as described below.

As done in most quantitative studies, frequency analyses were first conducted to describe the sample in terms of the rates of substance use and sociodemographic features using percentages and means. Next, Pearson correlations were computed to determine interrelationships among variables. For example, correlations were performed between sociodemographic (e.g., age, gender, family money problems) and social environment variables (e.g., peer activities, parental supervision, school engagement) to identify independent variables that were most significantly correlated. Correlations were also carried out for all substance use variables. To determine longitudinal trends, cross-lagged correlations for school engagement and polysubstance use at both points in time were examined.

Structural equation modeling was used to test the model shown in Figure 1. The concept of model building is embedded within behavioral science, where the primary goal is to build and test models that identify some direct and indirect, risk and protective, factors in a child's development. Direct influences are characterized by someone (e.g., parent, teacher, or peer) influencing the behavior of another individual by providing a model, appropriate reinforcement, or a relationship. Indirect effects result when a variable influences the development of another's behavior over a period of time. For example, a family's socioeconomic characteristics may indirectly affect youth substance use by causing less effective parenting. Baron and Kenny (1986) refer to this mechanism as a mediated effect because a third variable (family SES) effects the independent variable (parenting) which is able to influence the dependent variable of interest (youth PSU).

To verify directionality in this model, cross-lag correlations (for time one and time two) were carried out between each social environment variable (i.e. parenting, risky

peers, and protective peers) and school engagement. The resulting direct and/or indirect pathways indicate which variable is the most predictive of youth polysubstance use over time. Next, initial structural pathways between independent and dependant variables were specified based on the correlational findings.

Trial models were then modified to improve the fit of the available data to the hypothesized model. To facilitate this, modification indexes including the LaGrange Multiplier (LM) Test (Silvey, 1959) and the Wald test (Wald, 1945) were used to improve model fit. In an exploratory model, the LM test evaluates a model's fit by providing guidance or suggestions on the effect of adding free parameters such as gender, age, or peer influences. In contrast, the Wald test estimates whether an independent variable has a statistically significant relationship with a dependent variable by suggesting which independent variable(s) should be removed from the model. Following standard EQS procedures, the LaGrange Multiplier test was first applied and followed by the Wald test. This ensured that all pertinent variables were added to the model and were thoroughly considered before removing any less significant variables. Specific criteria used to assess and improve the fit of the model included: reaching a chi-squared to degrees of freedom ratio of less than two to one, a comparative fit index of over .90, and a root mean square error of equal to or less than .06 (Hu & Bentler, 1999). By inspecting the individual and combined effects of sociodemographic measures, social environments and polysubstance use at Time 1 on polysubstance use at Time 2, the SEM revealed those independent variables which best predicted polysubstance use after two years.

## RESULTS

### *Demographic characteristics*

The analyses for this research were conducted on data provided by the Healthy Youth Survey (HYS). The total sample size was 664 subjects. For the purposes of this study, only the data from 580 youth who participated at time one and time two were analysed. Demographic characteristics for this sample are outlined below.

The mean age of participants in the sample at time one was 15.5 years (s.d.±1.9) and the age range was 12 to 19 years. Slightly more females (51.7%) participated than males (48.3%) and overall participation was evenly divided among the middle and high school grades. The distribution of grades was as follows: 21 (3.3%) were in the 6<sup>th</sup> grade, 88 (14%) were in the 7<sup>th</sup> grade, 92 (14.6%) were in the 8<sup>th</sup> grade, 97 (15.4%) were in the 9<sup>th</sup> and 10<sup>th</sup> grades respectively, 111 (17.7%) were in the 11<sup>th</sup> grade, 103 (16.4%) were in the 12<sup>th</sup> grade, and 19 (3%) were in other grades or alternative schooling combinations.

Eighty-five percent of the subjects were Caucasian, 4% were Asian, 4% were bi-racial, 3% were Aboriginal, and the remaining 5% belonged to other ethnic groups (South Asian, African America, or other).

### *Attrition analyses*

The following results report differences between youth who participated at time one and time two versus youth who did not participate at time two. Of the sample, 87.3 percent participated at both times, while 12.7 percent did not participate in the second wave of interviews. Time two non-participants consisted of 48 males (57.1%) and 36 females (42.9%). A Chi-Square test showed no significant gender differences ( $\chi^2=3.00$ ,  $p=0.08$ ) between participants and non-participants at time two.

Results reported in Table 2 show sociodemographic characteristics of youth who participated at time two versus youth who did not participate at time two.

Sociodemographic indicators were examined for participant groups using a one-way analysis of variance (ANOVA). Only the number of household moves in life was significant ( $F=8.31$ ,  $p=0.004$ ) between groups, indicating that time two non-participants reported moving more often in their lives than participants.

Table 2. *Sociodemographic results of one way ANOVA*

Variable	n	Mean	sd	F
Age				
Time 2 non-participants	84	186.65	23.97	
Participants	580	186.32	23.08	
				.02
Mother's highest education				
Time 2 non-participants	70	3.87	1.50	
Participants	527	3.93	1.36	
				.13
Father's highest education				
Time 2 non-participants	70	3.37	1.60	
Participants	506	3.74	1.48	
				3.64
Family money problems				
Time 2 non-participants	84	1.33	.44	
Participants	572	1.26	.38	
				2.49
Number of moves in life				
Time 2 non-participants	83	3.65	3.01	
Participants	577	2.59	3.15	
				8.31**

When school engagement was examined, differences between time two non-participants and participants were not significant ( $F=0.81$ ,  $p>0.05$ ). In other words, attitudes towards school and teachers did not vary across participant groups. When respondents were asked about their most recent academic grades, differences between time two non-participants and participants were also not significant ( $F=2.70$ ,  $p>0.05$ ).

Results from a one way ANOVA comparing substance use patterns at time 1 among time two participants versus non-participants are reported in Table 3. Self-reports of substance use at time 1 were not significantly different among participants and non-participants at time two.

Table 3. *One way ANOVA: Time one substance use results*

Substance	n	Mean	sd	F
Smoking				
Time 2 non-participants	84	1.24	.57	
Participants	580	1.18	.50	
				.96
Alcohol				
Time 2 non-participants	83	2.22	1.17	
Participants	580	2.20	1.21	
				.02
Marijuana				
Time 2 non-participants	84	1.86	1.32	
Participants	580	1.71	1.20	
				1.08
Other drugs				
Time 2 non-participants	84	1.05	.17	
Participants	579	1.05	.16	
				.000
Polysubstance use				
Time 2 non-participants	83	1.66	.80	
Participants	579	1.59	.73	
				.74

#### *Prevalence of substance use*

The prevalence of substance use was determined by the analysis of frequency data. Smoking tobacco, drinking alcohol, smoking marijuana, and using other illicit substances were reported by youth in the sample. At time one, the most commonly used substances were alcohol (64.9%), marijuana (35.7%), and tobacco (13.1%).

Daily smoking was reported by 6.4 percent of females and by 4.7 percent of males. Differences between groups were not significant ( $F=0.56$ ,  $p>0.05$ ). Never using alcohol was reported by 17.3 percent of females and 15.8 percent of males, and differences between groups were not significant ( $F=2.06$ ,  $p>0.05$ ). However, at time two, differences between groups were significant for alcohol use in the past year ( $F=4.22$ ,  $p<0.05$ ). The direction of effects indicates that males reported drinking more often in the past year than females. When marijuana usage was examined at time one, 34.2 percent of females reported never using and 30.1 percent of males reported never using. At time two, differences between gender groups were significant for marijuana use ( $F=7.85$ ,  $p\leq 0.05$ ). The direction of effects suggests that males report marijuana use more often in the past year than females.

Table 4 reports results from a one-way analysis of variance examining differences between gender groups for other illicit drugs, as well as polysubstance use. A test of between-subjects effects for substance use by gender was only significant at time one for the other illicit drug use measure ( $F=5.60$ ,  $p=0.02$ ). The direction of effects, shown in Table 4, reveals that females reported more other illicit drug use than males at time one. Polysubstance use was not significantly different between genders.

Table 4. *One way ANOVA: Differences in substance use by gender*

Substance use	Gender	n	Mean	sd	F
Time 1: Other illicit drugs	Male	320	1.03	.10	5.60*
	Female	343	1.06	.20	
Time 2: Other illicit drugs	Male	273	1.08	.19	2.00
	Female	304	1.11	.27	
Time 1: Polysubstance use	Male	319	1.62	.72	.53
	Female	343	1.58	.76	
Time 2: Polysubstance use	Male	268	2.03	.88	2.37
	Female	301	1.92	.88	

### *Correlational relationships*

Pearson correlation analyses were conducted to examine the relationships among: (1) sociodemographic indicators and polysubstance use; (2) sociodemographic indicators and school engagement; (3) school engagement and substance use; (4) polysubstance use and social environment measures.

A correlational matrix of sociodemographic variables and polysubstance use is presented in Table 5. The analyses demonstrated a strong correlation between age and polysubstance use at both times (.49 and .33). No significant relationship existed between gender and polysubstance use. Mother's education did not significantly correlate with polysubstance use, whereas father's education was negatively correlated at both times. At time one and time two, both the number of household moves in life and family money problems were significantly correlated with PSU.

Table 5. *Correlations for sociodemographic indicators and polysubstance use*

Variables	Polysubstance use	
	Time 1	Time 2
Age	.49**	.33**
Gender	-.03	-.06
Mother's education	-.03	-.05
Father's education	-.10*	-.11*
Number of moves in life	.16**	.15**
Family money problems	.12**	.11**

Note: \*p<. 05; \*\*p<. 01

Note2: minimum N=497 (father's education)

Table 6 reports results from correlations performed between sociodemographic indicators and school engagement. Variable transformations (i.e. dummy variables) were performed for demographic variables, which allowed them to be entered into the correlation equation and analysed. A value of “0” indicated male gender and a value of “1” indicated female gender, meaning variables positively correlating with gender indicated a stronger relationship to female gender.

Age was negatively correlated with school engagement at time one, but no significant correlation existed for time two. The correlation suggests younger youth were more engaged in school compared to older youth at time one, however the direction changed at time two but was not significant. At time two, gender positively correlated with school engagement (.17). In other words, females were more likely to report higher school engagement. No significant relationships existed between mothers' and fathers' education and school engagement.

At time one, fewer household moves in life was correlated with higher scores on school engagement, but no relationship was found at time two. At time one, family money problems were negatively related to school engagement (-.10), but the correlation

was not significant at time two. In other words, youth reported less school engagement if their family experienced financial strain.

Table 6. *Correlations for sociodemographic indicators and school engagement*

Variables	School engagement Time 1	School engagement Time 2
Age	-.10*	.09
Gender	.07	.17**
Mother's education	.06	.05
Father's education	.05	.09
Number of moves in life	-.09*	-.10
Family money problems	-.10*	-.09

Note: \* $p < .05$ ; \*\* $p < .01$

Note2: minimum  $N=335$  (Father's education)

Cross-sectional correlations between school engagement and substance use patterns are presented in Table 7. Significant negative correlations were found between school engagement and all substance use measures. At time one and time two, polysubstance use correlated most significantly with school engagement (-.34). As shown in Table 7, marijuana and alcohol use equally correlated with school engagement (-.30) and smoking tobacco had the smallest correlation with school engagement (-.19). From time one to time two, the correlation between marijuana and school engagement was unchanged, while correlations with alcohol use changed the most. It is interesting to note that the relationship between the polysubstance use scale and school engagement was consistently higher than between any of the individual substances and school engagement.

Table 7. *Correlations for school engagement and substance use*

Substance categories	School engagement Time 1	School engagement Time 2
Smoking	-.19**	-.16**
Alcohol	-.30**	-.18**
Marijuana	-.30**	-.30**
Other drugs	-.23**	-.25**
Polysubstance use	-.34**	-.31**

Note: \*p<. 05; \*\*p<. 01

Results appeared to be particularly strong for all associations between polysubstance use and social environments (Table 8). Considering the risk factor domain first, risky peer activities most strongly correlated with PSU at time one and time two. The relationship changed over time (.60 to .49), but the relationship remained stronger than any of the other social environment risk factors. In other words, higher risky peer affiliations scores were associated with greater polysubstance use.

For protective factors, parenting demonstrated the most significant correlations as shown in Table 8. At time one, parenting was negatively correlated with polysubstance use (-.42), suggesting higher reports of protective parenting related to less polysubstance use. At time two, the correlation was lower but still significant (-.29). The correlations between protective peer activities and PSU indicate a negative relationship with polysubstance use at time one and time two. In other words, high scores on protective peer activities were associated with lower rates of PSU.

Table 8. *Correlations for polysubstance use and social environments*

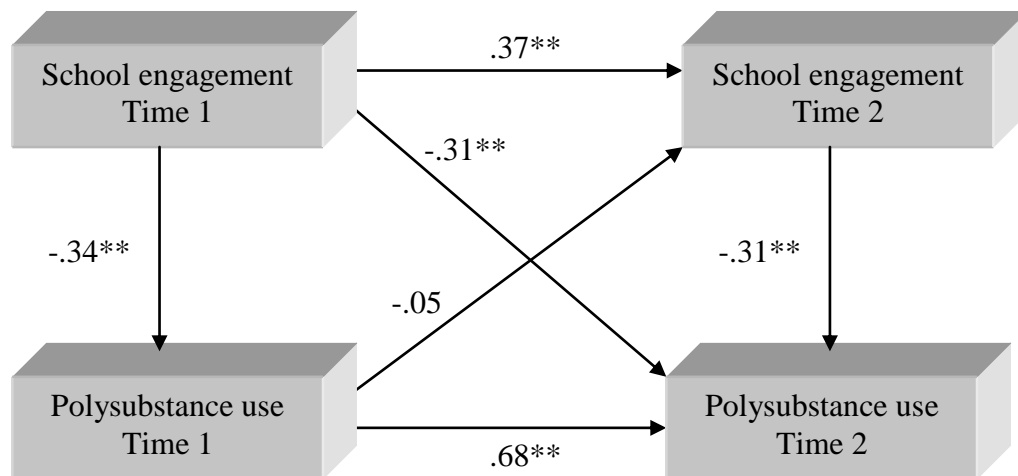
Variables	Polysubstance use Time 1	Polysubstance use Time 2
Risky peer activities	.60**	.49**
Parenting	-.42**	-.29**
Protective peer activities	-.39**	-.21**

Note: \*p<. 05; \*\*p<. 01

Note2: minimum N=551 (parenting)

To determine the longitudinal associations between polysubstance use and school engagement, cross lag analyses were carried out and results are diagrammed in Figure 2. School engagement at time one significantly predicted school engagement at time two (.37), while polysubstance use at time one also predicted PSU at time two (.68). Polysubstance use at time one was not significantly correlated with school engagement at time two (-.05). However, school engagement at time one is significantly correlated with PSU at time two (-.31), suggesting school engagement protects against polysubstance use longitudinally.

Figure 2. *Cross-sectional results for school engagement and polysubstance use*



Note: \* $p < .05$ ; \*\* $p < .01$

### *Structural equation model results*

Results of the structural equation model are presented in Figure 3. The fit indices for the final model met minimum recommended criteria, and the proposed model seemed to be quite successful in explaining the variance in school engagement and polysubstance

use. The overall model fit was good,  $\chi^2=44.82$ ,  $p=0.00$  (Comparative fit index=0.97; Root-mean square error of approximation=0.06), and model predictors accounted for a large portion ( $R^2=0.47$ ) of the variance in polysubstance at time two.

Results of the structural equation model predicting PSU showed that two variables made a significant contribution in the prediction of overall substance use at time two (Figure 3). These variables in order of magnitude were: polysubstance use at time one (.66) and school engagement at time one (-.08). Some of the variance for PSU at time two was explained by indirect paths running through PSU at time one. School engagement was the only social environment indicator with a direct path to PSU at time two as well as an indirect path. Model results are discussed in more detail below by demographic and social environment indicators respectively.

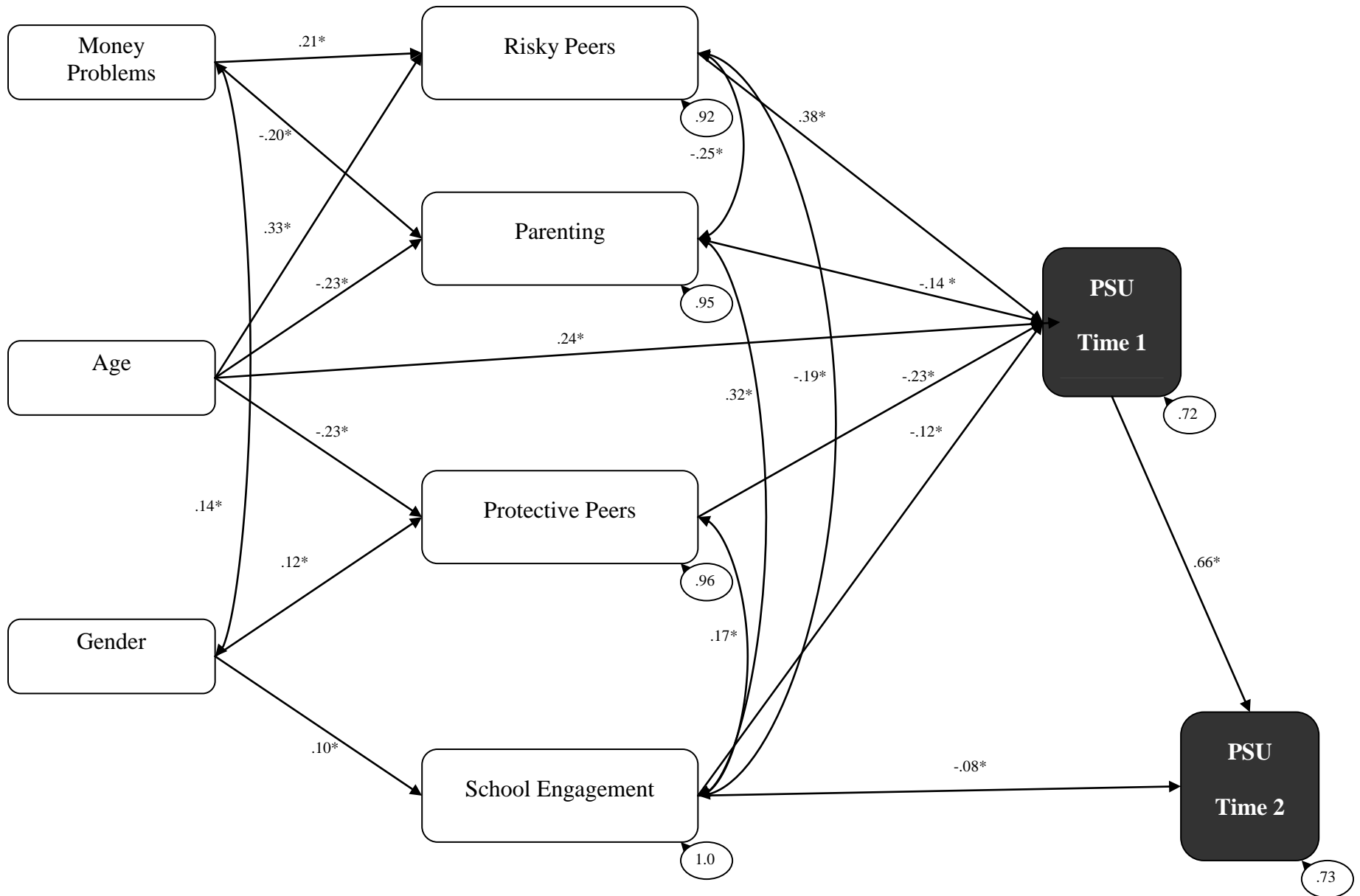


Figure 3. Structural equation model for youth polysubstance use  
 \* =  $p \leq .05$ ; \*\* =  $\leq .01$

*Sociodemographic results.* At time one, the age of the participant was the only sociodemographic indicator predicting PSU (.24). That is, older youth were more likely to report polysubstance use. Youth who were older also reported associating with peers who engaged in more risky activities and reported less protective parenting and protective peers. Gender and family money problems did not directly predict PSU at time one, but other effects were found. Female gender predicted higher school engagement (.10) and females reported more protective peer activities (.12).

Although money problems did not directly predict PSU, it showed important indirect effects. Money problems had a positive relationship to polysubstance use by producing greater affiliation with risky peers (.21), which in turn predicted PSU. Money problems also had a negative effect on substance use, by predicting lower protective parenting (-.20), which in turn increased the likelihood of polysubstance use.

*Social environment results.* All social environment measures predicted polysubstance use at time one and covariance existed between some of these variables. As shown in Figure 3, risky peers was the strongest measure in the model predicting PSU (.38) at time one. In other words, affiliating with peers that engage in risky behavior increases the likelihood of polysubstance use. Risky peer affiliations did not predict PSU at time two. However, some of the variance for polysubstance use at time two was explained by an indirect path running from risky peers through PSU at time one. Covariance was reported between risky peers and parenting (-.25) and between risky peers and school engagement (-.19). It is possible that protective parenting lessens the effects of risky peers on youth or that risky peers exert more influence over youth than

parents. At the same time, risky peer affiliations may lessen school engagement or school engagement may decrease affiliations with risky peers.

As for protective factors, protective peers were most significant (-.23) in protecting against polysubstance use at time one, followed by protective parenting (-.14), and school engagement (-.12). In other words, youth affiliating with peers who participated in positive social activities reported less substance use, and youth who reported higher protective parenting also reported less substance use. Protective peers and parenting did not directly predict PSU at time two.

For the school environment, higher school engagement scores predicted less polysubstance use at time one and time two. Although the relationship changed from -.12 to -.08, school engagement was the only direct measure protecting against polysubstance use longitudinally. Positive covariance existed between parenting and school engagement (.32) and between protective peers and school engagement (.17).

Although the model in Figure 3 does not prove the causal sequence, it is suggestive. The sociodemographic variables are time ordered and must occur at the first level in the model. Other variables, although not time ordered, have the best fit into the sequence as hypothesized. Variables assigned intermediate positions are predicted by variables occurring at an earlier stage in the model, which in turn predict variables ahead in the model. Results from the structural equation model are useful in explaining such things as the role of social environment (e.g., parents, peers and school) in predicting substance use.

## DISCUSSION

The purpose of the present study was to examine the prevalence of substance use and examine the cross-sectional and longitudinal relationships between school engagement and polysubstance use. Healthy Youth Survey data were analyzed and it was hypothesized that age, gender, money problems, risky and protective peer affiliations, parenting, and school engagement would all be correlated with youth polysubstance use. The latter social environment variables were expected to contribute in a combined way and predict the trajectory of polysubstance use patterns. All of the above mentioned variables formed the framework for testing the predictive model which is discussed in detail below.

*Prevalence and related demographic characteristics*

Recent surveys reflect that tobacco, alcohol, and cannabis are the substances most frequently used by the adolescent population. Findings from the present study were consistent with previous Canadian research showing that alcohol, marijuana, and tobacco were most commonly used in this order (Smith et al., 2009).

In the present investigation, the age of the youth was positively related to polysubstance use. Most participants were 16 years old and at this age results suggest youth may be starting to develop more harmful substance use behaviors, which is consistent with other research. Smit et al. (2002) found that age was a general risk factor for being a polydrug user. For instance, as the age of the youth increased, the risk of being a hard polydrug user (combining alcohol, tobacco, and marijuana with cocaine or ecstasy) tended to increase. Relating current findings to group socialization theory, Harris (1995) suggests children look up to the age group just ahead of them. Consequently, older

children are more dominant in mixed-age peer groups, while in same-age groups, children who are more advanced in physical maturation tend to dominate.

Differences in substance use between males and females have been reported in existing literature (Best et al., 2006; Barnes et al., 2002; O'Malley et al., 1998).

Secondary analysis of HYS data revealed that males drank more alcohol (i.e. once a week or more than once a week) than females, and also used more marijuana (i.e. more than once a week) than females in the past year. These results echo findings reported by the Canadian Centre on Substance Abuse (2007) and are consistent with results reported in England by Rodham et al. (2005) who found more males than females reported drinking and taking drugs. Biological and/or psychosocial differences across genders may explain these findings, but this goes beyond the scope of the current investigation.

The current finding that females reported using more illicit drugs at time one than males, differed from results reported elsewhere. For instance, Smit et al. (2002) found the prevalence rates of individual hard drugs (e.g., ecstasy, cocaine, amphetamines, and heroin respectively) was higher for males than females over four weeks. Similarly, results from Collins and colleagues' (1999) polydrug investigation reported that female adolescents were far less likely to combine marijuana and alcohol than male adolescents. However, current findings show no significant differences between genders in polysubstance use. By comparison, Smit et al. (2002) reported no gender differences for polydrug use when alcohol, tobacco, cannabis, and amphetamines were combined, however males had slightly higher polydrug rates when alcohol, tobacco, cannabis and ecstasy and/or cocaine were combined together.

When tobacco smoking was examined in Canada, Leatherdale, Manske, and Kroeker (2005) reported that the prevalence of older student smoking at a school was more influential among younger female students. It could be that female students are more likely to use smoking and other drug taking as a means for developing, attaining, or maintaining their social identity or popularity within their peer group. During childhood, gender differences emerge most clearly when boys and girls are playing in sex segregated groups, and these biological behavior differences might be extended into adolescence (Harris, 1995).

Sociodemographic correlates of substance use have been identified in past research. In this investigation, family money problems indirectly predicted polysubstance use as did father's education. Over time, it was not surprising that youth whose families' were experiencing financial hardship were more likely to report polysubstance use. Although Fergusson and Horowood (1997) did not investigate polysubstance use, they found that coming from a socially disadvantaged background increased the likelihood of using marijuana. Recall, family income is the highest single indicator of involvement in risky behaviors with lower socioeconomic status predicting more risky behavior, followed by parental occupation (such as manual labor or unemployed), and low parental education (Grunbaum et al., 2004; McLoyd, 1998; Brook et al., 1990). McLoyd (1998) also commented that school achievement typically declines with increases in the duration of poverty, which is worrisome when the relationship between polysubstance use and school engagement is considered. Current findings provide support for the view that lower socioeconomic status is a risk factor for substance use during adolescence.

Secondary analyses of HYS data also revealed that the number of household moves during a youth's life was correlated with polysubstance use. Other research found that youth who reported street-involvement and/or homelessness had higher rates of alcohol and other drug use compared to youth who lived in their parents' home (Smith et al., 2009; Lynskey & Hall, 2000). Current findings offer support and indicate that over time less stable home environments increase the risk of youth polysubstance use.

### *Social environments*

#### *Peer effects*

According to group socialization theory (Harris, 1995), children learn to behave outside the home by identifying with a group of others they perceive to be similar to themselves and by taking on the shared behaviors and attitudes of the group, whether risky or protective. Research indicates that youth who are socially connected to peers who are involved with the pop, skate/hip-hop, techno, and hippie peer groups have higher levels of substance use (Verkooijen et al., 2007) and present findings are in agreement.

Polysubstance use was highest among youth whose friends engaged in risky peer activities including doing drugs, skateboarding, and asking for money downtown. At time one, risky peer affiliations most strongly predicted PSU (.38), more so than any other the other social environment predictors (i.e. parenting), strengthening the view that children move away from the inside-the-home behavioral system towards the outside-the-home system (Harris, 1995). Current findings also support the tenet that youth assimilate to group norms, in this study, by partaking in health jeopardizing behaviors including polysubstance use.

Moving from risk to protective factors, analyses of HYS data also indicate peer activities protected against polysubstance use. Recall, youth who participate in organized teams and social clubs are less likely to use alcohol and drugs and the relationship becomes stronger with increased involvement in pro-social activities (Thorlindsson & Bernburg, 2006). At time one, protective peer activities (such as working hard for high grades or performing in drama, music, or band) most strongly protected against polysubstance use, more so than parenting (-.14) or school engagement (-.12). At time two, this relationship existed through an indirect pathway running through time one polysubstance use.

Findings on risky and protective peer affiliations emphasize the importance of extracurricular activities for adolescents in terms of prevention. Promoting youth sport and organized leisure activities as alternatives to associating with substance using peer groups may help reduce substance use among adolescents.

#### *Parenting effects*

Greater connectedness to parents has been associated with better psychological health, fewer negative life events, increased physical activity, and higher school engagement for adolescents (Carter et al., 2007; Benner et al., 2008). Positive parenting practices are often characterized by adequate involvement with children in terms of supervision, monitoring, and communication. Although polysubstance use was not primarily investigated by Dornbusch and others (2001), they found attachments to family tended to reduce the overall frequency, prevalence, and intensity of tobacco, alcohol, and marijuana use. The current investigation supports these claims, since parenting protected against polysubstance use at time one and indirectly at time two.

Compared to peer influences, GS theory suggests parenting is less influential because children are predisposed to favor the outside-the-home behavioral system. In other words, as children get older they focus more on the world outside their family and parenting effects lessen (Harris, 1995). At the same time, youth form alliances with peers and take on the norms of the peer group in order to become successful. Related research conducted by Simons-Morton (2007) found that over-time the negative relationship between parenting practices and adolescent substance use was mediated by the growth in the number of substance using friends. Because children tend to move away from the inside-the-home behavioral system, it is important to strengthen and maintain the parent-child relationship later into adolescence in an attempt to lessen risky peer group influences on the child. This is especially important considering that present results suggest parenting indirectly affects peer affiliations and school engagement. Overall, current findings emphasize the continuing importance of protective parenting in shaping youth substance use behavior.

#### *School engagement*

*Demographic characteristics.* Analyses of the HYS data showed that female gender correlated with school engagement more than male gender. This finding agrees with similar research conducted by Mo and Singh (2008) who found female students were more engaged with school and also performed academically better than males. Further, teacher and student reports indicate males often show a greater degree of non-cooperative behavior compared to females, which may explain their lower engagement and performance (Finn, 1993). When age was investigated in relation to school

engagement, younger youth were more engaged with school than older youth, which is consistent with results provided by Marks (2000).

Higher socioeconomic status is consistently linked to better school engagement (Finn, 1993) and results from the current study support this finding. Youth reporting family money problems were less engaged with their schooling. Not having enough money for basic necessities like food, clothing, or rent and for things at school such as school supplies, field trips, or hot lunches indirectly affected youths' school engagement. Not surprisingly, the number of household moves during a youth's life also related to lower school engagement. McLoyd (1998) indicates that residence in less economically advantaged neighborhoods predicts lower scores on tests of intelligence and cognitive functioning, lower levels of school achievement, and increased socio-emotional problems.

*Substance use.* School engagement is an important protective factor in reducing the use of substances in early adolescence (Simons-Morton, 2004; Schulenberg et al., 2003; Hundleby & Mercer, 1987) and current findings are consistent with previous research showing that youth who reported using substances were less engaged with school (Bond et al., 2007; McNeely & Falci, 2004). School engagement negatively correlated with all substance use measures in the corresponding order: polysubstance use, alcohol, marijuana, other illicit drugs, and smoking. In other words, school engagement protected against all forms of substance use and over time most strongly protected against the most dangerous form of drug use, polysubstance use.

It is interesting to note that the protective effects of school engagement increased over time for other illicit drugs and school engagement's protective effects remained

unchanged for marijuana use. Similar research by McNeely and Falci (2004) examined the school environment and found it was a protective factor for initiating cigarette smoking and binge drinking, and transitioning into regular use of marijuana. Considering that concurrent experimentation with alcohol and other substances is common, finding ways of increasing school engagement in younger age groups and maintaining engagement levels into late adolescence will be vital to prevention efforts. In turn, the trajectory of PSU may be delayed or diminished.

### *Structural equation model*

In this study, the cross-sectional and longitudinal relationships between school engagement and polysubstance use were examined at two points in time. The technique of SEM was used to test the viability of the proposed predictive model which integrated school engagement in the broader context of risk and protective social environment factors. Results of the analyses suggested that the data fit the proposed model well. At each level of the analysis, sociodemographic indicators, social environment, and prior polysubstance use contributed to the prediction of later polysubstance use. Together, the predictors accounted for 47% of the variance in polysubstance use at time two.

Youth polysubstance users tended to perceive more parental support and supervision and less coercive control. At the same time, polysubstance users reported higher family economic problems. Users tended to be older, less engaged with school, and report having peers who took part in risky activities such as drinking or doing drugs. Over two years, school engagement was the only significant social environment indicator mediating polysubstance use, providing support for school engagement as a protective

factor against PSU. The McCreary Center Society (2003) based in Vancouver, British Columbia report youth who showed strong associations to school were two-thirds less likely to use substances. Risky peers, protective parenting, and protective peers did not directly predict polysubstance use at time two which was surprising.

Sociodemographic factors also played a role in predicting polysubstance use in the structural equation model. Money problems had a positive relationship to polysubstance use by producing more affiliation with risky peers, which in turn predicts PSU. Tarter and colleagues (2002) report that deficient caregiver skill and/or resources can foster deficits in social competence and affiliations with socially marginalized youth. A lack of stability in the home environment, attributed to poverty, may result in less parental involvement with the child. In turn, friendship patterns and school connectedness may be inadequately monitored potentiating risky behaviors with peers and increasing the likelihood of substance use (Tarter et al., 2002). Current results are in agreement given that an indirect pathway exists from family money problems through parenting (risky parenting) to polysubstance use at both times.

Overall, findings are consistent with previous research on the effects of risk (Barnes et al., 2009; Hawkins et al., 1999; Jessor et al., 1991), where more risk factors contribute to and predict higher substance use. Results are also consistent with previous research on school engagement wherein supportive relationships within schools are associated with less health jeopardizing behaviors (Carter et al., 2007; Bond et al., 2007; Finn, 1993).

*Strengths and Limitations*

The current study investigated cross-sectional, as well as, longitudinal trends in youth substance use through multi-level modeling. This design permits the analysis of the strength and direction of the independent impact of different social and personal influences on youth health risk behavior, in addition to suggesting mediated relationships among predictor variables. Moreover, this study investigated a more harmful and recent form of substance use, polysubstance use, in a Canadian sample.

The current investigation was confined to secondary data analyses and therefore data did not permit the progression from formulating a research question to designing methods to answer that question. The polysubstance use and school engagement instruments used were short and relied solely on youth self-reports. Further, the sample was largely Caucasian and homogenous in reported activities and sociodemographics. It is possible that results from this sample may not be generalizable outside of Victoria, British Columbia. Despite this limitation, school engagement measures focusing on students' attitudes and relationships with teachers have been shown to be important in predicting the trajectory of polysubstance use in this investigation and these findings are consistent with results reported elsewhere.

The research design could have been strengthened by integrating open-ended questions about school engagement including specific measures of behavioral, psychological, and social aspects of the school environment. In addition, a qualitative follow-up may be advantageous with more specific questions about substance use combinations, reasons for use, location of use, how substances are acquired, and who is present during substance use may be advantageous.

Lastly, it is important to note that over two years the original sample size was reduced and it is possible to speculate reasons for this by examining the study's attrition rate. One way of doing this is to look at which youth withdrew after time one and consider those youths' demographic characteristics. Of the sociodemographic measures investigated, the number of household moves was the only significant indicator that differed between time two participants and non-participants. It seems reasonable that youth who did not participate at time two reported moving households more often. Since their contact and/or residential information may have changed between waves of interviewing, it is possible that being inaccessible may explain why these youth did not participate at time two.

### *Implications*

The results of this study have demonstrated that youth polysubstance use is multifaceted and involves the interaction between different social environments and demographic characteristics in its prediction. Since youth substance use is influenced by parent, peer, and school factors, the challenge is targeting and increasing those protective factors, while lessening the risks. The predictive model documented in this research provides insights into directions for intervention and prevention efforts, which are discussed below, in addition to future research.

### *Practice*

Low school engagement is related to poor academic achievement and misbehavior, both of which are risk factors for adolescent substance use (Hawkins et al., 1992). Over time, youth who report substance use may develop related problems or have

their usage interfere with long-term goals such as education and employment. As a result, helping students avoid negative school and health related outcomes should be a priority in child and youth care practice.

Finn (1993) conceptualizes school engagement as a cycle of developing student participation, where participation leads to academic success, which influences identification with school. In succession, identification increases the likelihood of future engagement. Practitioners may be able to increase students' positive attitudes and identification with school through interventions that promote greater involvement in extracurricular activities, including participation in sports or clubs. Recall that research has shown participation in after-school programs improves student achievement, lessens deviant behavior, and promotes a positive learning environment (Finn, 1993; Verkooijen et al., 2007; Thorlindsson & Bernburg, 2006).

Understanding the multiple environmental influences that effect school engagement is important for practice. If the experience of school leads to a lack of participation or motivation then steps could be made to counter disengagement. In other words, providing students with more socially supportive school environments such as advisory groups or mentorship programs may be beneficial to school engagement. In addition, school restructuring in the form of downsized schools (i.e., schools-within-a-school model) may have positive impacts, including improved retention rates and higher school satisfaction among student subgroups (Fouts, 1994). Further efforts to increase school engagement are needed and involving parents in these efforts is essential, considering the relationships among social environment factors.

At the family level, American research has shown that higher parental involvement is associated with better academic outcomes. Mo and Singh (2008) claim that parental involvement in school decreases as the students move to higher grade levels and toward peer group norms. Results of the current investigation offer support for increased parental involvement during middle and high school years since parenting has protective effects on students' school engagement and substance use. Teachers and schools may be able to increase parental involvement by encouraging parents to remain engaged as their children get older. At the same time, including and informing parents of school activities, projects, and curricular activities may improve student engagement.

Changing parent behaviors and strengthening relationships with adolescent children seems like a valuable practice. In their review of problem behavior intervention strategies, Dishion, McCord, and Poulin (1999) provided evidence for family focused interventions that target high-risk parents and improve parenting through education. Likewise, Tarter et al. (2002) suggest interventions should be initiated when the risk factors are first detectable and should be an ongoing process since developmental trajectories can change suddenly.

Current findings and research conducted elsewhere (Simons-Morton, 2007; Hawkins et al., 1992) show that deviant peer affiliations are associated with growth in substance use. At the peer level, efforts need to be made to limit interactions with high risk peers who can undermine healthy youth development. In their review, Dishion et al. (1999) report that interventions delivered among high risk peer groups (e.g., all participants have aggressive tendencies) increased adolescent problem behaviors (e.g., violence and substance use) and negative life outcomes in adulthood. Moreover, the older

more deviant children were most vulnerable to the induced effects from peer aggregation. For these reasons, Dishion et al. (1999) advise that peer group interventions should blend pro-social and anti-social youth to reduce peer deviancy training.

#### *Policy and future research*

Developmental perspectives have been widely integrated in attempts to reduce youth substance use. Previous policies on teenage substance use have included: harm reduction programs, reduced drug availability, and encouraging low risk patterns of use. Toumboutou et al. (2007) note that social developmental pathways predict a range of psychosocial problems and originate during the early years in a range of environments. Therefore, emerging strategies are improving conditions for healthy adolescent development by focusing on social participation and well-being earlier, in addition to prevention and harm reduction. Research suggests future approaches should be comprehensive, reducing risks and preventing new cases among youth, while limiting high-risk use, and treating substance use disorders (Toumboutou et al., 2007).

O'Donnell, Hawkins, Catalano, Abbott, and Day (1995) report strong evidence for interventions delivered through the early school years to improve educational environments. For example, the school-based prevention program enhanced school commitment and class participation, showed lower rates of substance use initiation for females, and increased social and school work skills in males. Further, the Center for Addictions Research of BC (2006) suggests harm-reduction programs within institutions such as high schools are effective among youth involved in risky substance use. However, more studies on drug education programs are needed.

Polysubstance use is an important topic for future research and monitoring because this pattern of usage raises the risk of health and social harms and users are more likely to have risk factor profiles early in their development. Extending the present research to consider school engagement and substance use trajectories among a younger general population sample, from childhood to young adulthood, would be beneficial to practitioners and to prevention and treatment programs. At the same time, investigating the causes and consequences of school engagement across the years is important because a more comprehensive understanding of the school environment's role could lead to better school outcomes. Future research could also identify school practices, policies, and programs that have established lower rates of school misbehavior, substance use, and early school leaving.

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