

Non-Medical Prescription Opioid Use among High-School Adolescents in Atlantic Canada

by

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Abstract

Canada has become one of the world's largest per capita consumer of prescription opioids, and opioids are now also among the top diverted pharmaceutical products across the country (1). Non-Medical Prescription Opioid (NMPO) use appears to be the fourth most prevalent form of substance use among the general Canadian population (2), with surveys suggesting that approximately 10-14% of high-school students engaged in NMPO use within the prior year (3,4). Opioids are highly addictive (5–7), and their use is associated with increased morbidity, mortality, and socioeconomic burden (8–10).

Despite the emergence of NMPO use as a major public health concern, gaps exist in our understanding of the correlates of NMPO use patterns among high-school students (11). Importantly, Canadian research into NMPO use has been particularly limited (12–17). To accurately inform prevention and treatment programming aimed at high-school youth, we need to refine our understanding of the patterns of substance use and psychosocial correlates among NMPO users. Our study addresses these limitations with the following objectives: **Objective 1:** To describe the sociodemographic, substance use, and psychosocial characteristics of Atlantic Canada high-school student NMPO users, and determine whether frequency of use is differentially associated with these measures. **Objective 2:** To determine the substance use patterns by which NMPOs are used among high school students, and whether these patterns of use are associated with psychosocial outcomes, particularly mental health (depression, suicidality, and anxiety) and protective (school and family bonds) factors.

To address these objectives, we analyzed data derived from the 2012 cycle of the Student Drug Use Survey in the Atlantic Provinces (SDUSAP). The SDUSAP is a paper-based self-report questionnaire that examines substance use and a range of other indicators. For Objective 1, statistics were generated to describe the sociodemographic, substance use, and psychosocial characteristics of Atlantic Canada high-school adolescents who reported on their use of NMPOs and other substances. To differentiate between those who engaged in frequent use, those who used infrequently, and non-users, multinomial regression models were used. To address Objective 2, we explored the data for emergence of patterns of additional substance use among only those who reported using NMPOs. The emergent subgroups were compared on psychosocial measures (mental health and protective factors) again using multinomial regression methods.

Our results reveal five major findings. 1 - Generally, basic descriptive comparisons show that NMPO users resemble illicit drug users and frequent cannabis users in their burden of mental health problems and association with protective factors. 2 - For the most part, our psychosocial measures did not differentially associate with frequent versus infrequent NMPO use, i.e. frequent and infrequent NMPO users appear to carry the same mental health burden, share similar social protective factors, and are similarly likely to engage in other substance use. 3 - About one third of students who reported medical use of opioids also engaged in misuse; medical use of prescription opioids was the factor most robustly associated with both infrequent and frequent NMPO use in our fully adjusted models. 4 – Despite heterogeneity in patterns of NMPO use with and without other substances, the overall mental health burden was similarly experienced, i.e. the use of other substances did not alter the risk of depression or anxiety among adolescents engaging in NMPO use. 5 – We substantiate and clarify the relationships between NMPO use and protective factors with two findings: a) we show an inverse relationship between any NMPO use (compared to none) and school connectedness, and b) we demonstrate an inverse relationship between greater parental monitoring and additional substance use among NMPO users.

Although this study is limited by its cross-sectional design, it has important implications for NMPO use prevention efforts. The results of this project can provide impetus for strengthening protective factors at the family and school level, as well as for the development of comprehensive provincial interventions, including prescription monitoring programs, improvement in guidelines for opioid prescribing, and substance use treatment services in Atlantic Canada.

List of Abbreviations Used

| | |
|-----------|--|
| CADUMS | Canadian Alcohol and Drug Use Monitoring Survey |
| CCSA | Canadian Centre on Substance Abuse |
| CDC YRBSS | Centers for Disease Control Youth Risk Behaviour Surveillance System |
| CDC | Centers for Disease Control and Prevention |
| CES-D | Center for Epidemiological Studies – Depression |
| CSTADS | Canadian Student Tobacco, Alcohol, and Drugs Survey |
| CTUMS | Canadian Tobacco Use Monitoring Survey |
| DALY | Disability-Adjusted Life Years |
| DSM | Diagnostic and Statistical Manual of Mental Disorders |
| FSA | Forward Sortation Area |
| MIZ | Metropolitan Influenced Zone |
| MTF | Monitoring the Future Survey |
| NLSCY | National Longitudinal Study of Children and Youth |
| NMPDU | Non-Medical Prescription Drug Use |
| NMPO | Non-Medical Prescription Opioid |
| NSDUH | National Survey on Drug Use and Health |
| PMP | Prescription Monitoring Program |
| SCARED | Screen for Child Anxiety Related Disorders |
| SDUSAP | Student Drug Use Survey in the Atlantic Provinces |
| SSS | Subjective Social Status |
| YRBS | Youth Risk Behaviour Survey |
| YSS | Youth Smoking Survey |

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“The best way out is always through.” – Robert Frost

When I started in the Master’s program, I had only a vague idea of what I wanted to accomplish - accompanied by limited experience to rely on and a naïve understanding of the skills and time required. This dissertation is the final product of a process during which I developed academically and personally, and none of it would have been possible without the support, guidance, encouragement, and motivation I received from those who became invested in my success.

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Chapter 1. Introduction

For centuries, humans have used various psychoactive substances for purposes ranging from disease treatment to relaxation and alteration of sensory perception (18). Psychoactive substances, often referred to simply as ‘drugs’, are licit and illicit compounds that affect mental processes such as cognition and affect; their use is most often referred to as ‘substance use’ or ‘drug use’ (19,20). These substances generally fall into three main classes of effect—stimulants, sedatives / tranquilizers (also referred to as ‘downers’), and hallucinogens—though some substances may have properties that cross these categories. Several substances that are available for primarily medicinal purposes, such as over-the-counter and prescription medications, also have psychoactive properties that fall into these categories and thus contribute to their misuse. Although some recreational drug use can be benign, it is known to be a significant contributor to a nation’s burden of disease and is thus of public health importance (21). The economic burden of substance use in Canada is significant, totaling almost 40 billion Canadian dollars in 2002 alone (22).

Of special concern is the misuse of prescription opioids, a relatively recent phenomenon that has reached unprecedented levels particularly in the United States and Canada (23). Although opioids are the most potent pain-relieving substances and have a key role in the medical management of acute and chronic pain, their psychoactive properties are highly reinforcing, resulting in their high addiction potential. Currently, the United States and Canada have far higher sanctioned per capita consumption of opioids than other nations in the world, a factor which contributes to their widespread availability for illicit misuse (1,23–25). The past two decades have witnessed an increasing heterogeneity among illicit opioid-using populations, and the image of the illicit opioid user as the marginalized, street-involved injection heroin user is now outdated. Approximately one in twenty North Americans report misuse of prescription opioids, a rate superseded only by that of cannabis (23). This non-medical prescription opioid (NMPO) use can have devastating consequences on the individual, place burden on their family and community, and it has resulted in significant healthcare, social and economic strain (23,24,26,27).

The misuse of prescription opioids by adolescents is of great public health concern. Youth are at particular risk of harm from substance use due to their unique stage of neuropsychological development and strong influence of social pressures, and opioids have become a popular choice given their perceived safety and wide availability. American and Canadian surveys consistently demonstrate that NMPOs are among the top three most prevalent substances used by the

adolescent population (along with alcohol and cannabis) (17,28). The apparent popularity and pervasiveness of NMPO use particularly among youth attests to the need for a concerted public health effort in prevention, identification of those at risk, and treatment.

Notwithstanding recent advances, we still know little about youth who engage in NMPO use, and Canadian research is particularly scant in this area. We remain limited in our understanding of the complex relationship between NMPO use and mental health outcomes, such as depression and anxiety. As a result, the development of effective prevention and intervention strategies is constrained by our inability to accurately characterize those at risk and compounded by our failure to recognize (and strengthen) protective factors. Though the relationship between NMPO use and other substance use may be useful in identifying those at highest risk of harm, the patterns of use remain poorly described. Since peer norms and subculture may vary not only between those who use drugs and those who do not, but also among subgroups of substance users, including NMPO users, identification of such patterns and associations can be used to inform a more accurate and targeted public health response. In this regard, the proposed project aims to advance our ability to characterize high-school NMPO users by examining the associations of NMPO use patterns with several psychosocial outcomes.

The following chapter provides a cursory review of substance use among adolescents, including the associated harms and trends in use (Chapter 2: Background). The misuse of prescription medication is introduced, and research into some of the correlates is reviewed. The literature on non-medical prescription opioid use particularly among the high-school attending adolescent population in the United States and Canada is examined. This includes a discussion of what is known about the sociodemographic correlates, substance use patterns, mental health, and protective social factors associated with NMPO use. In chapter 3 (Summary of Research Limitations), some of the limitations of the available literature are brought to light, followed by the specific objectives of this project (Chapter 4: Objectives). I describe the methods (Chapter 5) used to arrive at the results, and these results are reported in Chapter 6 and discussed in Chapter 7. Specific strengths and limitations of this work are reviewed, and the document concludes with implications for prevention efforts aimed at curbing prescription opioid misuse among the adolescent student population in Canada.

Chapter 2. Background

2.1 Adolescence and Substance Use

Adolescence, defined as the developmental stage between ages of 12 and 18 years, is a challenging period of transition from childhood to adulthood, marked by rapid psychological, physical, and social changes that can potentiate risk-taking behaviours, including substance use (29). From a physiological perspective, the curiosity, impulsivity, and tendency towards risk-taking exhibited by adolescents can be viewed as the result of incomplete, ongoing development of brain regions involved in decision-making, self-control, and planning (30). From a psychological standpoint, the exploratory behaviour seen during adolescence is motivated by a need for self-definition and formation of increasingly more diverse and meaningful relationships (21, 22). Socially, increasing significance of peer relationships places greater value on peer norms and peer acceptance, in the context of a conflicting effort to emancipate from parental figures despite ongoing reliance on their support (31–33). Though not all adolescents engage in drug use, they are, not surprisingly, the age group at greatest risk of initiating substance use and experiencing associated harms (29,32–34).

The decision to use a particular substance, and whether to engage in use experimentally, recreationally, frequently, or to abstain, is mediated by a multitude of dynamic internal and external factors (29,32–34). Drug culture factors, such as availability and perceived safety, as well as peer factors (e.g. affiliation with substance-using peers) influence whether and which substances are used (32). Family factors (such as family structure, function, attachment to parental figures, and parental drug use) and social or environment factors (such as community disorganization and presence or lack of support structures) further mediate adolescents' relationship with drug use (32,35). Interplay of genetic and psychological factors, including early and persistent behavioural problems, rebelliousness, and low self-esteem may precede, precipitate, and potentiate drug use (32,35). The concept of temporal ordering, or developmental stages, in substance use was first proposed in the 1970's, and the term 'gateway drugs'—defined as more common, available, and socially permissible substances whose use precedes that of other illicit substances—became popularized in the 1980's (36). It is important to note, however, that the 'gateway hypothesis' of substance use progression does not necessarily imply that the process is causal, obligatory, immutable, or universal; rather, it implies that certain substances, perhaps those locally acceptable or viewed as less harmful, are more

likely to be initiated first and influence progression to other drugs among certain individuals within a particular area or culture (21,36). Despite the use of some psychoactive substances being so prevalent among adolescents in North America that it may be conceptualized as normative behaviour (37), as described below, substance use in adolescence is associated with various harms.

2.2.1 Substance Use-Related Harms

Substance use is a major contributor of disability, morbidity and mortality among youth in developed nations (38,39). In high-income countries such as Canada, substance use and other psychiatric disorders are the leading cause of disability-adjusted life years (DALYs), a measure of overall burden of disease, among children and youth (ages 0-24) (40). Adolescents experience various psychosocial and physical harms as a result of their drug use, and this extends to negative social and health outcomes later in life (34,38,40).

Physical harm from substance use can be both intentional and unintentional, and arise from acute or chronic use. Youth disproportionately suffer from unintentional injuries (e.g. falls, road traffic-related injury) related to acute substance intoxication (32,41). Similarly, significant harm results from intentional injuries related to acute substance use, including violence, self-harm, and suicide (32,39). Acute toxicity from overdose, whether intentional or unintentional, additionally accounts for significant morbidity and mortality. Adolescent drug use is associated with sexual risk taking behaviours—such as unplanned intercourse, multiple sexual partners, and inconsistent condom use—which contribute to poorer sexual health and unwanted pregnancy (32,42–44). Though less common among mainstream youth, the spread of blood-borne viral and bacterial infectious disease (e.g. HIV, Hepatitis C, infective endocarditis) due to unsafe drug use practices cannot be overlooked; for example, new-onset of injection drug use has consistently been associated with higher rates of infection (32). Regular or chronic drug use can result in hindered or aberrant maturation of the structure and function of the brain (34,45), as well as the development of physical dependence and chronic disease (e.g. cardiovascular problems) (39).

Arguably, problems associated with drug use among youth in developed countries are more closely related to psychosocial than physical harms (32). Adolescents with substance use problems exhibit poorer school function (e.g. higher rates of drop-out and lower academic achievement), higher rates of delinquency, job dissatisfaction and employment instability (32,42,43). Relationships

with family and peers tend to be strained and poorer in quality (43). Maladaptive coping with psychological distress through repetitive use of substances hinders the rapid emotional and cognitive development that normally occurs in tackling life's challenges during this developmental life stage (31). Importantly, earlier onset of substance use predicts problematic substance use in adulthood, increasing risk of further negative psychosocial outcomes (32).

Although often discussed separately, substance use disorders are a diagnostic subset of mental health conditions, and comorbidity (i.e. the co-occurrence) of substance use and other mental health problems is an important area of morbidity among adolescents. In the 1980s, some of the first cross-sectional epidemiologic data on age of onset of psychiatric disorders revealed that several major psychiatric illnesses, including depressive disorders and anxiety disorders, also commonly first manifest in late adolescence or early adulthood (46). Past-year prevalence of mental disorders among adolescents is approximately 25% in community samples, with anxiety, mood, and substance use disorders among the most commonly diagnosed (47). Research in this area has focused on - and found - associations between substance use disorders and externalizing disorders (i.e. defined by an outward expression of distress directed at others or the physical environment, including antisocial behaviours and impulse-control problems, such as conduct disorder) (48). The evidence for an association between substance use and internalizing disorders (i.e. involving turning distress inward, characterized by anxiety and low mood) is more varied, with overall population and clinical samples suggesting comorbidity rates of 9% to 48% among adolescents (49). Internalizing disorders have been associated with an increased risk of substance use disorders in some longitudinal studies, yet the reverse is also supported, and still other evidence suggests that shared risk factors predispose to both (48,49). What is clear, however, is that the existence of both substance use and other mental health problems during adolescence is associated with increased individual, family, and societal burden related to impairment in general functioning (43,50).

2.2.2 Monitoring of Substance Use

Since substance use is a major cause of morbidity and mortality among youth, it is essential to monitor drug use patterns in order to mount an accurate public health response. A big challenge encountered in this endeavor is that substance use is not a static, but rather a dynamic and ever-changing phenomenon, with new substances entering the drug arena as others fall out of favour.

Monitoring of trends in drug use among youth is accomplished predominantly through student drug use surveys and surveys of the general population. In Canada, monitoring of trends in drug use among youth is achieved in part through student drug use surveys administered in the nine provinces, and nationally through the biennial Canadian Student Tobacco, Alcohol, and Drugs Survey (CSTADS) (previously named the Youth Smoking Survey (YSS)) which targets students in grades 6 through 12 (51). Older youth (aged 15 to 19 years) are additionally targeted using the Canadian Tobacco, Alcohol and Drugs Survey (CTADS; replacing the Canadian Tobacco Use Monitoring Survey, CTUMS and the Canadian Alcohol and Drug Use Monitoring Survey, CADUMS), which also includes youth who are out of school (52). Though the methods and information collected using different provincial student drug use surveys has varied, core indicators were incorporated in the late 2000s to facilitate inter-regional comparisons and estimate national rates (51). In the United States, statistical information regarding substance use is amassed using the National Survey on Drug Use and Health (NSDUH), which surveys the civilian, non-institutionalized population over the age of 12 years (53). Other established sources of data in the US are the annual Monitoring the Future Survey (MTF) (funded by the National Institute on Drug Abuse) which surveys students in the 8th, 10th, and 12th grades, and the biennial Youth Risk Behaviour Survey (YRBS) (sponsored by the Centers for Disease Control and Prevention (CDC)) for grades 9 through 12 (53).

2.2.3 Substance Use Trends – An Overview

The above surveys can be used to examine for trends and fluctuations in prevalence of substance use. Historically, lifetime illicit substance use among adolescents in North America peaked in the 1970s and 1980s to approximately two-thirds of the adolescent population (32,53–55). There was then a decline into the early 1990s to approximately 40%, another peak in the mid-to-late 1990s at 55%, and another, slighter decline in the early 2000s to below 50% (32,53–55). More recently and specifically, nearly one-fifth of Canadian youth in grade 7 or above reported past-year use of cannabis during the 2012/2013 school year on the YSS; one in twenty youth reported past-year use of illicit substances other than cannabis with the intent of getting high, and similarly one in twenty reported past-year misuse of medications (including sedatives, stimulants, pain relievers, cough or cold medicine, and sleeping pills) to get high on the 2012/2013 Youth Smoking Survey

(56). The results of the 2013 CTADS were similar, with nearly a quarter of 15 to 19 year olds indicating past-year use of at least one of six drugs (cannabis, cocaine / crack, speed, ecstasy, hallucinogens, or heroin), and one in twenty reporting past-year use of at least one of the above except cannabis (57). Current prevalence of illicit drug use may be slightly higher in the United States than in Canada, where over a quarter of 8th to 12th graders reported past-year use of any illicit drug (including cannabis), and one in ten reported use of any illicit drug other than cannabis on the 2014 MTF survey; however, the survey questions asked about a host of illicit, over-the-counter, and prescription drugs in addition to the selected six as reported from the CTADS (55). Nearly half of surveyed twelfth graders reported lifetime use of any illicit drug on the 2014 MTF survey (55). Thus, despite the general declines in prevalence over the past few decades in both the United States and Canada, adolescent substance use remains a common phenomenon, and a significant public health concern (4,54,55).

2.3 Non-Medical Prescription Drug Use

The misuse of prescription drugs, or non-medical prescription drug use (NMPDU), is now a major component of the illicit drug use problem. Though prescription medications have an important role in the management of the disabling conditions they are meant to treat, their psychoactive properties impart a high potential for recreational misuse (57). As elaborated below, misuse of prescription medication generally refers to the use of a psychotherapeutic medication without a prescription; this includes (but is not limited to) use in a way that was not intended by the prescriber, use with changes to dose, frequency, or route of administration, use in order to get high, or use in conjunction with alcohol or illicit drugs (58,59). A recent increase in prescribing of these medicines has created a supply surge of ‘abusable’ drugs in the average medicine cabinet, with less social stigma than ‘street’ drugs given the former’s legitimate uses and pharmaceutical manufacturing (55,60). Despite the promising declines in use of tobacco, alcohol, and most illicit drugs, there has been a disconcerting rise in NMPDU over the past two decades (55,58,60). There is evidence that over one-third of adolescents who report any misuse of prescription drugs develop one or more symptoms of a substance use disorder (61,62), suggesting an urgency to placing prescription drug misuse among the top public health priorities.

National and regional surveys of prescription drug misuse among adolescents usually ask about three (sometimes four) drug classes: sedatives / tranquilizers, stimulants, and opioids. Sedatives and tranquilizers are central nervous system depressants that are medically used for anxiety or to aid with sleep; diverted sedatives and tranquilizers are commonly known simply as “downers” or “tranqs”, and are used for their calming effects (63). Prescription stimulant drugs, also termed psychostimulants, are chemically related to the amphetamines, and generally prescribed for the treatment of attention-deficit hyperactivity disorder (ADHD); similarly to other stimulant drugs, they are used recreationally for their ability to increase energy, enhance self-esteem, and generate feelings of exhilaration (63). The opioid medicines, as further described below, are the most effective pharmacologic treatments for pain, whose potential for misuse is imparted by their calming and euphoric side-effects (63).

Although, as mentioned above, nationally in 2012/2013 less than one in twenty of Canadian high school students reported using a prescription drug with the specific intent of getting high (64,65), the overall prevalence of any prescription drug misuse appears much higher. One in ten adolescents aged 15-19 years reported past-year NMPDU on the 2013 CTADS survey (57). Similarly, the most recent MTF cycle found that 14% of American 12th graders engaged in past-year misuse of any prescription drug (55). The 2012 Student Drug Use Survey in the Atlantic Provinces (SDUSAP) (which included New Brunswick, Nova Scotia, and Newfoundland / Labrador) revealed that 2.5 to 5% of students admit to past-year misuse of sedatives/tranquilizers, 4.5 to 7% admit to past-year misuse of stimulants, and 10 to 12% admit to past-year pain medication misuse (4). These rates reflect the prevalence estimates compiled by Young et al. (2012) in their systematic review of US nationally and non-nationally representative studies published between 2000 and 2011 (66). Clearly, the prevalence of any past-year NMPDU is markedly higher than use of illicit street drugs (with the exclusion of cannabis).

Several studies have explored the sociodemographic correlates of NMPDU among adolescents, and there is some indication that not only the prevalence but also some correlates may vary by drug class (as reviewed in 6). Though several studies suggest that adolescent females are more likely to misuse prescription medications than males, others point in the opposite direction, with variation possibly related to the class of psychotherapeutic drug examined (6). This is interesting in light of the fact that females tend to have lower rates of use of most substances (64), and also have been noted to be more likely to have a legitimate prescription for psychoactive

medicine (67). Research results are similarly mixed with respect to income, with some studies finding misuse of prescription opioids and tranquilizers in association with lower family income, with no differences for stimulants and sedatives (66). There appears to be a greater tendency to misuse prescription drugs among rural youth (66). Though adolescents of white race have been found to exhibit a greater tendency towards NMPDU in most US-based research (66), one of the few available Canadian studies suggests elevated rates of NMPDU among Aboriginal youth (13). As with most substances (other than inhalants), NMPDU appears to increase with age and grade level (66).

Over the past several years, McCabe et al. in the United States have explored the motives and subtypes of nonmedical prescription drug use. They found that approximately one-fifth of adolescents who have a legitimate prescription for the commonly misused medications—sedatives / tranquilizers, opioids, and stimulants—admit to misusing their medication, including for purposes of getting high or augmenting the effects of other drugs; adolescents who misuse their own prescriptions are also more likely to engage in other illicit drug use and screen positive for drug use problems (68). Diversion of prescription medication is common among youth, with nearly a quarter of adolescents giving away or loaning their medications (66). The majority who misuse prescription drugs seem to do so with both recreational and self-treatment motives (69), though there may be variability in motive according to drug class (70). It also appears that female users are more likely to misuse for self-treatment purposes than males (71), perhaps contributing to the observed female preponderance among NMPD users.

NMPDU has been associated with several negative psychosocial outcomes among adolescents. Other substance use is one of the most robust associations with NMPDU noted in the research base (61,66,68,72,73); one study notes 60% of adolescents reporting past-year prescription drug misuse also engaged in past-year other illicit drug use (including cannabis) (72). There also appears to be a proclivity to misuse more than one class of prescription drugs; of Canadian students who reported misuse of prescription drugs to get high, one-fifth used all three prescription drug classes examined, i.e. a stimulant, sedative, and opioid pain reliever (13). Similarly, McCabe et al. (69) found that over one-third of their sample of undergraduate university students (mean age 20) reported misuse of more than one category of prescription medication.

As found with substance use among adolescents in general, NMPDU users suffer impaired school performance, including lower academic achievement and school dropout (66). NMPDU has also been associated with sexual risk taking behaviours and sexual victimization in adolescence (66,74). Being under the influence impairs psychomotor performance, and the past two decades have witnessed a rise in the amount of prescription medication involvement in fatal motor vehicle crashes (75,76). Earlier onset of NMPDU appears to predict the development of a prescription drug use disorder later in life (7).

There are a few studies suggesting NMPDU is associated with negative mental health outcomes among the mainstream youth population (66). In an Ontario study, Stewart et al. (77) found that 17% of all adolescent inpatients admitted to hospital for mental health reasons had a history of NMPDU; additionally, adolescents with three or more mental health admissions were more than twice as likely to misuse prescription drugs, in comparison to those admitted for their first time (77). American adolescents who reported past-year misuse of prescription drugs (sedatives, tranquilizers, stimulants, opioids) were found to be nearly twice as likely to report symptoms consistent with a past-year major depressive episode; however, in this particular study, it is unclear how other illicit drug use contributes to the relationship, as several drugs of abuse were not included (61). Risk of depression appears particularly high among rural youth, with one study finding 2.6 times greater likelihood of lifetime history of a major depressive episode among rural adolescents endorsing any lifetime NMPDU (78). Adolescents with greater symptoms of suicidality, particularly suicide planning, have been noted to have a higher likelihood of engaging in NMPDU (79).

Substance use in youth is clearly common, dynamic, and potentially dangerous. Given the disproportionately high prevalence of prescription drug misuse among adolescents, it is crucial to better understand the complex relationships between particular drug types and various demographic and psychosocial factors. The Canadian Centre on Substance abuse (CCSA) has recently developed a national strategy, described in their report titled *First Do No Harm: Responding to Canada's Prescription Drug Crisis*, urging research addressing gaps in the literature on pharmaceutical drug misuse in Canada (80). Responding to this call, the overarching goal of the proposed project is to elucidate some of the characteristics of high-school adolescents who engage in non-medical use of opioids, in order to empower prevention efforts and improve interventions, if needed. The

following section begins with an overview of opioids and then explores the current literature base on adolescent non-medical opioid use (NMPO).

2.4 Adolescent NMPO Use

2.4.1 Opioids

Although opioids have been used for both medicinal and recreational purposes for millennia (63), the use and misuse of opioid medicines among high-school youth requires prompt attention for several reasons. First, the relatively recent development of synthetic and semi-synthetic opioids by the pharmaceutical industry has contributed to a rapid increase in opioid prescribing in the past two decades (63,81,82); in Canada, we saw a 23% increase in the rate of dispensing of high-dose opioids between 2006 and 2011, with the greatest increase in rate observed in Newfoundland and Labrador (25). The term ‘opioid’—meaning ‘like opiates’—refers to all chemical compounds that potentiate activity of the opioid receptors (63,83). Opioid medicines are the most potent pain-relieving drugs, and include those naturally derived from the opium poppy (e.g. morphine, codeine), as well as semi-synthetic (e.g. hydromorphone (Dilaudid), oxycodone (Percodan), or synthetically created (e.g. tramadol (Tramacet), pethidine (Demerol)) compounds (63,83). Currently, Canada is second only to the United States in per capita consumption of prescription opioids worldwide (1). Though physicians remain cautious in prescribing controlled medication to youth, one US study revealed that up to two out of five adolescents diagnosed with non-cancer pain have received an opioid prescription (84), and one in seven Canadians aged 15 years or older reported prescription opioid use in 2013 (57).

Second, opioid compounds have a high addiction potential, and their increased availability for legitimate medical use has facilitated their diversion and misuse - a particular concern given the prevailing vulnerability for drug use in adolescence. Opioids are highly reinforcing, both through brain reward processes common to most drugs of abuse, as well as a result of unique properties, such as modulation of emotion (e.g. relief of sense of suffering) (63,85). Regardless of route of administration, repeated use of an opioid rapidly produces brain adaptations resulting in physical dependence and tolerance (i.e. withdrawal symptoms in their absence, and need for higher doses to

achieve desired effects) (63). Though historically most illicit opioid users were injection heroin users, the past two decades have witnessed a diversification and increasing heterogeneity among illicit opioid-using populations, including the misuse of prescription opioids and use via non-injection routes (86). Given their psychoactive properties, high risk of dependence, and potential for recreational use, opioid medications are regulated in many countries, including the United States (under the Controlled Substance Act) and Canada (under the Controlled Drugs and Substances Act (CDSA) (87,88). Despite these efforts, opioids are now among the top diverted pharmaceutical products (89); not only is non-medical prescription opioid (NMPO) use, rather than heroin use, the predominant form of illicit opioid use in Canada (24), but NMPO use is the fourth most prevalent form of substance abuse among the general Canadian population (2).

Third, opioid addiction is associated with various individual and societal harms. Globally, opioid addiction is emerging as one of the largest contributors to the global disease burden attributable to illicit drug use, particularly in measures of disability adjusted life years (DALYs) (2,21). Similarly to heroin, the misuse of prescription opioids carries a significant risk of overdose death; in the United States, prescription opioids were found to be involved in nearly 60% of drug overdose deaths in 2010, outnumbering overdose deaths from any other licit or illicit drug class (61,90). A large proportion of these deaths involved individuals without a legitimate prescription for the opioids involved in the overdose (reviewed in 98). An Ontario study found a three-fold increase in the proportion of all deaths related to opioid medications between 1992 and 2010, with the highest increase among relatively young individuals (aged 25-34 years); among the latter age group, nearly one in eight deaths was related to opioids in 2010 (27). NMPO use in adolescence has been associated with violent behaviour (91), as well as impaired academic performance, truancy, and school suspensions and expulsions (92). Overall, the toll on Canadian public health as a result of opioid misuse has increased significantly over the past two decades (93).

Most importantly, we still know little about youth who engage in NMPO use. This is despite the fact that American and Canadian surveys consistently demonstrate that NMPOs are among the top three most prevalent substances used by the adolescent population (along with alcohol and cannabis) (17,28). The apparent popularity and pervasiveness of NMPO use particularly among North American youth attest to the need for a concerted public health effort in prevention and treatment. However, the development of effective strategies is precluded by our failure to recognize potential risk and protective factors associated with adolescent NMPO use. In the

following sections, I first review what we know about the scope and correlates of prescription opioid misuse among North American youth. This is followed by a discussion of the limitations of the current research base, and how this project aims to address some of these research gaps.

2.4.2 Definitions of Misuse and Prevalence Estimates of Misuse

Although the literature on misuse of prescription opioids is rapidly expanding, defining prescription opioid misuse has been challenging, with a wide range of operational criteria (59). As a result, some authors suggest caution in interpreting and comparing studies (e.g. 106). In cross-sectional survey research in the United States and Canada, prescription opioid misuse is most often defined as any unsanctioned use, meaning use of a prescription that was not prescribed for the respondent or use of one's own prescription in a way that is not consistent with a physician's orders (59). Reporting terminology is similarly varied, with authors employing terms such as non-medical use of prescription opioids (NMUPO) (e.g. (94)), prescription opioid misuse (e.g. (87)), non-prescribed use of prescription pain relievers (PPR) (e.g. (95)), non-medical use of prescription pain medication (e.g. (96)), non-medical use of opioid analgesics (17), and non-medical prescription opiate (NMPO) use (28). For consistency, the term non-medical prescription opioid (NMPO) use in this work refers to any unsanctioned use on one or more occasions, unless specified otherwise. It is noteworthy that most of the adolescent literature reviewed below has focused on the prevalence and correlates of any lifetime or any past-year use of NMPOs, disregarding the frequency of use. Though informative in prevalence studies, this approach may be problematic when examining for social and psychological correlates of NMPO use, as these variables could be affected by differences in frequency of use.

As described earlier for other substances used by adolescents, most available prevalence rates and correlates of NMPO use are estimated using national and regional surveys of the general and student adolescent population. Over the past decade, nationally-representative surveys such as the MTF and NSDUH have shown prevalence rates of NMPO use among adolescents in the United States to range from approximately 7 to 9% for past-year use and up to 12% for lifetime use, with use generally increasing with age (61,62,72,73,87,92,95,97). This is slightly lower than non-nationally representative samples of youth, which depict prevalence rates between 14-18% for life-time use and 11-14% for past-year use (33,67,70,96,98,99).

Though the results of the 2012/2013 YSS suggest much lower rates in Canada – less than three percent of student adolescents reported NMPO use with the specific intent of ‘getting high’ – regional estimates of any NMPO use among this group approximate those observed in the United States (64). In 2012, nearly 11% of Atlantic Canada grade 7 to 12 students indicated NMPO use in the prior year (100). Similarly, 12% of Ontario high school students reported past-year NMPO use in 2013, with nearly a quarter of past-year users reporting using ten times or more (54). (The first iteration of the OSDUHS to include any item on NMPO use was in 2005, when students were specifically queried on their use of oxycodone; at that time, past-year prevalence of oxycodone use was estimated at approximately one percent, and has since then slightly increased to 1.6% in 2013 (54).) The only other available regional school-based surveillance report in Canada reporting NMPO use is The Alberta Youth Experience Survey, which in 2008 reported a past-year prevalence of codeine use without a physician’s prescription of 15.5% and a lifetime prevalence of 22.1%; additionally, 0.8% reported past-year, and 2.0% reported lifetime, misuse of oxycodone (101). Eleven percent of high-school students reported use of prescription pills without a doctor’s consent on the British Columbia Adolescent Health Survey in 2013; however, the prevalence of NMPO use in particular was not explored (102). This relative scarcity of reporting on adolescent NMPO use in the Canadian context is of concern, particularly given that the best available evidence suggests higher prevalence of use than that for any other illicit substance other than cannabis (17).

2.4.3 Sociodemographic Correlates

Increasing the potential for harm, there is some indication that adolescents who misuse opioids tend to initiate early and continue to use into adulthood. Wu, Pilowsky, and Patkar (62) found the mean age of first NMPO use to be 13, which is similar to first age of alcohol and cannabis use. The above surveys suggest that NMPO use, like most other substance use, increases steadily with grade level (54,100). Likely owing to opioids’ addictive properties, it appears that adolescent NMPO users do not mature out of their use in the same manner as observed with other drugs, use of which generally drops off in adulthood (28,103,104). Of those who reported NMPO use in high school, approximately one-half reported continued use in early adulthood (age 19 and 20) (28).

Although reports of gender differences in NMPO use among North American adolescents remain inconclusive, there is some indication that prevalence may be higher among females. Data

from the NSDUH suggests that adolescent females are significantly more likely to report both lifetime (62) and past-year (105) NMPO use, and are more likely to report criteria of an opioid drug use disorder (either abuse or dependence) (72). Although more Canadian adolescent females than males reported engaging in NMPO use (with the specific intent of getting high) on the 2008/2009 YSS (13), no significant gender differences were found with the 2012/2013 iteration (64). Using regional student drug surveys, no gender differences were found in Ontario in 2013 or the Atlantic Provinces in 2012 (54,100).

Reports on association of income, rurality, and race are similarly varied. Lower family income level has been associated with adolescent NMPO use in some nationally-representative studies from the United States (89,100,118), whereas others have not found a significant correlation (62,72,95). From the Canadian side, Fischer et al. (15) found NMPO to be more common among Ontario students reporting lower Subjective Social Status (see Methods section for description). In a latent class analysis, Vaughn et al. (106) noted income levels to be evenly distributed among their US sample of NMPO-using adolescents, but found significant associations with lower income and belonging to any of three identified high risk classes (defined as high risk of other substance use and / or high risk of delinquent behaviours, or both).

Several arguments have been proposed for a greater propensity towards misuse of prescription opioids in rural areas, particularly the dynamic interactions between a relatively increased prescription opioid availability, the void created by productive young adults leaving for urban centres increasing economic strain, greater economic stress contributing to increased vulnerability to drug use, and tighter social networks facilitating diffusion of opioids (reviewed in (82)). Although some research from the United States does in fact indicate a greater likelihood for misuse of prescription opioid drugs among rural, compared to urban, adolescents (73,78,92), other studies have failed to demonstrate a difference (62,72,105). In Canada, Fischer et al. (15) also noted greater likelihood of NMPO among rural Ontario students. Similarly, the association with race is unclear, with some (92,95) but not all (62,87,96) studies suggesting greater likelihood of NMPO use among Caucasians. Currie et al. (13) describe higher prevalence of prescription opioid use to get high among Metis, Inuit, and First Nations, compared to non-Aboriginal, adolescent populations in Canada. Evidently, there is significant variability among studies, and the basic sociodemographic characteristics of adolescent NMPO users have only sparsely been explored in the Canadian context.

2.4.4 Other Substance Use and NMPO Use

Other substance use is common among NMPO users. U.S. studies exploring the relationship between adolescent NMPO use and substance use (i.e. use of more than one substance over a specified period of time (107)) have consistently found a positive yet widely varying strength of association (12,17,33,61,62,73,78,87,92,96). Alcohol is perhaps the most socially-permissible and widely used substance among youth in North America, with Canadian and US school-based surveys indicating that between one-half to three-quarters of adolescents have consumed alcohol at some point (51,55,64). A strong association between NMPO use and alcohol use among adolescents has been established (33,61,72,87,96). Importantly, it appears that NMPO users are more likely to engage in harmful patterns of alcohol use, including frequent alcohol use (72) and binge drinking (i.e. having five or more drinks in one session) (96).

With approximately one-third of Canadian and US twelfth graders reporting past-year cannabis use on recent national surveys, cannabis is the most widely used illicit drug among adolescents in North America (53,55,64,108), and its acceptance in mainstream youth culture has arguably placed it outside of the ‘street’ drug category. Nonetheless, research indicates that those who initiate early, use frequently, or have been using chronically appear at greatest risk of harm from use (108). Similarly to alcohol, research indicates a strong positive relationship between any past-year cannabis and NMPO use (33,73,87,96).

Adolescent NMPO users are also generally more likely to engage in use of illicit drugs that are further out on the spectrum of peer-sanctioned substance use (67,73,96). These substances include hallucinogens, stimulants, and inhalants, and are used by a relatively small proportion of student youth. Hallucinogens—substances used to alter perception of reality through cognitive and sensory distortion, including LSD, mescaline, psilocybin, and salvia divinorum—are individually used by less than 3% of North American adolescents annually (4,54,64,65). US and Canadian youths’ annual use of stimulants, a class of drugs that includes cocaine, amphetamines, and related compounds such as MDMA (3,4-methylenedioxy-N-methamphetamine) and mephedrone, is estimated at 0.5 to 3% per drug annually (4,54,55,64); these substances are used for their ‘rush’ (described as intense feeling of exhilaration, power, and euphoria) and general ability to increase arousal, boost mood, confidence, and self-esteem (63). Annual use rates of inhalants—volatile

substances inhaled with intention of getting high (e.g. solvents, gasoline, computer dusters, spray paint, glue)—are similarly less than 4% among Canadian and US adolescents (4,51,53,55).

However, high-school adolescent NMPO users have been described as six to nearly nine times more likely to engage in the use of these illicit substances (67,96). With this in mind, some have argued that NMPO users are best conceptualized as broad-spectrum drug users (109). This posits two important considerations: first, that NMPO users may not present with unique psychosocial determinants, but rather share common factors with other illicit substance users; and second, that if NMPO users are characterized by unique psychosocial factors, these may be difficult to isolate unless the presence of other substance use is carefully considered (109).

There has been some deeper exploration of the associations between motives for use, medical and non-medical prescription opioid use, and other substance use. It is noteworthy that medical prescription opioid users (MPO users, i.e. those who use prescription opioids as directed by a physician) have been noted to report significantly higher cigarette and cannabis use than non-users of opioids (96). In addition, progressively increasing odds of illicit drug use have been documented for MPO-only users, mixed users (i.e. those endorsing both MPO use and NMPO use), and peaking with NMPO-only users (67,96). For example, McCabe et al. (67) found MPO-only users were twice as likely, mixed users nearly six times more likely, and NMPO-only users 6.5 times more likely than non-users of any opioids to engage in past-year illicit drug use (excluding cannabis). Although some have suggested that NMPO users endorsing non-therapeutic motives are more likely to engage in illicit drug use than those who misuse prescription opioids with the intent to self-treat (110,111), others found that endorsing a greater number of motives for misuse (e.g. pain relief, sleep aid, anxiety reduction, experimentation, getting high, among others) is positively correlated with higher risk for substance abuse and dependence (70).

There have been relatively few studies examining the effects of frequency of NMPO use. We found only two studies exploring the relationship between frequency of NMPO use and other substance use, both suggesting that the likelihood of cigarette, alcohol, cannabis, and other illicit drug use increases with higher frequency of NMPO use (28,33). Using longitudinal data, Catalano et al. (28) found that among American grade 10 students reporting lifetime light NMPO use (defined as fewer than 10 times in a year), 69% reported use of an illicit drug other than cannabis, with a mean of 3 illicit drugs used, whereas among those reporting lifetime heavy NMPO use (defined as

more than 10 times in a year), 86% reported other illicit drug use (excluding cannabis), with a mean of 4 illicit drugs used. Compared to occasional users, adolescents who reported more alcohol use were more likely to be frequent NMPO users in a study conducted by Fleary et al. (33). Increasing frequency of NMPO use seems to increase the probability of a drug use disorder (67), suggesting more entrenched substance use patterns among those who misuse opioid drugs more frequently. These findings suggest that taking frequency of use into account may be useful in isolating unique factors associated with different levels of NMPO use.

2.4.5 Psychosocial Correlates of NMPO Use

Despite a growing area of research on the role of psychosocial variables in substance use among adolescents, there is little research on the role of mental health problems and possible moderating effects of protective social factors specifically among NMPO users. The following section reviews the limited literature regarding how some psychosocial correlates, particularly mental health problems and protective social factors, relate to NMPO use among adolescents.

Depression, Suicidality, and Anxiety

Two common mental health outcomes associated with substance use include depression and anxiety. Depression, which is 2 to 3-times more likely among girls than boys, is characterized by the presence of sad, empty, or irritable mood along with somatic and cognitive changes that impair function (112,113). A range of 5 to 20% in prevalence rates of depression among adolescents is reported in the literature (47,114,115). However, non-diagnostic survey data suggest that up to 30% of adolescents report depressed mood and sub-threshold depressive symptoms (47,115); in 2012, just over 31% of surveyed Atlantic Canada high-school students reported elevated symptoms of depression (100). Although the latter do not meet the full diagnostic criteria, these adolescents are struggling with their mental health, and are also at greater risk for developing a mood disorder as adults (115). Anxiety disorders are characterized by a state of excessive apprehensive worry, anticipation of future threat, or pervasive fear out of keeping with cause, and concomitant impairment in social function (113,114). Although prevalence rates vary widely in range and change

with age, the median prevalence of anxiety disorders among children and adolescents is around 8% (47). In general, females are 1.5 to 2-times more likely to be afflicted (47,113).

Adult NMPO users have been shown to suffer more mental health problems than the general population. Disproportionately elevated prevalence rates of depression (17%) and anxiety (16%) have been found in a meta-analysis of general samples of NMPO users (i.e. including adults) (116). Research suggests a dynamic, bidirectional interaction between NMPO and psychopathology in adults; for example, it appears that pre-existing mood and anxiety disorders impart a two- to three-fold greater likelihood of NMPO use, while pre-existing NMPO use increases the risk of mood and anxiety disorders by two- to nearly four-fold in adult samples (117). An adult-sample longitudinal study found evidence for increased risk of incident mood and anxiety disorders among NMPO users as well as an increased risk of onset of NMPO use among those with mood and anxiety disorders, concluding that a shared vulnerability to both internalizing psychopathology and NMPO use is possible (118). Interestingly, for every year NMPO use was delayed, one group found a 2.1% decrease in lifetime odds of major depressive disorder diagnosis using the 2005 to 2007 NSDUHS samples (including adolescents and adults) (119).

There is some indication of a moderate association between adolescent substance use and internalizing disorders, including depression and anxiety. In a review of community-based studies of adolescents, Armstrong and Costello (120) found a moderate to strong relationship between depression and substance use problems (the odds ratios of concurrent comorbidity (i.e. present at the same time) ranged from 1.5 to 2.5, and those for lifetime comorbidity ranged from 1.5 to 4.5). Only one half of the reviewed studies demonstrated a significantly higher likelihood of an anxiety disorder among substance-using youth, with a modest median odds ratio of 1.3 (120).

Though the above points to an increased risk for depression and anxiety among adolescent NMPO users, the literature is sparse and the associations have not been robustly demonstrated. It appears that adolescent NMPO users may be twice as likely as non-users to access mental health services (61,62). In a longitudinal study by Catalano et al. (28), a significant association with mood disorder (defined as meeting DSM-IV criteria for any of major depressive disorder, generalized anxiety disorder, or post-traumatic stress disorder in the prior year) at age 21 was present when NMPO use and other illicit drug use were entered separately into hierarchical logistic regression models that controlled for sociodemographic, alcohol and cannabis use correlates. However,

NMPO use did not uniquely predict mood disorder when other illicit drug use was entered into the models, suggesting that at least some of the negative psychosocial outcomes of NMPO use are better accounted for by illicit drug use in general (28). It should be noted that this study lumped anxiety and depressive disorders into one ‘mood disorder’ category, despite nosological differences, and unique relationships between the individual disorders and NMPO use may be present. Additionally, this study does not tell us about the relationship between NMPO use and mental health among younger youth.

Most of the available literature is based on cross-sectional data. Although having had a major depressive episode (MDE) was associated with NMPO use in their univariate analysis of NSDUH data, Schepis and Krishnan-Sarin (61) did not report whether this relationship persisted in their adjusted models. Among combined 2005 and 2006 NSDUH sample of adolescents reporting past-year NMPO use, Wu et al. (95) found a moderate association (ORs 1.5 to 1.8) between a past-year major depressive episode (MDE) and meeting some (i.e. subthreshold) or sufficient criteria for NMPO dependence, as defined by DSM-IV. Similarly, using combined NSDUH data from 2008 to 2012, Edlund et al. (105) also found a 1.5 times greater risk of past-year NMPO use among adolescents with a past-year history of MDE; among adolescents reporting any NMPO use, a 2.2 times greater risk of meeting criteria for NMPO abuse or dependence was observed among adolescents with a past-year MDE. That the magnitude of association between MDE and opioid use disorder among NMPO users is larger than the magnitude of association between MDE and any past-year NMPO use among this general adolescent sample is suggestive of a gradient relationship between frequency of NMPO use and the likelihood of depression.

Despite the ability of opioid drugs to effectively decrease acute anxiety symptoms (63), there appears to be little research examining associations between anxiety and NMPO use among adolescents. Apart from the above study by Catalano et al. (28), the only other report found on comorbid anxiety among NMPO users is that by Vaughn et al. (106), who, using NSDUH data, examined for latent class membership among NMPO users. In their analysis, lifetime anxiety predicted membership in a high-risk (high substance use and high delinquency) class among adolescent NMPO users (106), suggesting that problematic levels of anxiety contribute to the vulnerability seen among adolescents expressing a spectrum of negative psychosocial outcomes. Whether increased levels of anxiety are independently associated with NMPO use among high-school students has not, to the best of my knowledge, been explored to date.

There is a small amount of literature indicating a connection between NMPO use and suicidality among youth. Substance use is now recognized as a major proximal and distal risk factor for suicide attempts and suicide completion among adolescents (121,122). Although suicide rates among the general population appear to be declining over the past several decades, suicide appears to have increased—and is now the third leading cause of death worldwide—among those aged 15 to 24 years (121), and prescription opioid medicines are the most commonly used drug class in overdose suicide attempts (cited in (123)). Heroin use is strongly associated with suicidal thoughts and suicide attempts (124), and at least one study suggests that rates of suicide attempts are similar between treatment-seeking populations of adolescent heroin and NMPO users (125). There appears to be a relationship between suicidality and NMPO use among young American women (123). In the only Canadian report examining suicidality and NMPO use among student youth (grades 7 to 12), thoughts of suicide were found to be independently associated with NMPO use among female, but not male, Ontario high-school students (after controlling for sociodemographic factors and other substance use) (15). Whether a unique relationship exists between the use of NMPOs and suicide *attempts* among North-American high-school students still remains to be determined.

The above indicates that more work is required to deepen our understanding of the associations between mental health problems and NMPO use. It remains to be seen how patterns of NMPO use—including frequency and patterns of use with other substances—relate to mental health outcomes, such as depression, suicidality, and anxiety. Given the high societal burden incurred from adolescent suicide, the relationship between suicidality and NMPO use requires further exploration. Refining our understanding of these relationships is vital for the planning of effective prevention and intervention programming.

Protective Factors

Arguably, strengthening protective factors is as important as decreasing risk factors. Protective factors are those considered to moderate or enhance resilience against substance use, and include not only individual strengths, such as perceived self-efficacy, problem-solving skills, and adaptive coping skills, but also supportive social structures that encourage the development of these strengths and potentiate pro-social behaviour (32). It has been theorized that a bond between an individual and society constrains deviant behaviour, as this would threaten important relationships;

thus, the stronger the bond to pro-social groups, the more likely the person is to conform to societal norms (73). In this regard, close relationships with parental figures, or strong family bonding, and positive regard for pro-social groups, such as school, may mitigate deviant behaviour (73).

Family bonding, which includes factors such as supportive parenting, parental involvement in adolescents' activities, and clear limit setting, has been shown to be protective against adolescents' tendency to engage in substance use (e.g. (18,35), and there is some evidence this effect is also observed with adolescent NMPO use (73,87). Adolescents living in a two-parent household were found to exhibit a lower likelihood of engaging in any prescription drug misuse (72,78), including NMPO (61). Sung et al. (87) noted a small inverse association between parental praise and past-year NMPO use. In a latent class analysis of adolescents who misuse prescription opioids, Vaughn et al. (106) found low levels of parental praise were strongly associated with being in any one of three 'high-risk' classes (high substance use and/or high delinquency), suggesting a general effect of family support in decreasing substance use and delinquent behaviours among NMPO users.

Using 2005 NSDUH data, Ford (73) noted a significant inverse relationship between adolescents' bonding to parents / parental supervision (measured as seven items exploring parents' monitoring and help with homework, limit-setting, and praise) and past-year NMPO use in logistic regression analyses. In their combined 2008 to 2012 NSDUH sample, Edlund et al. (105) found that adolescents reporting lower family support exhibited a greater likelihood of engaging in NMPO use. However, not only did they not find a buffering effect of parental support on the association of MDE with NMPO use, they also found that the magnitude of the association between MDE and NMPO use was *higher* among adolescents reporting greater levels of parental support (105). Although the authors do not, one can speculate that the increase in parental involvement was related to recognition of the adolescents' problems. Particularly given its modifiable nature, the relationship between family bonding and adolescents' tendency to misuse prescription opioid drugs warrant further exploration.

There is research evidence supporting a protective effect of school connectedness—defined as the “belief by students that adults in the school care about their learning as well as about them as individuals”(126)—against adolescent substance use, and some limited evidence that this effect is found among adolescent NMPO users. Poor grades (D-grade or worse) have been associated with an increased likelihood of prescription drug misuse (stimulants, sedatives, tranquilizers, opioids) in

the 2005 NSDUH U.S. (61). School connectedness was found to be significantly inversely correlated with adolescent past-year NMPO use by Ford (73). Although friends' pro-social behaviour does not appear to be a differentiating factor between non-users versus occasional NMPO users, an inverse association has been observed for non-users versus frequent NMPO misusers, and occasional NMPO users versus frequent NMPO misusers (33). From a Canadian perspective, compared to those reporting low school connectedness, Currie et al. (13) found adolescents who reported average to high levels of school bonding were less likely to report using NMPOs to get high. Though encouraging, these results need to be further substantiated. Given the call for effective prevention of problematic substance use in adolescence, refining our understanding of protective psychosocial factors such as improved family bonds and school connectedness is important in the development and strengthening of current prevention strategies.

Chapter 3: Summary of Literature Limitations

Despite the apparent high prevalence of NMPO use among high school students—higher than for any individual illicit drug other than cannabis—our ability to reliably characterize student NMPO users and our understanding of how NMPOs are used remains rudimentary. Key limitations that hinder our ability to accurately inform prevention and treatment strategies are as follows:

Limitation 1: Lack of Canadian reporting

There is a general lack of reporting on the scope and correlates of NMPO use among high-school adolescents in the Canadian context. This is despite a strong indication that the prevalence of NMPO use among Canadian adolescents parallels that of U.S. youth, as described above. Much of the available research evidence originates from the United States, which differs from Canada in several important aspects including healthcare provision, prescription drug monitoring and accessibility, and school-based interventions, decreasing our ability to generalize the findings to Canadian youth. Elucidating some of the sociodemographic and psychosocial factors that characterize high-school NMPO users in Canada will therefore facilitate our ability to critically apply findings from the evidence base.

Limitation 2: Lack of attention to frequency of NMPO use

Most reports exploring correlates of NMPO use ignore frequency, combining all past-year users into one category (70,73,87,96,99,127). However, as recently pointed out by Nargiso et al. (11) in their systematic review of adolescent prescription drug misuse in the United States, whether misuse occurs experimentally versus non-experimentally / regularly may be tied to various individual and social factors. As suggested by Fleary et al. (33), valuable information may be lost when frequency of drug use is not considered and measures are dichotomized, clumping experimental / occasional users with regular / non-experimental users. This could result in confounded research on correlates of use (i.e. muddling of associations due to effects of varying frequency of use).

Limitation 3: Lack of attention to other substance use

The third major limitation is that we do not know how NMPOs are used in relation to other substances, and whether demographic or psychosocial factors contribute to substance use patterns among NMPO users (11). As reviewed, NMPO users appear distinct in some ways; the prevalence of NMPO use falls between the apparent socially-normative use of alcohol and cannabis and the prevalence of illicit drug use, and some demographic and psychosocial factors appear to uniquely predict NMPO use. Plausibly, there is a group of exclusive NMPO users, with unique psychosocial determinants – if so, this has implications for targeted prevention and intervention efforts. However, NMPO users are also known to commonly engage in use of other substances, leading some researchers to propose that NMPO use is simply another form of ‘hard’ drug use (28,87). Those adolescents who cross normative boundaries and engage in NMPO use may be the same traditional high-risk youth who engage in an array of illicit drug use, with misuse of prescription opioids being just one of the latest trends. In this regard, NMPO users would share substance use profiles, mental health outcomes and protective factors with other illicit drug users. It is important therefore to first determine whether there are adolescents who use NMPOs exclusively and adolescents who use other substances in addition to NMPOs, and second, whether these subgroups are characterized by unique psychosocial determinants. Use of multiple substances during adolescence—i.e. comorbid substance use—has been associated with more harmful patterns of use and negative outcomes (128). If NMPO users form unique subgroups identifiable through their substance use profiles, and these can be meaningfully distinguished in terms of mental health problems or associations with protective factors, then this would have important implications for the development of screening tools and our current prevention and intervention strategies aimed at curbing adolescent NMPO use and associated harms.

Chapter 4: Project Objectives

The over-arching goal of this project is to characterize high-school student NMPO users, and determine whether unique associations exist between their patterns of use and psychosocial factors. This project examines how frequency of use and patterns of other substance use are associated with the psychosocial profile of NMPO users, particularly with respect to mental health (depression, suicidality, and anxiety symptoms) and protective factors (bonds with school and family). A secondary goal is to contribute to the very limited Canadian research in this field. Therefore, the proposed study extends earlier work and addresses the above described limitations with the following specific objectives:

Objective 1:

To describe the sociodemographic, substance use, and psychosocial characteristics of Atlantic Canada high-school student NMPO users, and determine whether frequency of use is differentially associated with these measures.

- a. What is the sociodemographic, substance use, and psychosocial profile of Atlantic Canada high-school student NMPO users, in particular those who use NMPOs experimentally and those that use NMPOs non-experimentally? How are these profiles similar to, or different from, other high-school student substance users, particularly those who use alcohol, cannabis, and other illicit drugs?
- b. Can we differentiate between experimental and non-experimental student high-school NMPO users based on substance use patterns, and measures of mental health (depression, suicidality, and anxiety) and protective factors (school and family bonds)?

Objective 2:

To determine substance use patterns among high school student NMPO users, and whether these patterns of use are associated with any specific psychosocial factors.

- a. Are NMPOs used alone or in conjunction with other substances? (Are there substance user subgroups among NMPO users?)
- b. Do these subgroups of NMPO users differ on measures of mental health (depression, suicidality, and anxiety) and protective factors (school and family bonds)?

Chapter 5: Methods

5.1 Research Methods Overview

In order to address the objectives, I completed a secondary analysis of data from the 2012 cycle of the Student Drug Use Survey in the Atlantic Provinces (SDUSAP). The SDUSAP is a self-report questionnaire that examines substance use and a range of other indicators that include demographics, social environment, and mental health. For this project's purposes, this data set had the particular advantage of a large sample size representative of high-school adolescents in Atlantic Canada (Nova Scotia, New Brunswick, Newfoundland and Labrador).

All analyses took into account the survey design and incorporated probability weights. To address Objective 1, which aims to describe student NMPO users and determine whether frequency of use is differentially associated with demographic and psychosocial indicators, descriptive statistics were first generated to describe the sociodemographic, substance use, and psychosocial characteristics of Atlantic Canada high-school adolescents who reported on their use of NMPOs and other substances. Multinomial regression models were used to assess the relationships between the different frequency levels of NMPO use (no use, infrequent use, and frequent use) and the explanatory variables.

To address Objective 2, which aims to explore associations between psychosocial factors and the patterns by which NMPOs are used in conjunction with other substances, data was explored for emergence of substance use patterns among only those who reported using NMPOs in the past year. The emergent subgroups were then compared on psychosocial measures (mental health and protective factors) again using multinomial regression models.

The following section of this chapter is divided into three subsections. It begins with a description of the data source. The second subsection defines the measures. Finally, the third subsection describes the statistical methods for addressing each objective of the project.

5.2 Data Source – Design and Sample

This project used cross-sectional data from the 2012 Student Drug Use Survey in the Atlantic Provinces (SDUSAP). Only Nova Scotia, New Brunswick, Newfoundland and Labrador participated in this most recent iteration, whereas Prince Edward Island, which had previously participated, chose not to do so for this iteration of the survey. The 2012 SDUSAP surveyed grade 7, 9, 10 and 12 students in the Anglophone and Francophone public school system; private schools and schools on First Nations reserves were excluded. The survey design precluded inclusion of adolescents who do not attend school (street youth, school-leavers) and those absent on the day of the survey. The sampling design was a two-stage stratified cluster sample of randomly selected classrooms within each of the Shared Service Areas (regions of shared government service provision). Each of the selected classes in each of the four surveyed grades (7, 9, 10, and 12) contained at least 20 students. The sampling strategy allowed for approximately proportional representation of each province, within each region, within each grade, and then was allocated proportionately according to school size. Weighting of the data was undertaken to correct for the sampling technique and survey non-response (100).

The 2012 SDUSAP survey is a self-report questionnaire comprised of 106 multiple-choice items and one open-ended question. Items include information on demographics, social environment (including school, community, and family), substance use, problems related to substance use, risk behaviours (including driving under the influence and sexual risk behaviours), mental health symptoms and help seeking behaviour, gambling, and school policies / drug education (see survey in Appendix 1).

The survey was administered by trained individuals, who had completed sessions aimed at developing skills for addressing potential problems during data collection, improving capacity to interact effectively with students and school administration, and increasing familiarity with the survey and research protocol. Following data collection, the research team members looked through each survey to identify and correct potential problems that might interfere with accurate function by the scanning machine. Research team members coded each survey with a five digit number specific to the province, school, and class of collection, and the bundled surveys (by school and class) were shipped to the Propel Centre for Population Health Impact at the University of Waterloo, Ontario for machine scanning using Optical Mark Read (OMR) technology. At Propel, the processing staff

repeated quality control measures (identified and corrected potential scanning problems) to ensure accurate scanning, and the data outputs were examined for responses that could not be coded. Missing values were given to responses that could not be corrected (e.g. it was unclear which response was selected by the student) (100).

The Dalhousie University Health Sciences Research Ethics Board granted ethics approval for the 2012 SDUSAP after reviewing the informed consent process, risks and benefits of participation, and confidentiality and anonymity. Consent was obtained from each province's Department of Education and Department of Health (and Wellness). In Nova Scotia, agreement to participate was first obtained from the Superintendent from each school board, and then from the principals of the individual randomly-selected schools. In the Halifax Regional Municipality, additional separate ethics approval was obtained from the Halifax Regional School Board Planning and Research Department, along with mandated 'active' parental / guardian consent (in contrast to the rest of the province, where the need for active parental / guardian consent was determined by individual schools) (100).

In New Brunswick, superintendents from each school board were requested to notify their principals, and then cooperation was sought from the principals of selected schools; an internal process led to agreement on passive parental consent. In Newfoundland and Labrador, following agreement from the school districts, randomly-selected schools were contacted. In every province, participants provided consent implicitly by completing the survey. They were informed of the purpose for the survey, that their participation was voluntary, that they could withdraw at any time, and that their answers were confidential and anonymous (100).

5.2.1 Sample Size

A total of 9 229 students participated in the 2012 SDUSAP (100). The total response rate across all participating provinces was 89.9% of students present on survey day, and 77.2% of students officially enrolled in schools (100).

Due to developmental considerations, Grade 7 students were excluded from all analyses. Given the myriad of biopsychosocial changes occurring during adolescence, substantial differences exist between younger and older students. In particular, the prevalence of mental health problems

risers with age; the mean onset of major depressive disorder is in the mid to late teens (129), and there is significant heterogeneity in presentation of anxiety symptoms across developmental stages (130). Substance use also generally increases with age; for example, less than one-third of grade 7 students, compared to over two-thirds of students in grades 9, 10, and 12 reported past-year use of alcohol on the 2012 SDUSAP (100). The importance of peer relationships and parental involvement are also known to vary across adolescent age groups (31–33). Even though in Canada, students enter secondary school sometime between grades 6 and 8 (131), the general North American definition of high-school is grades 9 through 12. Thus, this project focuses specifically on adolescents between grades 9 and 12 to improve the accuracy (and facilitate interpretation of) the findings.

5.2.2 Exclusion Criteria

To identify adolescents over-reporting their substance use, a fictitious substance was added to the survey. Those responding affirmatively to this item were excluded from all analyses.

5.3 Measures

5.3.1 Outcome Variable - NMPO Use

The main variable of interest is NMPO use. The 2012 SDUSAP asked respondents to self-report on their past-year use of NMPOs using the following survey item: “In the past 12 months, how often did you use PAIN RELIEF PILLS (such as Percocet, Percodan, Tylenol #3, Demerol, OxyContin, codeine) without a prescription or without a doctor telling you to take them? (We do not mean regular Tylenol or Aspirin that anyone can buy in a drug store)” (item 59 – see Appendix 1). Respondents were provided with the following response choices:

I do not know what pain relief pills are
Not at all
One time
Two times
Three or four times
Five to eight times
Nine to 12 times (about once a month)

Thirteen to 26 times (about twice a month)
Twenty-seven or more times (more than twice a month)
Used without a prescription, but not in the past 12 months

An objective of this project is to describe and compare experimental and non-experimental NMPO users, since frequency of use may be associated with varying levels of social and psychological correlates. However, as described in Chapter 3: Summary of Research Limitations, most research has collapsed the response options into a dichotomous variable: ‘any past-year/lifetime use’ and ‘no past-year/lifetime use’. Although a few studies have commented on frequency of use, a cut-point differentiating between experimental and non-experimental NMPO use has not been established in the literature. Therefore, I first determined the frequency distribution of NMPO use, and noted a natural cut-point in the data between students reporting NMPO use ‘two times’ and ‘three or four times’ in the past year. Second, I considered the most pertinent available literature. The most relevant report is that by Pulver et al. (14), who explored the sociodemographic correlates of NMPO use among a sample of Canadian adolescents (using data collected for the World Health Organization using the Health Behaviour in School Aged Children survey). In this study, infrequent use was defined as 1 to 2 times, and frequent use as 3 or more times in the past year; this cut-point suggests a distinction between experimentation versus use that has progressed past such discovery use. I also considered greater cut-points, found in publications from the United States (McCabe et al. and Catalano et al. (28,104) defined heavy use as more than 10 times per year).

Informed by both the distribution of NMPO use frequency in our sample, and the above prior research, I created a categorical variable and collapsed the response options into the following three levels: “non-experimental past-year NMPO use”, defined as use three or more times in the past year; “experimental past-year NMPO use”, defined as use on one or two occasions in the past year; and “no past-year NMPO use”, which included responses of not knowing what pain relief pills are, ‘not at all’, and ‘used without a prescription, but not in the past 12 months’. This is in line, therefore, with the aforementioned Canadian report by Pulver et al. (14).

5.3.2 Covariates - Sociodemographic Factors

Informed by earlier reports indicating possible relationships to NMPO use, the sociodemographic indicators included urbanicity, sex, grade level, living arrangements, and

socioeconomic status (see Appendix I). Sex was a dichotomous variable (male versus female), and grade level was categorical (grade 7, 9, 10, and 12).

Urbanicity was determined according to the school postal code for each respondent using Statistics Canada definitions of census subdivisions, as done by Pulver et al. (14). This was a categorical variable with the following four levels based on the below definitions:

Urban areas

Strong Metropolitan Influenced Zone (MIZ)

Moderate Metropolitan Influenced Zone (MIZ)

Weak or No Metropolitan Influenced Zone (MIZ)

Students were categorized as residing in an “Urban Area” using Statistics Canada definitions of census metropolitan (CMA; >100 000 population) or census agglomeration (CA; >10 000 population) areas (132). Non-urban areas were classified by Metropolitan Influenced Zones (MIZ), which are founded on geographic distance and degree of influence that CMAs and CAs have on them; the categories are “based on the percentage of their resident labour force that commutes to work in the core of a CMA or CA” (page 69) (132). Strong MIZs include census subdivisions where at least 30% of the employed residents commute to work in a CMA or CA (132). Moderate MIZs include census subdivisions from which 5 to 30% of the resident employed labour force commute to work in a CMA or CA (132). Weak MIZs are those from which more than 0% but less than 5% commute to work in a CMA or CA, and No MIZs are those where none of the employed labour force commutes out to work, or the resident labour force is comprised of fewer than 40 persons (132). Using this classification of geographic status is useful in that it allows for more detailed exploration of potential disparities in association with NMPO use than that possible with a dichotomous measure of urbanicity versus rurality.

Item 7 in the 2012 SDUSAP asks respondents to indicate with whom they are living, with combinations of mother, father, and/or step-parents, as well as independent living (alone or with friends) and the option of entering free text (item 7, Appendix 1). Simoni-Wastilla et al. (72), used a dichotomous variable to describe living arrangements, looking at both or not both parents present in the household as a proxy measure of family stability in relation to NMPO use. In the analyses, I considered living arrangements as demographic information; this categorical variable included the following levels based on who the adolescent is living with: ‘both parents’, ‘one parent only’, ‘either parent and step-parent’, and ‘neither parent’ (100).

To capture perceived social standing based on traditional socioeconomic status indicators (i.e. income, education, and occupation), the youth version of the MacArthur Subjective Social Status (SSS) scale was employed (item 9, Appendix 1). The subjective assessment of the respondent's family's social status is measured on a 10-rung ladder, with the top of the ladder indicating highest socioeconomic status. This scale has been demonstrated to be a reliable indicator of adolescents' perceived social status, and social status is a known determinant of adolescent health (133). Similarly to the approach taken by Fischer et al. (15), a three-level categorical variable was created based on calculated interquartile ranges ('low income' as below the first quartile, 'middle income' as between the first and third quartiles, and 'high income' as above the third quartile).

5.3.3. Explanatory Variables - Substance Use

Alcohol use

Alcohol use in adolescence can be socially normative or problematic, based on the pattern of use. Several studies have explored associations of NMPO use with any lifetime or past-year use of alcohol (e.g. (33,72,87)), while others include use patterns such as past-month alcohol use, history of binge alcohol use (96), and alcohol use in the past week (72). Though certain use patterns, such as binge drinking, have been associated with greater risk of harm (55,134,135), I focused on frequency of past-year alcohol use to maintain consistency across the measures on substance use. Though there is a lack of consensus for cut-points for problematic frequency of alcohol use in adolescence, I used relevant literature to inform the definition of this measure. In a study aiming to identify subgroups of adolescent cannabis users, Fallu et al. (108) used a cut-point of '31 or more times' in the prior year (i.e. more than twice a month) to define both frequent alcohol use and frequent cannabis use among Quebec 10th graders. The 'clinical cut-off criteria' suggested by Blake et al. (2001) for frequent alcohol use in adolescence as drinking on 'two or more days per week' was used by Cable and Sacker (136) in their study aiming to describe different typologies of United Kingdom adolescent alcohol users. Particularly relevant to this study, Simoni-Wastilla et al. (72) noted that although alcohol use was strongly associated with any NMPO use in the year prior, adolescents who used alcohol less than once per week were less likely to fall into problematic NMPO use (defined as meeting opioid abuse or dependence criteria, as per DSM-IV). Taken together, these reports suggest

a cut-point of once per week or more as a meaningful indicator of problematic alcohol use for the purposes of this study.

The 2012 SDUSAP asked respondents to self-report on their past-year use of alcohol using the following survey item: “In the past 12 months, how often did you drink alcohol – beer, wine, coolers or hard liquor (rum, whisky, vodka, gin, etc.)?” (survey item 28; see Table 1). Students were provided with the following response options:

Not at all
Just a sip
Once a month or less often
Two or three times a month
Once a week
Twice a week
Three times a week
Four or five times a week
Almost every day – six or more times a week

Considering the above mentioned studies, these response options were collapsed into the following: ‘No past year alcohol use’ will include the first two response options, ‘not at all’ or ‘just a sip’; ‘Infrequent alcohol use’ was defined as ‘once a month or less often’ to ‘two or three times a month’; and ‘Frequent alcohol use’ will include ‘once a week’ and any greater frequency of use (see Table 1).

Cannabis use

Cannabis is the most widely used illicit drug among North American mainstream youth, with its general acceptance within mainstream youth culture arguably placing it outside of the ‘hard’ drug category (55,108,137). Though clearly not all adolescents who use cannabis experience significant harms, those who use frequently are at greater risk of associated problems (108). Although most of the reviewed reports have operationalized cannabis use as simply any lifetime or past-year use (e.g. (33,61), I defined cannabis use on three levels based on frequency of use.

The 2012 SDUSAP asked respondents to self-report on their past-year use of cannabis using the following survey item: “In the past 12 months, how often did you use cannabis (marijuana, grass, weed, pot, hash, hash oil)?” (Survey item 42; see Appendix 1). Students were provided with the following response options:

I do not know what cannabis is
I have never used cannabis
I did not use cannabis in the past 12 months
One time
Two times
Three or four times
Five to eight times
Nine to 12 times (about once a month)
Thirteen to 26 times (about twice a month)
Twenty-seven or more times (more than twice a month)

As with alcohol use, there is little consensus in the literature about what constitutes frequent or heavy cannabis use, with some employing cut-points of ‘10 times or more’, and others using a cut-off of ‘40 times or more’ in the prior year (e.g. as cited by (138)). As mentioned above, Fallu et al. (108) used a cut-point of ‘31 or more times’ in the prior year (i.e. more than twice a month) to define both frequent alcohol use and frequent cannabis use in a sample of adolescents in Quebec. Using this study as precedent, the response options were collapsed into the following: ‘No past-year cannabis use’ was defined as ‘I do not know what cannabis is’ or ‘I have never used cannabis’ or ‘I did not use cannabis in the past 12 months’; ‘Infrequent cannabis use’ was defined as ‘One time’ to ‘thirteen to 26 times (about twice a month)’, and ‘Frequent cannabis use’ was defined as ‘twenty-seven or more times (more than twice a month)’ (see Table 1).

Other illicit drug use

The 2012 SDUSAP asks respondents about their past-year use of the following illicit drugs: inhalants (solvent or glue), LSD (acid, cid), psilocybin (magic mushrooms, shrooms)/mescaline (mesc), cocaine (snow or coke) / crack cocaine (rock), ecstasy/MDMA, methamphetamine, salvia divinorum, and mephedrone (targeted by survey items 44, 45, 46, 48, 49, 50, 51, 53; see Appendix 1). Similarly to the item targeting cannabis, students were asked: “In the past 12 months, have you used [name of substance] [(commonly used names)]?” and provided with the following response options:

I do not know what [name of substance] is
Not at all
One time
Two times
Three or four times

Five to eight times
Nine to 12 times (about once a month)
Thirteen to 26 times (about twice a month)
Twenty-seven or more times (more than twice a month)

In line with other studies, any past-year use of the aforementioned substances was combined to create an ‘other past-year illicit drug use’ variable. Though most studies have used a dichotomous variable (no past-year illicit drug use versus any past-year illicit drug use) (e.g. (17,73,96)), I elected to proceed similarly to Catalano et al. (28), where the frequency was based on the drug reported as used most frequently. Thus, I examined illicit drug use on three levels: no use, occasional use, and frequent use (see Table 1). Using the definitions in Table 1, a student who reported they used psilocybin 1 to 2 times and ecstasy 9 to 12 times in the past year was regarded as a ‘frequent’ user. My rationale is that youth who experiment with any substances on one or two occasions are unlikely to experience the same risks and suffer the same harms as those who use any illicit drugs more frequently, and combining these individuals into a single ‘any past-year use’ group may result in lost information (as suggested by Fleary et al. (33) and Nargiso et al. (11)). Although other studies have included the misuse of stimulants and sedatives / tranquilizers in the illicit drug use category, this project looks to examine the patterns and correlates of NMPO use in relation to use of other conventional drugs, and thus the misuse of other prescription drug classes will not be incorporated into our analyses.

Table 1: Substance Use Measures

| Survey Item | Independent Variable | Composition of levels of variable based on response options |
|--|----------------------------|---|
| 28 | Past-year alcohol use | No past year alcohol use = ‘not at all’ or ‘just a sip’ Infrequent past-year alcohol use = ‘once a month or less often’ to ‘two or three times a month’ Frequent past-year alcohol use = ‘once a week’ or more |
| 42 | Past-year cannabis use | No past-year cannabis use = ‘I do not know what cannabis is’ or ‘I have never used cannabis’ or ‘I did not use cannabis in the past 12 months’ Infrequent past-year cannabis use = ‘One time’ to ‘13 to 26 times (about twice a month)’ Frequent past-year cannabis use = ‘twenty-seven or more times (more than twice a month)’ |
| 44 45 46 48 49 50 51 53 | Past-year illicit drug use | No past-year illicit drug use = response to each of 8 substances is ‘I do not know what [substance] is’ or ‘not at all’ Infrequent past-year illicit drug use = response to any of 8 substances is ‘one time’ or ‘two times’ Frequent past-year illicit drug use = response to any of 8 substances is ‘three or four times’ or more |

5.3.4 Explanatory Variables - Psychosocial Measures

Depression

Depressive symptoms seven days prior to the survey were assessed using the 12-item version of the Center for Epidemiological Studies – Depression (CES-D) scale (item 101, Appendix 1). The CES-D scale was originally designed to measure symptoms of depression in the general population (139,140); this abbreviated 12-item version was created for the National Longitudinal Study of Children and Youth (NLSCY; a long-term study following the development of Canadian children) (141). The 12-item scale has been validated for use among Atlantic Canadian adolescents by Poulin et al. (141) using the 2002/2003 Student Drug Use Survey in the Atlantic Provinces. Internal consistency as measured by Cronbach’s alpha was 0.87, previously calculated in this sample. As pointed out by Poulin et al. (141), one particular limitation of the CES-D scale is the absence of an item querying irritability, a common symptom of depression in youth.

The 12-item CES-D scale uses a four-point rating scale, ranging from ‘never or rarely’ (0 points) to ‘always’ (3 points); the scale thus ranges from 0 to 36 points, with higher values indicating greater severity of depressive symptomatology. The depression variable was treated as a categorical variable using cut points as established by Poulin et al. (141) (see Table 2).

Suicidality

Suicidality over the past year was assessed by items asking respondents about their experience of suicidal thoughts and suicide attempts (items 94 and 96, Appendix I), based on the Centers for Disease Control Youth Risk Behaviour Surveillance System (CDC YRBSS) (142). Suicidal ideation (item 94) remained dichotomous (yes versus no). Number of past-year suicide attempts is captured on an ordinal scale, from “never” to “six or more times” (item 96), and was collapsed into a dichotomous variable: “no past-year suicide attempts” and “past-year suicide attempts” (one time or more) (see Table 2).

Anxiety

Anxiety symptoms 30 days prior to the survey were addressed using the five-item version of the Screen for Child Anxiety Related Disorders (SCARED) scale, scored on a three point scale from ‘not true’ (0 points) to ‘sometimes true’ (1 point) to ‘often true’ (2 points) (item 102, Appendix I). The five-item version was initially developed by Birmaher et al. (143) and is based on the five factors of the full 38-item scale developed for clinical samples, specifically panic disorder (“I got really frightened for no reason at all”), separation anxiety (“I was afraid to be alone in the house”), generalized anxiety disorder (“People told me that I worry too much”), school refusal (“I was scared to go to school”) and social anxiety disorder (“I was shy”) (143). The five-item version of the scale has similar psychometric properties to the full SCARED scale, and has been validated for use in the general adolescent population by Hale et al. (144). Internal consistency as measured by Cronbach’s alpha was 0.90, previously calculated in this sample. The anxiety variable was treated as a dichotomous categorical variable, using a cut-off of 3 points, as suggested by Birmaher et al. (143).

School Connectedness

The measure of students' bond to school was a measure of school connectedness based on a scale from the National Longitudinal Study of Adolescent Health, a longitudinal study of high-school adolescents in the United States (145,146). The three item version used in the 2012 SDUSAP asks respondents to indicate on a four-point Likert scale (from "Strongly agree" to "Strongly disagree") their agreement with statements assessing how safe they feel at school, how close they feel to others at school, and how happy they feel at school (item 17, Appendix I). These three items are found in the five-item version of the scale that has been used in different samples of Nova Scotia high-school students (147,148). Internal consistency as measured by Cronbach's alpha was 0.74, previously calculated in this sample by Azagba et al. (149).

School connectedness was treated as a categorical variable. First, responses were summed and reverse-scored (higher score reflecting greater school connectedness) to create a composite score, for which the mean and standard deviation were calculated; this approach is similar to that of Currie et al. (13). Although Currie et al. (13) created a dichotomous variable, reflecting low versus average/high school connectedness, we examined school connectedness on three levels, namely low, average, and high. Scores lower than one standard deviation below the mean were used to indicate "low school connectedness", scores within one standard deviation were used to indicate "average school connectedness", and scores higher than one standard deviation above the mean were used to indicate "high school connectedness" (see Table 2).

Parental Monitoring

Family bonding was targeted by three items, which ask respondents to indicate on a five-point Likert scale (from "Strongly agree" to "Strongly disagree") how much they agree with the following statements: "My parent(s) or guardian(s) usually know where I am when I am not at home", "My parent(s) or guardian(s) usually know who I am with when I am not at home", and "It is important that I do not let down or disappoint my parent(s) or guardian(s)" (item 13, Appendix I). These items address an aspect of the family bond construct, namely 'parental monitoring', which is reflective of the students' perception of parental knowledge and importance they place on their parents' expectations of them (150). Cronbach's alpha was 0.74, previously calculated for this sample by Asbridge et al. (16).

As with school connectedness, responses were summed and reverse-scored (higher score reflecting greater parental monitoring) to create a composite score, for which the mean and standard deviation were calculated. I examined parental monitoring on three levels, namely low, average, and high. Scores lower than one standard deviation below the mean were used to indicate “low parental monitoring”, scores within one standard deviation were used to indicate “average parental monitoring”, and scores higher than one standard deviation above the mean were used to indicate “high parental monitoring” (see Table 2).

Table 2: Psychosocial Measures

| Survey Item | Independent Variable | Composition of levels of variable based on response options |
|-------------|----------------------|---|
| 101 | Depressive Symptoms | Minimal depressive symptoms – score 0 – 11; Somewhat elevated depressive symptoms – score 12 – 20; Elevated depressive symptoms – score 21 – 36. |
| 102 | Anxiety Symptoms | None to minimal anxiety symptoms: score 0 – 3 Elevated anxiety symptoms: 4 - 10 |
| 94 | Suicidal Ideation | No Yes |
| 96 | Suicide Attempts | No past-year suicide attempts Past-year suicide attempts – one time, or higher |
| 17 | School Connectedness | Low school connectedness – score lower than one standard deviation below the mean of the composite score (< 1 SD below mean) Average school connectedness – score within one standard deviation of the mean of the composite score High school connectedness – score higher than one standard deviation above the mean of the composite score (> 1 SD above mean) |
| 13 | Parental Monitoring | Low parental monitoring – score lower than one standard deviation below the mean of the composite score (< 1 SD below mean) Average parental monitoring – score within one standard deviation of the mean of the composite score High parental monitoring – score higher than one standard deviation above the mean of the composite score (> 1 SD above mean) |

5.3.5. Explanatory Variables – Medical Opioid Use (MPO)

It was important to consider and control for medical prescription opioid (MPO) use in the analyses. First, as discussed above, opioids are indicated in the treatment of pain, and depression and anxiety are commonly associated with physical complaints, including pain symptoms (113). Second, adolescents who have been prescribed opioid medication appear more likely to misuse opioids than adolescents who have not had their own prescription for opioids (67,96). Research suggests that adolescents with chronic pain and comorbid mental health problems, particularly depression and anxiety, are not only more likely to receive opioid treatment, but also to continue into long-term opioid therapy (151), thus increasing the potential for physical and psychological dependence. Third, there is indication that adolescents treated with prescription opioids are more likely to engage in illicit substance use, particularly cannabis use (96).

The 2012 SDUSAP asked respondents to self-report on their past-year medical use of opioids using the following survey item: “In the past 12 months, how often did you use PAIN RELIEF PILLS (such as Percocet, Percodan, Tylenol #3, Demerol, OxyContin, codeine) with a prescription or because a doctor told you to take them? (We do not mean regular Tylenol or Aspirin that anyone can buy in a drug store)” (item 58 – see Appendix 1). Respondents were provided with the following response choices:

I do not know what pain relief pills are
Not at all
One time
Two times
Three or four times
Five to eight times
Nine to 12 times (about once a month)
Thirteen to 26 times (about twice a month)
Twenty-seven or more times (more than twice a month)
Used with a prescription, but not in the past 12 months

As done by others (e.g. (67)), past-year medical prescription opioid (MPO) use was defined as a dichotomous variable, with the response options collapsed into the following two levels: ‘no past-year MPO use’ will include response options of “I do not know what pain relief pills are”, “not at all”, and “used with a prescription, but not in the past 12 months”, and ‘any past-year MPO use’, which included all other response options (i.e. one time, or more).

5.4 Statistical Analyses

Statistical significance for all analyses was defined at the $p < 0.05$ level (2-sided), and 95% confidence intervals (CIs) were reported for all relative risk ratios (RRRs). STATA SE 13 software was used in all analyses. To produce population estimates, the STATA survey commands, “svyset” (to declare the survey design) and “svy” (survey prefix command), were used to account for the clustering, stratification, and weighting incorporated into the survey design. Analyses per objective are outlined below.

Objective 1:

To describe the sociodemographic, substance use, and psychosocial characteristics of Atlantic Canada high-school student NMPO users, and determine whether frequency of use is differentially associated with these measures.

- a. What is the sociodemographic, substance use, and psychosocial profile of Atlantic Canada high-school student NMPO users, particularly those that use NMPOs experimentally and those that use NMPOs non-experimentally? How is their profile similar to, or different from, other high-school student substance users, particularly those who use alcohol, cannabis, and other illicit drugs?*

Statistics were generated to describe the sociodemographic, substance use, MPO use, and psychosocial characteristics of students who reported use of NMPOs, as well as those who reported use of alcohol, cannabis, and other illicit drugs. The sociodemographic factors included urbanicity, sex, grade level, age, and living arrangements (as defined in Measures section). For each category of substance users summary statistics were generated for the remaining types of substance use (e.g., for NMPO users, summary statistics for alcohol use, cannabis use, and other illicit drug use were calculated), and distinction was made based on frequency of use (no use versus infrequent use versus frequent use, as defined in Measures section and Table 1). The psychosocial characteristics included depression, suicidal ideation, suicide attempts, anxiety, school connectedness, and parental monitoring (as defined in Measures section and Table 2).

- b. *Can we differentiate between experimental and non-experimental high-school student NMPO users based on substance use patterns, and measures of mental health (depression, suicidality, and anxiety) and protective factors (school connectedness and parental monitoring)?*

Multinomial regression (also known as polychotomous or polytomous logistic regression) methods were used to assess the relationship between the outcome variable (NMPO use frequency), substance use patterns, MPO use, and psychosocial factors of interest, while controlling for sociodemographic covariates. Multinomial regression allows for three or more categories of the response variable (in this case, the three categories of use: no use, experimental use, and non-experimental use, as defined in Table 1) by breaking the analysis into a series of regressions comparing each category to the base (or referent) group. Separate multinomial models were run in order to obtain the following comparisons:

Non-experimental use versus experimental use
Experimental use versus no use
Non-experimental use versus no use.

One model had the ‘experimental use’ category as the referent group, allowing us to make the comparison between the non-experimental use and experimental use categories. The other model had the ‘no use’ category as the referent group, allowing us to compare ‘experimental use’ to ‘no use’, and ‘non-experimental use’ to ‘no use’ categories of the variable. Results of the multinomial regressions are reported as adjusted relative risk ratios (ARRRs).

Since anxious distress can be a prominent feature of depression (152), the multinomial regression models were tested with the anxiety variable removed (to assess for changes in the association between depressive symptoms and the outcome variable, frequency of NMPO use).

Collinearity Testing

A model with correlated independent variables may not give accurate results about the individual effects of each of these independent variables, since correlated explanatory variables provide redundant information about the outcome variable (153). To address this, collinearity of the mental health variables was tested. First, the standard errors (SEs) of the mental health explanatory variables (depressive symptoms, anxiety symptoms, suicidal ideation, suicide attempts) were compared between models including only one mental health variable at a time (adjusted for all other covariates)

and the standard errors obtained in the full models; none of the standard errors obtained were noted to be inflated. Next, variance inflation factors (VIFs) were calculated; though none reached the general cut-off of 10, the two suicidality variables (suicidal ideation and suicide attempts) had the highest values (depression variable VIF = 1.4; anxiety variable VIF = 1.84; suicidal ideation VIF = 4.28; suicide attempts VIF = 4.06.) Third, a correlation matrix revealed a correlation coefficient of 0.87 for suicidal ideation and suicide attempts. In light of this examination, the two variables assessing suicidality were entered separately into our models.

Objective 2:

To determine the substance use patterns by which NMPOs are used among high school students, and whether these patterns of use are associated with any specific psychosocial factors.

- a. *Are NMPOs used alone or in conjunction with other substances? (Are there substance user subgroups among NMPO users?)*

The data was explored for emergence of substance use patterns in conjunction with NMPOs (among only those adolescents who reported NMPO use). First, the NMPO use variable was dichotomized into ‘no use’, which included responses of not knowing what pain relief pills are, ‘not at all’, and ‘used without a prescription, but not in the past 12 months’ and ‘any use’, which included all other responses on this item. The remaining substance use variables (alcohol, cannabis, and other illicit drug use) were similarly recoded to ‘any use’, versus ‘no use’. By selecting the ‘no use’ categories of each of the substances, a subgroup of NMPO users who did not use any other substances was determined. I then explored for subgroups of any individual substance use in addition to NMPOs (e.g. NMPO users who use alcohol but did not use cannabis or other illicit drugs), and for more than one additional type of substance use (e.g. NMPO users who use alcohol and cannabis but did not use other illicit drugs) through cross-tabulations.

- b. *Do these subgroups of NMPO users differ on measures of mental health (depression, suicidality, and anxiety) and protective factors (school connectedness and parental monitoring)?*

The subgroups of NMPO users formed in part a. defined the categories of the NMPO variable for this part of the project. Again, multinomial regression methods were used to differentiate between the subgroups based on the same psychosocial factors examined in Objective 1 (and defined in Measures section); the outcome variable (NMPO use) was regressed against the psychosocial variables (depression, anxiety, school connectedness, and parental monitoring) and MPO use while controlling for sociodemographic covariates (same as for Objective 1, defined in Measures section).

As in the analyses for Objective I, the models were tested with the anxiety variable removed, to assess for changes in the association between depressive symptoms and patterns of NMPO use. In assessing for multicollinearity, suicidal ideation and suicide attempts were again noted to be highly correlated; these two variables were therefore entered separately into our models.

Chapter 6: Results

6.1 Description of Sample (weighted prevalence estimates, not displayed in tables)

Of the total 9 226 students in grades 7, 9, 10 and 12 responding to the 2012 SDUSAP, students in grade 7 (2 357 respondents) and students reporting use of a fictitious drug (108 respondents) were excluded, for a total study sample of 6 786 students. Students were equally distributed across the three included grade levels. Of the study sample, 50.5% were female, 47.3% male (2.2% did not specify their sex). Most resided in an urban area (63%) and the majority were living with both of their parents (62.8%). Over the year prior to the survey, more than one-fifth of students (21.9%) used prescription opioids medically, i.e. as prescribed by a physician. Past-year non-medical use of prescription opioids was reported by 12.7%; 7.1% reported both medical and non-medical prescription opioid use. The percentage of high-school students that reported any past-year use was 59.7% for alcohol, 38.7% for cannabis, and 12.6% for the combined category of other illicit drugs. Somewhat elevated symptoms of depression in the week prior to the survey were reported by 25.6% of students, and 6.3% had very elevated scores. Elevated anxiety symptoms in the preceding month were reported by 16.9%. Suicidal ideation was reported by 19.8% and 8.8% disclosed attempting suicide in the preceding year. The results of analyses specific to the objectives are presented below.

6.2 Results for Objective I

To describe the sociodemographic, substance use, and psychosocial characteristics of Atlantic Canada high-school student NMPO users, and determine whether frequency of use is differentially associated with these measures.

1.1 *What is the sociodemographic, substance use, and psychosocial profile of Atlantic Canada high-school student NMPO users, particularly those that use NMPOs experimentally and those that use NMPOs non-experimentally? How is their profile similar to, or different from, other high-school student substance users, particularly those who use alcohol, cannabis, and other illicit drugs?*

Tables 3 through 6 display the sociodemographic and psychosocial characteristics of students in grades 9, 10, and 12 reporting on their past-year use of NMPOs, alcohol, cannabis, and

other illicit drugs on the 2012 SDUSAP (total Ns and weighted prevalence estimates). Seven percent of high-school adolescents engaged in non-experimental NMPO use and 5% in experimental NMPO use, with negligible differences between males and females (Table 3). In contrast, frequent illicit drug use was slightly more prevalent among males (6.8%) than females (5.8%) (Table 6), and a clear male preponderance was observed among frequent users of alcohol and cannabis (alcohol: 15.9% males versus 11.7% females; cannabis: 15.5% males versus 10.4% females) (Tables 4 and 5). Use of substances generally increased with grade level, though this effect was least pronounced for NMPO use. Although no major differences were observed in prevalence of substance use by degree of urbanicity, a provincial difference was observed in that cannabis and NMPOs were slightly more commonly used in Nova Scotia than the other two Atlantic provinces. Generally, a greater proportion of students who did not live with a parent engaged in substance use than those who lived with at least one of their parents. The prevalence of infrequent and frequent illicit drug use and frequent cannabis use decreased sharply with perception of one's family as being near the top of the socioeconomic ladder. In contrast, both experimental and non-experimental NMPO use appeared nearly equally distributed across levels of subjective social status. Similarly, the differences in prevalence of infrequent cannabis use and alcohol (both infrequent and frequent) use showed only minor variability across social status. Finally, NMPO use was common among medical users of opioids; 12.8% of those who used opioids medically also engaged in experimental misuse and 19.7% of medical opioid users engaged in non-experimental misuse of this class of medicines.

In comparison to those who reported lower parental monitoring, the proportions of students engaging in substance use was lower among those reporting high levels of parental monitoring. In particular, whereas 7.3% and 17.2% of students reporting low parental monitoring engaged in experimental and non-experimental NMPO use, respectively, the prevalence decreased to 3.5% of those reporting high levels of parental monitoring (for both experimental and non-experimental NMPO use; see Table 3). In this regard, NMPO users were similar to other illicit drug users and frequent cannabis users, whose prevalence also sharply declined with increasing levels of parental monitoring (from 14.2% and 18.2%, to 1.7% and 1.6%, infrequent and frequent illicit drug users, respectively (Table 6); and 33.2% to 2.8%, frequent cannabis users (Table 5). In comparison, the decrease in prevalence of *infrequent* alcohol use and *infrequent* cannabis use with higher levels of parental monitoring was much less pronounced (Tables 4 and 5).

A similar phenomenon was observed with respect to school connectedness. Although 9.2% and 14% of students with low school connectedness scores reported experimental and non-experimental NMPO use, the prevalence respectively declined to 2.9% and 4.5% of those with strong connection to school (Table 3). Again, NMPO users resembled illicit drug users and frequent cannabis users, whose prevalence also declined markedly with increasing levels of school connectedness (Tables 5 and 6). In contrast, the prevalence of infrequent cannabis use, and any alcohol use (i.e. infrequent or frequent) was more evenly distributed across levels of school connectedness (Tables 4 and 5).

Though the prevalence of mental health problems was variable across types and frequency of substance use, the distribution of NMPO use again resembled illicit drug users (both infrequent and frequent users) and frequent cannabis users. In general, more students with elevated anxiety and depressive symptoms reported both experimental and non-experimental NMPO use in comparison to students with lower scores on these mental health measures (Table 3). Compared to students reporting minimal scores on the CES-D scale, the prevalence of both experimental and non-experimental NMPO use as well as frequent illicit drug use more than tripled among those reporting elevated scores (Tables 3 and 6); similarly, the prevalence of infrequent illicit drug use and frequent cannabis use nearly doubled (Tables 5 and 6). In comparison, the proportions of students engaging in infrequent and frequent alcohol use showed little relative variability across both anxiety and depression scores (Table 4). Cannabis use (both infrequent and frequent use) and infrequent illicit drug use were evenly distributed across our anxiety measure (Tables 5 and 6). In contrast, an increase in both experimental and non-experimental NMPO use and frequent other illicit drug use was observed among students reporting elevated versus none to minimal symptoms on the SCARED scale (Tables 3 – 6).

Finally, sharp increases in substance use were evident with positive history of suicidal ideation and suicide attempts. In particular, prevalence of non-experimental NMPO use was approximately three-times higher among students with a history of suicidal ideation (15.8% versus 5.4%) and suicide attempts (19.6% versus 6.3%) (Table 3). A similar tripling in prevalence of frequent illicit drug use (14.8% versus 4.1% for suicidal ideation and 19.5% versus 5.0% for suicide attempts; Table 6), and a doubling in prevalence of infrequent illicit drug use (11.4% versus 5.0% for suicidal ideation and 12.1% versus 5.8% for suicide attempts; Table 6) as well as frequent cannabis

use (21.6% versus 10.7% for suicidal ideation and 24.6% versus 11.7% for suicide attempts; Table 5) were observed with history of suicidality. Infrequent cannabis use and both infrequent and frequent alcohol use were much more evenly distributed across these two measures of suicidality (Tables 4 and 5).

In summary, NMPO use patterns were more like those seen with frequent cannabis use and other illicit drug use (both infrequent and frequent); the prevalence of the aforementioned tended to increase with increased burden of mental health problems and decrease with greater levels of protective factors. This is in contrast to alcohol use, which was more evenly distributed across these same measures.

1.2. *Can we differentiate between experimental and non-experimental high-school student NMPO users based on substance use patterns, and measures of mental health (depression, suicidality, and anxiety) and protective factors (school and family bonds)?*

To examine the association between psychosocial factors and frequency of NMPO use, unadjusted and adjusted multinomial regressions were performed (N = 6731); the results are displayed in Table 7 and described below. All tested psychosocial variables were significantly associated with NMPO use in unadjusted analyses and thus considered for inclusion in the final regressions. Multicollinearity tests revealed a high correlation between suicidal ideation and suicide attempts. These two variables were hence entered separately, and the reported RRRs are from the regressions that included suicide attempts; the adjusted RRRs for suicidal ideation displayed in Table 5 were obtained from separate regressions that included all of the same covariates. The following models were examined: experimental NMPO use versus no NMPO use; non-experimental NMPO use versus no NMPO use; and non-experimental NMPO use versus experimental NMPO use. Indeterminant categories (as displayed in Tables 1 through 4) were included in the analyses but not reported.

6.2.1 Sociodemographics

After adjusting for covariates, being male increased the risk of experimental NMPO use relative to no NMPO use (RRR 1.41; 95% CI 1.06 – 1.88) (result not reported in Table 7); otherwise, sex did not have influence on past-year use of NMPOs. The relative risk of non-experimental NMPO use (versus no NMPO use) was lower among twelfth graders compared to ninth graders (RRR 0.52; 95% CI 0.34 – 0.80). Although living arrangements did not influence the frequency of NMPO use overall, not living with parents increased the risk of non-experimental NMPO use almost two-fold (relative to no NMPO use, RRR 1.95; 95% CI 1.20 – 3.17). Province, urbanicity of residence, and subjective social status were not significantly associated with frequency of NMPO use in the full models.

6.2.2 Other Substance Use

Relative to no past-year use of NMPOs, past-year use of alcohol, cannabis, and other illicit drugs was generally associated with an increased relative risk of both experimental and non-experimental past-year NMPO use. In particular, students who engaged in use of other illicit drugs had the greatest relative risk of NMPO use; the relative probability of experimental past-year NMPO use, rather than none, was nearly four times higher (RRR 3.91, 95% CI 2.23 – 6.85), and the relative probability of non-experimental NMPO use, rather than none, was more than four times higher (RRR 4.34, 95% CI 2.72 – 6.92) for students who frequently used other illicit drugs than for students who did not, after adjustment for sociodemographic and psychosocial variables. Despite being significantly associated with experimental NMPO use (RRR 2.29; 95% CI 1.45 – 3.60), infrequent use of other illicit drugs was not significantly associated with non-experimental use of NMPOs, relative to no past-year NMPO use. Although frequent use of alcohol, cannabis, and other illicit drugs suggested a greater risk of non-experimental NMPO use relative to experimental NMPO use in unadjusted analyses, after controlling for other covariates, experimental NMPO users could no longer be differentiated from non-experimental NMPO users based on their substance use patterns.

An exception was the significant *decrease* in risk of non-experimental relative to experimental NMPO use (RRR 0.56; 95% CI 0.32 – 0.97) with infrequent use of illicit drugs (versus no illicit drug use).

6.2.3 MPO Use

Compared to students who were not prescribed opioids in the prior year, students who used opioids medicinally had a large increase in their relative risk of also engaging in non-medical opioid use (RRR 5.50, 95% CI 4.14 – 7.31 for experimental and RRR 6.52, 95% CI 4.91 – 8.66 for non-experimental NMPO use, relative to no past-year NMPO use). However, using opioids medicinally was not differentially associated with frequency of NMPO use (i.e. non-experimental versus experimental).

6.2.4 Protective Factors

Although stronger bonds to school and greater parental monitoring significantly lowered the odds of both experimental and non-experimental NMPO use in unadjusted analyses, once adjusted for other covariates, the protective effects were mixed. Relative to no past-year NMPO use, the probability of both experimental (RRR 0.66; 95% CI 0.48 – 0.91) and non-experimental (RRR 0.69; 95% CI 0.49 – 0.97) NMPO use was lower among students reporting average (compared to low) levels of school connectedness. Though a high degree of school connectedness protected against experimental NMPO use (relative to no NMPO use, RRR 0.46; 95% CI 0.28 – 0.75), the relative probability of non-experimental NMPO use rather than no NMPO use was not significantly different for students highly connected to their school compared to those with low school connectedness. Additionally, the degree of school connectedness did not differ between experimental and non-experimental NMPO users. Although a greater level of parental monitoring was significantly associated with lower odds of NMPO use in unadjusted analyses (all comparisons), this effect was lost once covariates were included.

6.2.5 Mental Health Factors

In unadjusted analyses, elevated scores on the depressive and anxiety scales were associated with experimental and non-experimental NMPO use (in reference to no NMPO use) in the prior year. Yet once we controlled for sociodemographic and protective factors, experimental and non-experimental NMPO use, relative to no NMPO use, were no longer significantly associated with elevated anxiety symptoms as measured by the SCARED scale. Relative to non-users of NMPOs, both experimental and non-experimental NMPO use were twice as likely among students with somewhat elevated depressive symptoms versus those with minimal scores on the CES-D (RRR 2.17 95% CI 1.41 – 3.34 for experimental, RRR 2.11, 95% CI 1.36 – 3.27 for non-experimental NMPO use). Although non-experimental NMPO use, relative to none, was more than two-and-half times as likely among students with very elevated depressive symptoms (RRR 2.68; 95% CI 1.26 – 5.71), there was no relative increase in probability of non-experimental NMPO use versus none among students with very elevated depressive symptoms (compared to those with minimal scores). There was no significant change in the relative risk of experimental versus non-experimental NMPO use with increasing risk of depression. Removing the anxiety variable from the otherwise fully adjusted models did not result in any significant changes in the relationships between depressive symptoms and NMPO use frequency.

Suicidal ideation and history of suicide attempts were associated with both experimental and non-experimental NMPO use (compared to no NMPO use) in unadjusted analyses. Once we controlled for the effects of sociodemographics, protective factors, and our two measures of mental health, a positive history of suicidal ideation in the past-year increased the relative risk of experimental NMPO use (versus no NMPO use, RRR 1.48; 95% CI 1.03 – 2.13 (separate model)); similarly, past-year suicide attempts increased the relative risk of experimental NMPO use nearly two-fold (versus no NMPO use, RRR 1.92; 95% CI 1.09 – 3.36). However, suicidality did not differentiate non-experimental NMPO users from experimental NMPO users and from students who did not use NMPOs.

The most robust correlate (i.e. having greatest effect) of both experimental and non-experimental NMPO use was the medical use of opioids, as evidenced by large t-statistics (11.80 and 13.01) when no NMPO use was the referent category (t-statistics not reported in table displaying results of multinomial regressions). However, the relative contribution of MPO use was

insignificant when examining non-experimental NMPO use in reference to experimental NMPO use.

6.3 Results for Objective II

To determine the substance use patterns by which NMPOs are used among high school students, and whether these patterns of use are associated with any specific psychosocial factors.

2.1 *Are NMPOs used alone or in conjunction with other substances? (Are there substance user subgroups among NMPO users?)*

Table 8 displays past-year substance use patterns among high-school students in Atlantic Canada who reported past-year NMPO use on the 2012 SDUSAP, with weighted prevalence estimates as a percentage of the total study sample (N = 6 786) and as percentage of NMPO users (N = 845). Placing additional substance use on a continuum of most to least socially acceptable (alternatively, in reverse, on a risk continuum from least to most problematic), four subgroups of NMPO users were evident. The first subgroup included exclusive NMPO users; this subgroup of students who denied the use of other substances accounted for 11.3% of all NMPO users. The second subgroup, accounting for 18.6% of all NMPO users, reported past-year use of alcohol but denied any past-year use of cannabis or other illicit drugs. Students who had used cannabis but denied use of other illicit drugs (regardless of alcohol use history) formed the third subgroup on the continuum, accounting for 31.4% of all NMPO users. Students whose past-year drug use repertoire had progressed to any of a number of illicit drugs (see Methods section for description of measure) comprised the largest subgroup, accounting for 38.8% of all NMPO users. Within the first subgroup, there was a nearly equal number of students reporting frequent (54 students) and infrequent NMPO use (52 students); in contrast, there were almost twice as many frequent (191 students) than infrequent NMPO users (104 students) in the subgroup reporting the most diversified substance use history (totals for subgroup 4).

2.2 *Do these subgroups of NMPO users differ on measures of mental health (depression, suicidality, and anxiety) and protective factors (school and family bonds)?*

To determine whether the four observed subgroups of NMPO users, as defined above, could be differentiated using measures of mental health and protective factors, unadjusted and adjusted multinomial regressions were performed (subsample N = 844); the results are displayed in Table 9 and described below. The subgroups were regressed on all psychosocial variables, using exclusive NMPO users (the NMPO-only subgroup) as the referent category. The following models were examined: NMPO-only versus NMPO + alcohol; NMPO-only versus NMPO + cannabis; and NMPO-only versus NMPO + illicit drugs. Given the high correlation between suicidal ideation and suicide attempts, separate adjusted regressions were modeled, as in Objective I; the below reported RRRs are from the regressions including suicide attempts, unless specified otherwise. Indeterminant categories created for variables with missing values (as displayed in Tables 3 through 6) were included in the analyses but not reported.

6.3.1 Sociodemographics

Among our sample of student NMPO users, substance use patterns were variably associated with province of residence and degree of urbanicity. After adjusting for covariates, residents of Nova Scotia (versus Newfoundland) were relatively less likely to use alcohol in addition to NMPOs (relative to NMPO-only subgroup, RRR 0.26; 95% CI 0.10 – 0.67). Residing in New Brunswick (versus Newfoundland) decreased the relative risk of past-year cannabis use in addition to NMPO use (relative to NMPO-only subgroup, RRR 0.37; 95% CI 0.15 – 0.99) and past-year other illicit drug use (relative to NMPO-only subgroup, RRR 0.37; 95% CI 0.14 – 0.94). Again controlling for covariates, the relative risk of using NMPOs in conjunction with illicit drugs was significantly lower among students living in strong (RRR 0.29; 95% CI 0.09 – 0.99) and moderate (RRR 0.37; 95% CI 0.15 – 0.92) MIZs, compared to students living in urban areas.

6.3.2 MPO use

Past-year medical use of opioids among NMPO users was not associated with subgrouping based on past-year substance use patterns.

6.3.3 Mental Health Factors

After adjusting for covariates, past-year suicidal ideation increased the relative likelihood of also using illicit drugs, versus exclusive NMPO use, by more than a three-fold relative risk (NMPO + all substances subgroup relative to the NMPO-only subgroup RRR 3.35; 95% CI 1.68 – 6.71). No significant relationships between past-year patterns of substance use among NMPO users and our measures of depression, past-year suicide attempts, and anxiety were evident in unadjusted or adjusted regression models. Removing the anxiety variable from the otherwise fully adjusted models did not result in any significant changes in the relationships between depressive symptoms and patterns of substance use among NMPO users.

6.3.4 Protective Factors

In general, a higher degree of parental monitoring was associated with a lower risk of other substance use among NMPO users, whereas degree of school connectedness was not related to past-year patterns of substance use among these students. Compared to NMPO-only users, NMPO users reporting greater parental monitoring were less likely to engage in the use of alcohol, cannabis, and other illicit drugs in unadjusted analyses, and this effect persisted after controlling for covariates; relative to students exclusively using NMPOs, students reporting high (versus low) levels of parental monitoring were significantly less likely to report past-year alcohol use (RRR 0.30; 95% CI 0.10 – 0.87), cannabis use (RRR 0.16; 95% CI 0.05 – 0.50), and other illicit drug use (RRR 0.03; 95% CI 0.01 – 0.11) in addition to past-year NMPO use. Among students reporting average (versus low) levels of parental monitoring, this effect persisted only for the additional use of illicit drugs (relative to NMPO-only users, the RRR was 0.18 for NMPO + illicit drug user subgroup; 95% CI 0.07 – 0.40); average (versus low) level of parental monitoring did not significantly alter the likelihood of past-year alcohol or cannabis use among NMPO users.

In our full regression models of NMPO user subgroups on psychosocial correlates, parental monitoring had the strongest effect, as evidenced by large t-statistics; the t-statistic ranged from 2.21

(NMPO + alcohol, relative to NMPO-only) to 5.69 (NMPO + illicit drugs, relative to NMPO-only)
(t-statistics not reported in table 7).

Table 3: Sociodemographic and Psychosocial Profile of Atlantic Canada High-School Students Reporting Past-Year NMPO Use (SDUSAP 2012): Weighted prevalence as row % (unweighted N)

| Past-Year NMPO Use | No Use | Experimental Use | Non-Experimental Use | Missing | Total |
|--------------------------------------|-----------------|------------------|----------------------|----------|--------------|
| SOCIODEMOGRAPHICS | | | | | |
| Sex | | | | | |
| Female | 86.5 (2,947) | 5.3 (186) | 7.7 (257) | 0.4 (19) | 3,409 |
| Male | 86.8 (2,818) | 5.1 (164) | 7.3 (221) | 0.9 (31) | 3,234 |
| Not specified | 84.6 (122) | 5.6 (7) | 7.1 (10) | 2.7 (4) | 143 |
| <i>Total N</i> | | | | | 6,786 |
| Grade Level | | | | | |
| 9 | 87.4 (1,890) | 4.6 (100) | 6.8 (136) | 1.2 (24) | 2,150 |
| 10 | 86.2 (2,070) | 5.8 (129) | 7.4 (191) | 0.6 (23) | 2,413 |
| 12 | 86.3 (1,927) | 5.2 (128) | 8.2 (161) | 0.2 (7) | 2,223 |
| <i>Total N</i> | | | | | 6,786 |
| Living Arrangements | | | | | |
| Both parents | 88.8 (3,840) | 4.7 (204) | 5.9 (251) | 0.6 (32) | 4,327 |
| One parent only | 83.1 (1,009) | 6.7 (68) | 9.3 (103) | 0.9 (10) | 1,190 |
| Parent & step-parent | 85.5 (692) | 5.3 (48) | 8.4 (71) | 0.7 (5) | 816 |
| Neither parent | 77.7 (301) | 6.1 (34) | 15.9 (54) | 0.3 (3) | 392 |
| Indeterminant | 45 | 3 | 9 | 4 | 61 |
| <i>Total</i> | | | | | 6,786 |
| Province of Residence | | | | | |
| Newfoundland | 88.1 (1,686) | 4.8 (100) | 6.4 (137) | 0.7 (19) | 1,942 |
| Nova Scotia | 85.5 (1,960) | 5.4 (123) | 8.6 (175) | 0.5 (12) | 1,960 |
| New Brunswick | 87.1 (2,241) | 5.3 (134) | 6.8 (176) | 0.9 (23) | 2,574 |
| <i>Total</i> | | | | | 6,786 |
| Urbanicity | | | | | |
| Urban | 87.4 (2,703) | 4.9 (146) | 7.2 (193) | 0.5 (18) | 3,060 |
| Strong MIZ | 86.0 (264) | 5.4 (13) | 8.0 (26) | 0.6 (2) | 305 |
| Moderate MIZ | 86.1 (1,124) | 5.3 (68) | 7.9 (95) | 0.8 (14) | 1,301 |
| Weak or no MIZ | 84.5 (1,690) | 5.8 (117) | 8.3 (166) | 1.3 (20) | 1,993 |
| Indeterminant | 106 | 13 | 8 | 0 | 127 |
| <i>Total</i> | | | | | 6,786 |
| Subjective Social Scale (SSS) | | | | | |
| Low | 82.7 (929) | 6.0 (66) | 10.8 (101) | 0.5 (4) | 1,100 |
| Middle | 87.7 (3,917) | 5.2 (236) | 6.6 (298) | 0.5 (23) | 4,474 |
| High | 86.5 (734) | 4.3 (33) | 8.5 (64) | 0.7 (7) | 838 |
| Indeterminant | 84.8 (307) | 5.0 (22) | 6.1 (25) | 4.1 (20) | 374 |

| | | | | | |
|--|-----------------|-------------------------|-----------------------------|----------------|--------------|
| <i>Total</i> | | | | | 6,786 |
| Medical Prescription Opioid Use | | | | | |
| No | 92.8 (4,918) | 3.0 (155) | 4.1 (198) | 0.1 (5) | 5,276 |
| Yes | 67.3 (965) | 12.8 (199) | 19.7 (288) | 0.2 (5) | 1,457 |
| Indeterminant | 4 | 3 | 2 | 44 | 53 |
| <i>Total</i> | | | | | 6,786 |
| SUBSTANCE USE | | | | | |
| Past-year alcohol use | | | | | |
| No | 94.6 (2,434) | 2.7 (70) | 2.2 (68) | 0.4 (11) | 2,583 |
| Yes | 81.5 (3,426) | 6.9 (285) | 11.0 (420) | 0.5 (28) | 4,159 |
| Indeterminant | 27 | 2 | 0 | 15 | 44 |
| <i>Total</i> | | | | | 6,786 |
| (CONTINUED) | No Use | Experimental Use | Non-Experimental Use | Missing | Total |
| Past-year cannabis use | | | | | |
| No | 93.1 (3,949) | 3.2 (146) | 3.3 (159) | 0.4 (20) | 4,274 |
| Yes | 77.5 (1,889) | 8.0 (206) | 14.0 (326) | 0.4 (13) | 2,434 |
| Indeterminant | 49 | 5 | 3 | 21 | 78 |
| <i>Total</i> | | | | | 6,786 |
| Past-year illicit drug use | | | | | |
| No | 90.7 (5,402) | 3.9 (253) | 5.0 (297) | 0.3 (25) | 5,977 |
| Yes | 59.7 (485) | 14.1 (104) | 25.1 (191) | 1.2 (10) | 790 |
| Indeterminant | 0 | 0 | 0 | 19 | 19 |
| <i>Total</i> | | | | | 6,786 |
| PSYCHOSOCIAL CORRELATES | | | | | |
| Parental monitoring | | | | | |
| Low | 74.7 (782) | 7.3 (84) | 17.2 (172) | 0.8 (8) | 1,046 |
| Average | 87.7 (3,752) | 5.3 (231) | 6.5 (262) | 0.5 (25) | 4,270 |
| High | 92.5 (1,295) | 3.5 (40) | 3.5 (52) | 0.4 (8) | 1,395 |
| Indeterminant | 58 | 2 | 2 | 13 | 75 |
| <i>Total</i> | | | | | 6,786 |
| School connectedness | | | | | |
| Low | 76.4 (933) | 9.2 (102) | 14.0 (154) | 0.4 (7) | 1,196 |
| Average | 87.7 (3,361) | 5.0 (199) | 6.7 (250) | 0.7 (26) | 3,836 |
| High | 92.2 (1,508) | 2.9 (54) | 4.5 (78) | 0.4 (7) | 1,647 |
| Indeterminant | 85 | 2 | 6 | 14 | 107 |
| <i>Total</i> | | | | | 6,786 |
| Anxiety (5-item SCARED) | | | | | |
| None to minimal | 88.2 (4,805) | 4.5 (255) | 6.9 (360) | 0.4 (20) | 5,440 |
| Elevated | 81.6 (871) | 7.4 (82) | 10.8 (113) | 0.1 (1) | 1,067 |
| Indeterminant | 77.0 (211) | 8.8 (20) | 4.9 (15) | 9.3 (33) | 279 |
| <i>Total</i> | | | | | 6,786 |

| | | | | | |
|--|-----------------|-----------|------------|--------------|--------------|
| Depressive Symptoms (12-item CES-D) | | | | | |
| Minimal | 91.3 (3,933) | 3.3 (156) | 5.1 (212) | 0.3 (15) | 4,316 |
| Somewhat elevated | 79.4 (1,336) | 8.8 (145) | 11.6 (184) | 0.2 (4) | 1,669 |
| Elevated | 72.6 (300) | 9.0 (35) | 18.1 (74) | 0.3 (1) | 410 |
| Indeterminant | 83.4 (318) | 5.8 (21) | 3.8 (18) | 7.0 (34) | 391 |
| <i>Total</i> | | | | | 6,786 |
| Suicidal ideation | | | | | |
| No | 90.3 (4,855) | 4.0 (228) | 5.4 (269) | 0.3 (22) | 5,374 |
| Yes | 73.8 (928) | 9.9 (119) | 15.8 (209) | 0.5 (5) | 1,261 |
| Indeterminant | 70.4 (104) | 5.8 (10) | 6.9 (10) | 16.8 (27) | 151 |
| <i>Total</i> | | | | | 6,786 |
| Suicide attempts | | | | | |
| No | 88.9 (5,392) | 4.4 (276) | 6.3 (367) | 0.3 (23) | 6,058 |
| Yes | 67.0 (400) | 13.3 (72) | 19.6 (113) | 0.1 (1) | 586 |
| Indeterminant | 72.9(95) | 3.9 (9) | 5.9 (8) | 17.2 (30) | 142 |
| <i>Total</i> | | | | | 6,786 |

Table 4: Sociodemographic and Psychosocial Profile of Atlantic Canada High-School Students Reporting Past-Year Alcohol Use (SDUSAP 2012): Weighted prevalence as row % (unweighted N)

| Past-Year Alcohol Use | No Use | Infrequent Use | Frequent Use | Missing | Total |
|--|-------------|----------------|--------------|----------|-------------|
| SOCIODEMOGRAPHICS | | | | | |
| Sex | | | | | |
| Female | 37.5 (1251) | 50.4 (1737) | 11.7 (402) | 0.5 (19) | 3409 |
| Male | 41.7 (1265) | 41.8 (1385) | 15.9 (561) | 0.6 (23) | 3234 |
| Not specified | 47.7 (67) | 33.9 (51) | 16.4 (23) | 2.0 (2) | 143 |
| <i>Total N</i> | | | | | 6786 |
| Grade Level | | | | | |
| 9 | 56.2 (1173) | 35.6 (794) | 7.5 (170) | 0.7 (13) | 2150 |
| 10 | 40.8 (932) | 46.1 (1136) | 12.6 (324) | 0.6 (21) | 2413 |
| 12 | 23.4 (478) | 55.3 (1243) | 20.8 (492) | 0.5 (10) | 2223 |
| Indeterminant | 0 | 0 | 0 | 0 | 0 |
| <i>Total N</i> | | | | | 6786 |
| Living Arrangements | | | | | |
| Both parents | 42.5 (1751) | 43.6 (1957) | 13.2 (590) | 0.7 (29) | 4327 |
| One parent only | 38.4 (424) | 47.7 (577) | 13.6 (184) | 0.3 (5) | 1190 |
| Parent & step-parent | 28.8 (251) | 54.9 (431) | 15.8 (131) | 0.6 (3) | 816 |
| Neither parent | 34.1 (132) | 49.6 (184) | 16.0 (73) | 0.2 (4) | 392 |
| Indeterminant | 25 | 24 | 8 | 4 | 61 |
| <i>Total</i> | | | | | 6786 |
| Province of Residence | | | | | |
| Newfoundland | 39.3 (707) | 43.6 (884) | 15.9 (330) | 1.2 (21) | 1942 |
| Nova Scotia | 39.5 (857) | 47.2 (1095) | 13.0 (309) | 0.3 (9) | 2270 |
| New Brunswick | 40.1 (1019) | 45.8 (1194) | 13.4 (347) | 0.6 (14) | 2574 |
| Indeterminant | 0 | 0 | 0 | 0 | 0 |
| <i>Total</i> | | | | | 6786 |
| Urbanicity | | | | | |
| Urban | 40.6 (1226) | 45.5 (1399) | 13.4 (420) | 0.5 (15) | 3060 |
| Strong MIZ | 39.8 (119) | 46.7 (149) | 12.3 (33) | 1.2 (4) | 305 |
| Moderate MIZ | 39.9 (482) | 46.9 (614) | 12.6 (193) | 0.7 (12) | 1301 |
| Weak or no MIZ | 37.2 (726) | 46.3 (939) | 15.7 (316) | 0.7 (12) | 1993 |
| Indeterminant | 30 | 72 | 24 | 1 | 127 |
| <i>Total</i> | | | | | 6786 |
| Subjective Social Scale (SSS) | | | | | |
| Low | 40.5 (433) | 45.6 (504) | 13.2 (155) | 0.6 (8) | 1100 |
| Middle | 39.0 (1680) | 46.6 (2128) | 14.0 (650) | 0.4 (16) | 4474 |
| High | 43.0 (341) | 43.8 (371) | 12.9 (121) | 0.3 (5) | 838 |
| Indeterminant | 37.5 (129) | 43.3 (170) | 15.5 (60) | 3.7 (15) | 374 |
| <i>Total</i> | | | | | 6786 |
| Medical Prescription Opioid Use | | | | | |
| No | 44.1 (2243) | 43.7 (2359) | 11.8 (647) | 0.4 (27) | 5276 |
| Yes | 24.5 (328) | 54.1 (796) | 20.9 (330) | 0.4 (3) | 1457 |
| Indeterminant | 12 | 18 | 9 | 14 | 53 |
| | | | | | 6786 |
| SUBSTANCE USE | | | | | |
| Past-year NMPO use | | | | | |
| No | 43.4 (2434) | 44.9 (2709) | 11.3 (717) | 0.4 (27) | 5887 |
| Yes | 15.4 (138) | 53.7 (444) | 30.6 (261) | 0.2 (2) | 845 |
| Indeterminant | 11 | 20 | 8 | 15 | 54 |
| <i>Total</i> | | | | | 6786 |

| | No Use | Infrequent Use | Frequent Use | Missing | Total |
|--|-------------|----------------|--------------|-----------|-------------|
| Past-year cannabis use | | | | | |
| No | 59.1 (2342) | 35.3 (1667) | 5.1 (243) | 0.5 (22) | 4274 |
| Yes | 9.9 (218) | 62.4 (1472) | 27.5 (737) | 0.1 (7) | 2434 |
| Indeterminant | 23 | 34 | 6 | 15 | 78 |
| <i>Total</i> | | | | | 6786 |
| Past-year illicit drug use | | | | | |
| No | 44.6 (2529) | 45.1 (2773) | 9.9 (646) | 0.5 (29) | 5977 |
| Yes | 6.5 (51) | 52.4 (397) | 40.9 (340) | 0.2 (2) | 790 |
| Indeterminant | 3 | 3 | 0 | 13 | 19 |
| <i>Total</i> | | | | | 6786 |
| PSYCHOSOCIAL CORRELATES | | | | | |
| Parental monitoring | | | | | |
| Low | 16.3 (176) | 54.7 (551) | 28.2 (311) | 0.7 (8) | 1046 |
| Average | 38.0 (1553) | 48.2 (2106) | 13.2 (588) | 0.5 (23) | 4270 |
| High | 61.9 (822) | 32.6 (488) | 5.1 (80) | 0.3 (5) | 1395 |
| Indeterminant | 32 | 28 | 7 | 8 | 75 |
| <i>Total</i> | | | | | 6785 |
| School connectedness | | | | | |
| Low | 38.5 (434) | 44.9 (549) | 16.4 (208) | 0.3 (5) | 1196 |
| Average | 38.6 (1408) | 47.0 (1849) | 13.7 (555) | 0.6 (24) | 3836 |
| High | 43.9 (702) | 43.4 (727) | 12.4 (213) | 0.3 (5) | 1647 |
| Indeterminant | 39 | 48 | 10 | 10 | 107 |
| <i>Total</i> | | | | | 6786 |
| Anxiety (5-item SCARED) | | | | | |
| None to minimal | 39.6 (2063) | 45.8 (2527) | 14.3 (826) | 0.4 (24) | 5440 |
| Elevated | 40.3 (416) | 48.0 (526) | 11.2 (123) | 0.5 (2) | 1067 |
| Indeterminant | 39.4 (104) | 39.7 (120) | 15.2 (37) | 5.8 (18) | 279 |
| <i>Total</i> | | | | | 6786 |
| Depressive Symptoms (12-item CES-D) | | | | | |
| Minimal | 42.9 (1783) | 43.9 (1928) | 12.7 (587) | 0.5 (18) | 4316 |
| Somewhat elevated | 33.5 (519) | 50.1 (862) | 16.2 (282) | 0.2 (6) | 1669 |
| Elevated | 34.3 (133) | 51.5 (211) | 14.2 (66) | 0 | 410 |
| Indeterminant | 38.7 (148) | 42.7 (172) | 14.2 (51) | 4.4 (20) | 391 |
| <i>Total</i> | | | | | 6786 |
| Suicidal ideation | | | | | |
| No | 41.7 (2159) | 45.0 (2459) | 12.8 (734) | 0.4 (22) | 5374 |
| Yes | 32.8 (380) | 49.7 (647) | 17.4 (231) | 0.1 (3) | 1261 |
| Indeterminant | 28.4 (44) | 44.6 (67) | 15.7 (21) | 11.3 (19) | 151 |
| <i>Total</i> | | | | | 6786 |
| Suicide attempts | | | | | |
| No | 40.9 (2375) | 45.4 (2810) | 13.4 (848) | 0.4 (25) | 6058 |
| Yes | 29.0 (164) | 52.5 (301) | 18.5 (120) | 0.0 (1) | 586 |
| Indeterminant | 34.8 (44) | 41.9 (62) | 12.4 (18) | 10.9 (18) | 142 |
| <i>Total</i> | | | | | 6786 |

Table 5: Sociodemographic and Psychosocial Profile of Atlantic Canada High-School Students Reporting Past-Year Cannabis Use (SDUSAP 2012): Weighted prevalence as row % (unweighted N)

| Past-Year Cannabis Use | No Use | Infrequent Use | Frequent Use | Missing | Total |
|--|---------------|-----------------------|---------------------|----------------|--------------|
| SOCIODEMOGRAPHICS | | | | | |
| Sex | | | | | |
| Female | 60.0 (2192) | 28.5 (885) | 10.4 (300) | 1.0 (32) | 3409 |
| Male | 60.0 (1997) | 23.2 (752) | 15.5 (444) | 1.3 (41) | 3234 |
| Not specified | 59.1 (85) | 21.9 (35) | 13.9 (18) | 5.1 (5) | 143 |
| <i>Total N</i> | | | | | 6786 |
| Grade Level | | | | | |
| 9 | 69.2 (1554) | 19.5 (402) | 9.5 (164) | 1.8 (30) | 2150 |
| 10 | 61.6 (1534) | 24.1 (576) | 12.9 (274) | 1.4 (29) | 2413 |
| 12 | 49.9 (1186) | 33.5 (694) | 16.0 (324) | 0.6 (19) | 2223 |
| Indeterminant | 0 | 0 | 0 | 0 | 0 |
| <i>Total N</i> | | | | | 6786 |
| Living Arrangements | | | | | |
| Both parents | 64.8 (2935) | 24.2 (982) | 10.0 (367) | 1.0 (43) | 4327 |
| One parent only | 56.8 (682) | 24.2 (304) | 16.9 (187) | 2.1 (17) | 1190 |
| Parent & step-parent | 48.7 (445) | 33.7 (248) | 16.5 (114) | 1.1 (9) | 816 |
| Neither parent | 42.9 (177) | 34.3 (127) | 22.0 (84) | 0.7 (4) | 392 |
| Indeterminant | 35 | 11 | 10 | 5 | 61 |
| <i>Total</i> | | | | | 6786 |
| Province of Residence | | | | | |
| Newfoundland | 60.9 (1244) | 26.5 (487) | 11.6 (189) | 1.0 (22) | 1942 |
| Nova Scotia | 55.9 (1276) | 28.5 (652) | 14.3 (318) | 1.3 (24) | 2270 |
| New Brunswick | 64.5 (1754) | 22.2 (533) | 11.9 (255) | 1.4 (32) | 2574 |
| Indeterminant | 0 | 0 | 0 | 0 | 0 |
| <i>Total</i> | | | | | 6786 |
| Urbanicity | | | | | |
| Urban | 59.1 (1876) | 26.2 (764) | 13.7 (390) | 1.0 (30) | 3060 |
| Strong MIZ | 64.5 (198) | 24.8 (77) | 9.1 (25) | 1.6 (5) | 305 |
| Moderate MIZ | 62.8 (881) | 21.9 (260) | 13.3 (138) | 2.0 (22) | 1301 |
| Weak or no MIZ | 61.1 (1243) | 26.7 (531) | 10.7 (200) | 1.5 (19) | 1993 |
| Indeterminant | 76 | 40 | 9 | 2 | 127 |
| <i>Total</i> | | | | | 6786 |
| Subjective Social Scale (SSS) | | | | | |
| Low | 53.9 (642) | 26.5 (282) | 18.4 (164) | 1.2 (12) | 1100 |
| Middle | 60.5 (2834) | 26.2 (1121) | 12.2 (476) | 1.1 (43) | 4474 |
| High | 66.6 (578) | 23.8 (181) | 8.9 (73) | 0.7 (6) | 838 |
| Indeterminant | 57.6 (220) | 24.1 (88) | 14.0 (49) | 4.4 (17) | 374 |
| <i>Total</i> | | | | | 6786 |
| Medical Prescription Opioid Use | | | | | |
| No | 63.4 (3495) | 23.6 (1212) | 12.0 (524) | 1.1 (45) | 5276 |
| Yes | 48.7 (759) | 34.0 (451) | 16.4 (234) | 0.9 (13) | 1457 |
| Indeterminant | 20 | 9 | 4 | 20 | 53 |
| | | | | | 6786 |
| SUBSTANCE USE | | | | | |
| Past-year NMPO use | | | | | |
| No | 64.5 (3949) | 24.8 (1378) | 9.8 (511) | 0.9 (49) | 5887 |
| Yes | 30.9 (305) | 33.5 (288) | 33.8 (244) | 1.9 (8) | 845 |
| Indeterminant | 20 | 6 | 7 | 21 | 54 |
| <i>Total</i> | | | | | 6786 |

| | No Use | Infrequent Use | Frequent Use | Missing | Total |
|--|-------------|----------------|--------------|-----------|-------------|
| Past-year alcohol use | | | | | |
| No | 89.4 (2342) | 7.8 (179) | 1.9 (39) | 0.9 (23) | 2583 |
| Yes | 40.5 (1910) | 38.1 (1490) | 20.3 (719) | 1.1 (40) | 4159 |
| Indeterminant | 22 | 3 | 4 | 15 | 44 |
| <i>Total</i> | | | | | 6786 |
| Past-year illicit drug use | | | | | |
| No | 67.5 (4194) | 25.3 (1404) | 6.3 (326) | 0.9 (53) | 5977 |
| Yes | 9.0 (79) | 30.5 (268) | 58.9 (436) | 1.6 (7) | 790 |
| Indeterminant | 1 | 0 | 0 | 18 | 19 |
| <i>Total</i> | | | | | 6786 |
| PSYCHOSOCIAL CORRELATES | | | | | |
| Parental monitoring | | | | | |
| Low | 33.8 (391) | 30.9 (340) | 33.2 (297) | 2.0 (18) | 1046 |
| Average | 58.8 (2665) | 29.1 (1156) | 11.1 (412) | 1.0 (37) | 4270 |
| High | 83.8 (1175) | 12.4 (164) | 2.8 (42) | 0.9 (14) | 1395 |
| Indeterminant | 43 | 12 | 11 | 9 | 75 |
| <i>Total</i> | | | | | 6786 |
| School connectedness | | | | | |
| Low | 53.6 (680) | 22.0 (277) | 22.5 (223) | 1.9 (16) | 1196 |
| Average | 58.9 (2355) | 28.6 (1042) | 11.6 (405) | 0.9 (34) | 3836 |
| High | 68.7 (1178) | 21.9 (333) | 8.4 (120) | 1.0 (16) | 1647 |
| Indeterminant | 61 | 20 | 14 | 12 | 107 |
| <i>Total</i> | | | | | 6786 |
| Anxiety (5-item SCARED) | | | | | |
| None to minimal | 60.0 (3436) | 25.8 (1332) | 13.2 (625) | 1.0 (47) | 5440 |
| Elevated | 60.0 (668) | 28.5 (289) | 11.3 (103) | 0.4 (7) | 1067 |
| Indeterminant | 62.0 (170) | 15.3 (51) | 14.1 (34) | 8.6 (24) | 279 |
| <i>Total</i> | | | | | 6786 |
| Depressive Symptoms (12-item CES-D) | | | | | |
| Minimal | 64.2 (2892) | 23.2 (950) | 11.6 (437) | 1.0 (37) | 4316 |
| Somewhat elevated | 52.0 (915) | 32.1 (516) | 14.7 (223) | 1.1 (15) | 1669 |
| Elevated | 48.1 (215) | 32.7 (132) | 19.0 (62) | 0.1 (1) | 410 |
| Indeterminant | 63.1 (252) | 19.0 (74) | 11.7 (40) | 0.6 (25) | 391 |
| <i>Total</i> | | | | | 6786 |
| Suicidal ideation | | | | | |
| No | 64.1 (3601) | 24.2 (1224) | 10.7 (503) | 0.9 (46) | 5373 |
| Yes | 44.1 (589) | 33.3 (419) | 21.6 (243) | 1.1 (10) | 1261 |
| Indeterminant | 57.3 (84) | 16.5 (29) | 11.1 (16) | 15.1 (22) | 151 |
| <i>Total</i> | | | | | 6786 |
| Suicide attempts | | | | | |
| No | 62.5 (3957) | 24.9 (1430) | 11.7 (624) | 0.9 (47) | 6058 |
| Yes | 34.8 (241) | 38.1 (216) | 24.6 (119) | 2.5 (10) | 586 |
| Indeterminant | 59.7 (76) | 14.7 (26) | 12.6 (19) | 12.9 (21) | 142 |
| <i>Total</i> | | | | | 6786 |

Table 6: Sociodemographic and Psychosocial Profile of Atlantic Canada High-School Students Reporting Past-Year Illicit Drug Use (SDUSAP 2012): Weighted prevalence as row % (unweighted N)

| Past-Year Illicit Drug Use | No Use | Infrequent Use | Frequent Use | Missing | Total |
|--|-------------|----------------|--------------|----------|-------------|
| SOCIODEMOGRAPHICS | | | | | |
| Sex | | | | | |
| Female | 87.5 (3045) | 6.5 (205) | 5.8 (152) | 0.2 (7) | 3409 |
| Male | 86.9 (2811) | 6.0 (208) | 6.8 (204) | 0.3 (11) | 3234 |
| Not specified | 84.3 (121) | 8.2 (12) | 7.3 (9) | 0.2 (1) | 143 |
| <i>Total N</i> | | | | | 6786 |
| Grade Level | | | | | |
| 9 | 89.7 (1939) | 5.9 (120) | 3.9 (82) | 0.5 (9) | 2150 |
| 10 | 87.4 (2139) | 6.3 (144) | 6.1 (123) | 0.2 (7) | 2413 |
| 12 | 84.6 (1899) | 6.7 (161) | 8.6 (160) | 0.1 (3) | 2223 |
| Indeterminant | 0 | 0 | 0 | 0 | 0 |
| <i>Total N</i> | | | | | 6786 |
| Living Arrangements | | | | | |
| Both parents | 90.9 (3941) | 4.7 (207) | 4.2 (169) | 0.2 (10) | 4327 |
| One parent only | 82.8 (1008) | 9.1 (98) | 7.9 (82) | 0.2 (2) | 1190 |
| Parent & step-parent | 79.9 (678) | 9.3 (77) | 10.4 (58) | 0.5 (3) | 816 |
| Neither parent | 78.1 (301) | 8.4 (40) | 13.3 (50) | 0.1 (1) | 392 |
| Indeterminant | 49 | 3 | 6 | 3 | 61 |
| <i>Total</i> | | | | | 6786 |
| Province of Residence | | | | | |
| Newfoundland | 87.1 (1713) | 6.1 (122) | 6.5 (99) | 0.3 (8) | 1942 |
| Nova Scotia | 86.7 (1978) | 6.5 (157) | 6.7 (132) | 0.1 (3) | 2270 |
| New Brunswick | 87.8 (2286) | 6.1 (146) | 5.7 (134) | 0.4 (8) | 2574 |
| Indeterminant | 0 | 0 | 0 | 0 | 0 |
| <i>Total</i> | | | | | 6786 |
| Urbanicity | | | | | |
| Urban | 87.2 (2699) | 6.2 (189) | 6.5 (166) | 0.1 (6) | 3060 |
| Strong MIZ | 88.3 (270) | 6.9 (19) | 4.5 (15) | 0.2 (1) | 305 |
| Moderate MIZ | 88.7 (1166) | 5.8 (75) | 5.2 (54) | 0.3 (6) | 1301 |
| Weak or no MIZ | 85.6 (1719) | 7.1 (140) | 6.8 (128) | 0.5 (6) | 1993 |
| Indeterminant | 123 | 2 | 2 | 0 | 127 |
| <i>Total</i> | | | | | 6786 |
| Subjective Social Scale (SSS) | | | | | |
| Low | 79.5 (920) | 67.6 (84) | 13.2 (92) | 0.5 (4) | 1100 |
| Middle | 88.9 (3992) | 63.0 (277) | 4.8 (202) | 0.0 (3) | 4474 |
| High | 90.1 (751) | 4.9 (41) | 5.0 (45) | 0.1 (1) | 838 |
| Indeterminant | 82.7 (314) | 8.1 (23) | 6.6 (26) | 2.5 (11) | 374 |
| <i>Total</i> | | | | | 6786 |
| Medical Prescription Opioid Use | | | | | |
| No | 89.6 (4782) | 5.5 (281) | 4.8 (212) | 0.0 (1) | 5276 |
| Yes | 79.7 (1168) | 8.8 (141) | 11.5 (148) | (0) | 1457 |
| Indeterminant | 27 | 3 | 5 | 18 | 53 |
| | | | | | 6786 |
| SUBSTANCE USE | | | | | |
| Past-year NMPO use | | | | | |
| No | 91.3 (5402) | 52.8 (306) | 3.4 (179) | 0 | 5887 |
| Yes | 61.2 (550) | 13.1 (116) | 25.7 (179) | 0 | 845 |
| Indeterminant | 25 | 3 | 7 | 19 | 54 |
| <i>Total</i> | | | | | 6786 |

| | No Use | Infrequent Use | Frequent Use | Missing | Total |
|--|-------------|----------------|--------------|-----------|-------------|
| Past-year alcohol use | | | | | |
| No | 97.9 (2529) | 1.4 (34) | 0.7 (17) | 0.1 (3) | 2583 |
| Yes | 80.3 (3419) | 9.6 (389) | 10.1 (348) | 0.1 (3) | 4159 |
| Indeterminant | 29 | 2 | 0 | 13 | 44 |
| <i>Total</i> | | | | | 6786 |
| Past-year cannabis drug use | | | | | |
| No | 98.1 (4194) | 1.4 (52) | 0.5 (27) | 0.0 (1) | 4274 |
| Yes | 71.0 (1730) | 14.1 (372) | 15.0 (332) | (0) | 2434 |
| Indeterminant | 53 | 1 | 6 | 18 | 78 |
| <i>Total</i> | | | | | 6786 |
| PSYCHOSOCIAL CORRELATES | | | | | |
| Parental monitoring | | | | | |
| Low | 67.3 (726) | 14.2 (150) | 18.2 (167) | 0.2 (3) | 1046 |
| Average | 89.2 (3848) | 5.8 (244) | 4.8 (170) | 0.2 (8) | 4270 |
| High | 96.5 (1347) | 1.7 (26) | 1.6 (20) | 0.2 (2) | 1395 |
| Indeterminant | 56 | 5 | 8 | 6 | 75 |
| <i>Total</i> | | | | | 6786 |
| School connectedness | | | | | |
| Low | 77.9 (962) | 7.3 (101) | 14.7 (131) | 0.1 (2) | 1196 |
| Average | 88.1 (3389) | 6.9 (258) | 4.8 (184) | 0.2 (5) | 3836 |
| High | 93.5 (1543) | 3.8 (59) | 2.6 (42) | 0.2 (3) | 1647 |
| Indeterminant | 83 | 7 | 8 | 9 | 107 |
| <i>Total</i> | | | | | 6786 |
| Anxiety (5-item SCARED) | | | | | |
| None to minimal | 87.8 (4820) | 6.3 (335) | 5.9 (284) | 0 (1) | 5440 |
| Elevated | 85.2 (924) | 6.5 (77) | 8.2 (66) | 0 | 1067 |
| Indeterminant | 82.7 (233) | 5.1 (13) | 6.6 (15) | 5.7 (18) | 279 |
| <i>Total</i> | | | | | 6786 |
| Depressive Symptoms (12-item CES-D) | | | | | |
| Minimal | 90.5 (3912) | 4.8 (209) | 4.7 (195) | 0 | 4316 |
| Somewhat elevated | 83.0 (1411) | 9.3 (151) | 7.7 (107) | 0 | 1669 |
| Elevated | 73.8 (321) | 8.5 (42) | 17.7 (47) | 0 | 410 |
| Indeterminant | 84.2 (333) | 6.4 (23) | 5.0 (16) | 4.3 (19) | 391 |
| <i>Total</i> | | | | | |
| Suicidal ideation | | | | | |
| No | 90.8 (4903) | 5.0 (267) | 4.1 (201) | 0.0 (3) | 5374 |
| Yes | 73.8 (954) | 11.4 (148) | 14.8 (159) | 0 | 1261 |
| Indeterminant | 78.2 (120) | 4.5 (10) | 6.4 (5) | 10.8 (16) | 151 |
| <i>Total</i> | | | | | 6786 |
| Suicide attempts | | | | | |
| No | 89.2 (5444) | 5.8 (345) | 5.0 (267) | 0.0 (2) | 6058 |
| Yes | 68.4 (424) | 12.1 (71) | 19.5 (91) | 0 | 586 |
| Indeterminant | 78.5 (109) | 3.9 (9) | 6.9 (7) | 10.8 (17) | 142 |
| <i>Total</i> | | | | | 6786 |

Table 7: Multinomial Logistic Regression of Frequency of Past-Year NMPO Use on Psychosocial Correlates among High-School Students in Atlantic Canada (2012 SDUSAP) – Relative Risk Ratios (95% Confidence Intervals in parentheses) (n = 6731)

| | Unadjusted Relative Risk Ratio (95% CI) | | | Adjusted Relative Risk Ratio (95% CI) | | |
|---------------------------------------|---|--------------------------------|--|---------------------------------------|--------------------------------|--|
| | Experimental Use vs No Use | Non-Experimental Use vs No Use | Non-Experimental Use vs Experimental Use | Experimental Use vs No Use | Non-Experimental Use vs No Use | Non-Experimental Use vs Experimental Use |
| Province | | | | | | |
| NFLD / Labrador | ref | | | ref | | |
| Nova Scotia | 1.16 (0.80 – 1.69) | 1.38 (0.94 – 2.03) | 1.19 (0.70 – 2.02) | 1.19 (0.82 – 1.71) | 1.46 (0.93 – 2.29) | 1.23 (0.71 – 2.14) |
| New Brunswick | 1.12 (0.80 – 1.56) | 1.06 (0.77 – 1.47) | 0.95 (0.61 – 1.48) | 1.18 (0.85 – 1.65) | 1.11 (0.76 – 1.64) | 0.94 (0.58 – 1.52) |
| Sex | | | | | | |
| female | ref | | | ref | | |
| male | 0.94 (0.74 – 1.20) | 0.94 (0.66 – 1.33) | 1.00 (0.66 – 1.50) | 1.41* (1.06 – 1.88) | 1.43 (0.95 – 2.13) | 1.01 (0.65 – 1.57) |
| Grade | | | | | | |
| 9 | ref | | | ref | | |
| 10 | 1.27 (0.90 – 1.79) | 1.11 (0.81 – 1.50) | 0.87 (0.55 – 1.37) | .99 (0.68 – 1.45) | 0.75 (0.54 – 1.06) | 0.76 (0.48 – 1.20) |
| 12 | 1.14 (0.78 – 1.67) | 1.23 (0.83 – 1.82) | 1.08 (0.62 – 1.88) | 0.65 (0.42 – 1.00) | 0.52** (0.34 – 0.80) | 0.80 (0.45 – 1.43) |
| Urbanicity | | | | | | |
| Urban | ref | | | ref | | |
| Strong MIZ | 1.11 (0.44 – 2.84) | 1.13 (0.69 – 1.83) | 1.01 (0.33 – 3.11) | 1.11 (0.39 – 3.18) | 1.18 (0.66 – 2.11) | 1.06 (0.37 – 3.05) |
| Moderate MIZ | 1.08 (0.66 – 1.77) | 1.11 (0.71 – 1.73) | 1.02 (0.49 – 2.14) | 1.19 (0.75 – 1.89) | 1.21 (0.78 – 1.88) | 1.02 (0.50 – 2.08) |
| Weak or No MIZ | 1.22 (0.91 – 1.64) | 1.19 (0.88 – 1.62) | 0.98 (0.65 – 1.47) | 1.28 (0.94 – 1.76) | 1.22 (0.84 – 1.77) | 0.95 (0.61 – 1.47) |
| Living Arrangements | | | | | | |
| Both Parents | ref | | | ref | | |
| One Parent Only | 1.53* (1.08 – 2.18) | 1.69** (1.21 – 2.37) | 1.10 (0.69 – 1.78) | 1.10 (0.77 – 1.57) | 1.33 (0.91 – 1.93) | 1.21 (0.75 – 1.96) |
| Parent + Step-Parent | 1.19 (0.80 – 1.77) | 1.49 (0.9 – 2.24) | 1.25 (0.71 – 2.21) | 0.80 (0.52 – 1.25) | 0.84 (0.52 – 1.35) | 1.04 (0.57 – 1.91) |
| Neither Parent | 1.50 (0.91 – 2.49) | 3.09*** (2.10 – 4.55) | 2.05* (1.14 – 3.71) | 1.10 (0.62 – 1.95) | 1.95** (1.20 – 3.17) | 1.78 (0.98 – 3.23) |
| Subjective Social Status (SSS) | | | | | | |
| Low SSS | ref | | | ref | | |
| Middle SSS | 0.82 (0.56 – 1.20) | 0.58** (0.43 – 0.79) | 0.70 (0.41 – 1.20) | 1.20 (0.77 – 1.86) | 1.09 (0.77 – 1.54) | 0.91 (0.53 – 1.57) |
| High SSS | 0.69 (0.39 – 1.23) | 0.76 (0.49 – 1.16) | 1.09 (0.56 – 2.09) | 1.23 (0.63 – 2.40) | 1.56 (0.95 – 2.56) | 1.27 (0.65 – 2.50) |
| Past-Year Alcohol Use | | | | | | |
| No Use | ref | | | ref | | |
| Infrequent Use | 2.47*** (1.70 – 3.60) | 4.42*** (3.03 – 6.45) | 1.79* (1.10 – 2.90) | 1.64* (1.03 – 2.60) | 2.51*** (1.66 – 3.80) | 1.54 (0.89 – 2.67) |

| | | | | | | |
|--|---------------------------|----------------------------|-------------------------|--------------------------|--------------------------|------------------------|
| Frequent Use | 4.93*** (3.23 – 7.51) | 10.80*** (7.39 – 15.79) | 2.19** (1.29 – 3.72) | 2.14** (1.26 – 3.66) | 3.38*** (1.98 – 5.79) | 1.57 (0.80 – 3.12) |
| Past-Year Cannabis Use | | | | | | |
| No Use | ref | | | ref | | |
| Infrequent Use | 2.49*** (1.86 – 3.33) | 3.12*** (2.20 – 4.43) | 1.25 (0.79 – 1.99) | 1.46* (1.03 – 2.06) | 1.54* (1.02 – 2.31) | 1.05 (0.64 – 1.74) |
| Frequent Use | 4.47*** (3.01 – 6.63) | 9.71*** (7.13 – 13.22) | 2.17** (1.29 – 3.66) | 1.61 (0.95 – 2.73) | 2.66*** (1.77 – 3.98) | 1.65 (0.87 – 3.13) |
| Past-Year Illicit Drug Use | | | | | | |
| No Use | ref | | | ref | | |
| Infrequent Use | 3.95*** (2.60 – 5.99) | 3.50*** (2.46 – 5.00) | 0.89 (0.51 – 1.54) | 2.29*** (1.45 – 3.60) | 1.28 (0.86 – 1.92) | 0.56* (0.32 – 0.97) |
| Frequent Use | 7.75*** (4.80 – 12.50) | 14.17*** (10.20 – 19.7) | 1.83* (1.10 – 3.05) | 3.91*** (2.23 – 6.85) | 4.34*** (2.72 – 6.92) | 1.10 (0.60 – 2.05) |
| Past-Year MPO Use | | | | | | |
| No | ref | | | ref | | |
| Yes | 5.86*** (4.53 – 7.58) | 6.67*** (5.03 – 8.86) | 1.14 (0.81 – 1.60) | 5.50*** (4.14 – 7.31) | 6.52*** (4.91 – 8.66) | 1.18 (0.85 – 1.66) |
| School Connectedness | | | | | | |
| Low | ref | | | ref | | |
| Average | 0.47*** (0.35 – 0.64) | 0.42*** (0.32 – 0.55) | 0.88 (0.61 – 1.27) | 0.66* (0.48 – 0.91) | 0.69* (0.49 – 0.97) | 1.04 (0.67 – 1.60) |
| High | 0.26*** (0.17 – 0.40) | 0.26*** (0.18 – 0.39) | 1.02 (0.58 – 1.80) | 0.46** (0.28 – 0.75) | 0.59 (0.33 – 1.03) | 1.27 (0.64 – 2.78) |
| Parental Monitoring | | | | | | |
| Low | ref | | | ref | | |
| Average | 0.61** (0.44 – 0.86) | 0.32*** (0.23 – 0.45) | 0.53** (0.33 – 0.85) | 1.23 (0.83 – 1.81) | 0.75 (0.51 – 1.11) | 0.61 (0.37 – 1.01) |
| High | 0.38*** (0.24 – 0.62) | 0.17*** (0.11 – 0.25) | 0.43* (0.22 – 0.83) | 1.37 (0.78 – 2.40) | 0.70 (0.43 – 1.14) | 0.51 (0.25 – 1.04) |
| Depressive Symptoms (12-item CES-D) | | | | | | |
| Minimal | ref | | | ref | | |
| Somewhat Elevated | 3.04*** (2.21 – 4.20) | 2.64*** (1.81 – 3.86) | 0.87 (0.54 – 0.45) | 2.17*** (1.41 – 3.34) | 2.11*** (1.36 – 3.27) | 0.97 (0.58 – 1.63) |
| Very Elevated | 3.41*** (2.12 – 5.48) | 4.50*** (2.71 – 7.47) | 1.32 (0.70 – 2.50) | 1.78 (0.78 – 4.05) | 2.68* (1.26 – 5.71) | 1.51 (0.66 – 3.45) |
| Anxiety Symptoms (5-item SCARED) | | | | | | |
| None to Minimal | ref | | | ref | | |
| Elevated | 1.76*** (1.29 – 2.41) | 1.69** (1.25 – 2.30) | 0.96 (0.62 – 1.50) | 0.97 (0.61 – 1.55) | 0.91 (0.59 – 1.38) | 0.93 (0.57 – 1.53) |
| Past-Year Suicide Attempts | | | | | | |
| No | ref | | | ref | | |
| Yes | 3.98*** (2.62 – 6.04) | 4.10*** (2.81 – 5.97) | 1.03 (0.65 – 1.64) | 1.92* (1.09 – 3.36) | 1.37 (0.85 – 2.22) | 0.72 (0.41 – 1.24) |
| Past-Year Suicidal Ideation[‡] | | | | | | |
| No | ref | | | ref | | |
| Yes | 3.03*** (2.30 – 3.99) | 3.58*** (2.60 – 4.94) | 1.18 (0.79 – 1.77) | 1.48* (1.03 – 2.13) | 1.43 (0.99 – 2.06) | 0.97 (0.62 – 1.52) |

*p<0.05; **p<0.01; ***p<0.001

[‡]A separate multinomial logistic regression model was performed to obtain RRRs for past-year suicidal ideation given the high correlation of this variable with past-year suicide attempts; this model included the same covariates.

Table 8: Past-Year Substance Use Patterns of High-School NMPO Users (2012 SDUSAP)

| Subgroup | Alcohol | Cannabis | Other Illicit Drugs | # infrequent NMPO users | # frequent NMPO users | Total # of NMPO users | Weighted prevalence of NMPO use with other substances, as percentage of total sample | Weighted Prevalence of NMPO use with other substances, as percentage of NMPO users |
|------------|---------|----------|---------------------|-------------------------|-----------------------|-----------------------|--|--|
| Subgroup 1 | - | - | - | 52 | 54 | 106 | 1.43 | 11.27 |
| Subgroup 2 | + | - | - | 91 | 96 | 187 | 2.35 | 18.53 |
| Subgroup 3 | - | + | - | 14 | 9 | 23 | 0.36 | 2.85 |
| Subgroup 4 | - | - | + | 3 | 2 | 5 | 0.06 | 0.46 |
| Subgroup 3 | + | + | - | 96 | 138 | 234 | 3.63 | 28.55 |
| Subgroup 4 | + | - | + | 5 | 10 | 15 | 0.31 | 2.47 |
| Subgroup 4 | - | + | + | 3 | 3 | 6 | 0.14 | 1.09 |
| Subgroup 4 | + | + | + | 93 | 176 | 269 | 4.42 | 34.78 |
| | totals | | | 357 | 488 | 845 | 12.70 | 100 |

Legend: “-” = no use or indeterminant; “+” = any past-year use

Table 9: Multinomial Logistic Regression of NMPO User Subgroups on Psychosocial Correlates among High-School Students in Atlantic Canada (2012 SDUSAP) – Relative Risk Ratios (95% Confidence Intervals in parentheses) (n = 844)

| | Unadjusted Relative Risk Ratio (95% CI) | | | Adjusted Relative Risk Ratio (95% CI) | | |
|---------------------------------|---|------------------------------|-----------------------------------|---------------------------------------|------------------------------|-----------------------------------|
| | NMPO + Alcohol vs only NMPO | NMPO + Cannabis vs only NMPO | NMPO + Illicit Drugs vs only NMPO | NMPO + Alcohol vs only NMPO | NMPO + Cannabis vs only NMPO | NMPO + Illicit Drugs vs only NMPO |
| Province | | | | | | |
| NFLD / Labrador | ref | | | ref | | |
| Nova Scotia | 0.27** (0.10 – 0.72) | 0.71 (0.30 – 1.69) | 0.47 (0.20 – 1.13) | 0.26** (0.10 – 0.67) | 0.73 (0.30 – 1.73) | 0.43 (0.17 – 1.07) |
| New Brunswick | 0.43* (0.19 – 0.99) | 0.33** (0.14 – 0.75) | 0.35* (0.15 – 0.80) | 0.49 (0.19 – 1.22) | 0.37* (0.15 – 0.90) | 0.37* (0.14 – 0.94) |
| Sex | | | | | | |
| female | ref | | | ref | | |
| male | 1.45 (0.69 – 3.06) | 1.06 (0.53 – 2.13) | 1.80 (0.90 – 3.60) | 1.26 (0.55 – 2.89) | 0.75 (0.34 – 1.62) | 1.09 (0.49 – 2.42) |
| Grade | | | | | | |
| 9 | ref | | | ref | | |
| 10 | 1.17 (0.53 – 2.59) | 1.28 (0.61 – 2.70) | 1.35 (0.65 – 1.81) | 1.18 (0.51 – 2.70) | 1.38 (0.63 – 3.03) | 1.62 (0.70 – 3.74) |
| 12 | 1.11 (0.43 – 2.85) | 2.35* (1.02 – 5.45) | 2.23 (0.94 – 5.27) | 0.99 (0.35 – 2.78) | 2.51 (0.91 – 6.93) | 2.60 (0.93 – 7.28) |
| Urbanicity | | | | | | |
| Urban | ref | | | ref | | |
| Strong MIZ | 0.45 (0.11 – 1.85) | 0.28 (0.06 – 1.29) | 0.25 (0.61 – 1.06) | 0.47 (0.13 – 1.76) | 0.40 (0.11 – 1.42) | 0.29* (0.09 – 0.99) |
| Moderate MIZ | 0.84 (0.39 – 1.83) | 0.75 (0.36 – 1.56) | 0.58 (0.24 – 1.41) | 0.65 (0.33 – 1.28) | 0.75 (0.38 – 1.51) | 0.37* (0.15 – 0.92) |
| Weak or No MIZ | 1.32 (0.61 – 2.83) | 0.88 (0.44 – 1.75) | 0.88 (0.44 – 1.75) | 0.98 (0.44 – 2.18) | 0.75 (0.36 – 1.54) | 0.51 (0.24 – 1.10) |
| Subjective Social Status | | | | | | |
| Low | ref | | | ref | | |
| Middle | 1.27 (0.53 – 3.02) | 1.06 (0.50 – 2.26) | 0.52 (0.26 – 1.04) | 1.33 (0.56 – 3.11) | 1.06 (0.50 – 2.23) | 0.62 (0.30 – 1.29) |
| High | 0.82 (0.19 – 3.54) | 1.13 (0.45 – 3.65) | 0.53 (0.15 – 1.79) | 0.79 (0.14 – 4.45) | 1.01 (0.20 – 5.19) | 0.53 (0.09 – 2.92) |
| Past-Year MPO Use | | | | | | |
| No | ref | | | ref | | |
| Yes | 1.30 (0.67 – 2.54) | 1.69 (0.87 – 3.30) | 0.82 (0.40 – 1.67) | 1.39 (0.67 – 2.89) | 1.71 (0.83 – 3.52) | 0.93 (0.43 – 1.99) |
| School Connectedness | | | | | | |
| Low | ref | | | ref | | |
| Average | 0.97 (0.47 – 2.02) | 0.95 (0.48 – 1.88) | 0.56 (0.26 – 1.22) | 0.97 (0.49 – 1.92) | 1.00 (0.54 – 1.85) | 0.65 (0.33 – 1.30) |
| High | 1.39 (0.48 – 4.00) | 1.27 (0.49 – 3.27) | 0.39 (0.14 – 1.12) | 1.75 (0.50 – 6.08) | 1.82 (0.55 – 6.04) | 0.73 (0.20 – 2.72) |

| Parental Monitoring | | | | | | |
|--|------------------------|-------------------------|--------------------------|------------------------|-------------------------|--------------------------|
| Low | ref | | | ref | | |
| Average | 0.97 (0.42 – 2.21) | 0.80 (0.36 – 1.75) | 0.22*** (0.11 – 0.46) | 0.91 (0.37 – 2.24) | 0.57 (0.25 – 1.30) | 0.18*** (0.07 – 0.40) |
| High | 0.31* (0.10 – 0.91) | 0.19** (0.06 – 0.56) | 0.03*** (0.01 – 0.10) | 0.30* (0.10 – 0.87) | 0.16** (0.05 – 0.50) | 0.03*** (0.01 – 0.11) |
| Depressive Symptoms (12-item CES-D) | | | | | | |
| Minimal | ref | | | ref | | |
| Somewhat Elevated | 0.99 (0.49 – 2.00) | 0.90 (0.48 – 1.83) | 0.94 (0.45 – 1.96) | 1.33 (0.63 – 2.81) | 0.87 (0.41 – 1.86) | 0.84 (0.35 – 2.04) |
| Very Elevated | 1.37 (0.40 – 4.68) | 1.84 (0.65 – 5.19) | 2.35 (0.82 – 6.73) | 2.35 (0.59 – 9.30) | 2.23 (0.60 – 8.32) | 2.09 (0.50 – 8.73) |
| Anxiety Symptoms (5-item SCARED) | | | | | | |
| None to Minimal | ref | | | ref | | |
| Elevated | 0.76 (0.35 – 1.69) | 0.60 (0.29 – 1.23) | 0.52 (0.23 – 1.10) | 0.72 (0.32 – 1.64) | 0.48 (0.21 – 1.07) | 0.43 (0.17 – 1.05) |
| Past-Year Suicide Attempts | | | | | | |
| No | ref | | | ref | | |
| Yes | 0.75 (0.28 – 1.97) | 1.81 (0.78 – 4.21) | 2.24 (0.98 – 5.13) | 0.55 (0.19 – 1.56) | 1.68 (0.61 – 4.67) | 2.07 (0.77 – 5.60) |
| Past-Year Suicidal Ideation[¥] | | | | | | |
| No | ref | | | ref | | |
| Yes | 0.89 (0.41 – 1.95) | 1.29 (0.67 – 2.49) | 2.71** (1.39 – 5.27) | 0.70 (0.31 – 1.56) | 1.46 (0.66 – 3.22) | 3.35*** (1.68 – 6.71) |

*p≤0.05; **p≤0.01; ***p≤0.001

¥A separate multinomial logistic regression model was used to obtain RRRs for past-year suicidal ideation given the high correlation of this variable with past-year suicide attempts; this model included the same covariates.

Note: NMPO-only users are referent category.

Chapter 7: Discussion

7.1 Discussion of Results

The over-arching goal of this project was to characterize high-school student NMPO users, and determine how their use patterns associate with certain psychosocial factors. As outlined above (see Chapter 3 – Summary of Research Limitations) and as recently pointed out by others (e.g. Nargiso et al. (2015)), a major limitation has been the lack of research into patterns of non-medical prescription drug use among adolescents. The results of this project help fill this important gap by examining the relationships between patterns of NMPO use and specific risk and protective factors among a representative sample of high-school students in Atlantic Canada. This study contributes to the literature with five major findings:

- 1 Generally, basic descriptive comparisons show that NMPO users resemble illicit drug users and frequent cannabis users in their burden of mental health problems and association with protective factors.
- 2 For the most part, the psychosocial measures did not differentially associate with experimental versus non-experimental NMPO use, i.e. experimental and non-experimental NMPO users appear to carry the same mental health burden, share similar social protective factors, and are similarly likely to engage in other substance use.
- 3 About one third of students who reported medical use of opioids also engaged in misuse; medical use of prescription opioids was the factor most robustly associated with both experimental and non-experimental NMPO use in our fully adjusted models.
- 4 Despite heterogeneity in patterns of NMPO use with and without other substances, the overall mental health burden was similarly experienced, i.e. the use of other substances did not alter the risk of depression or anxiety among adolescents engaging in NMPO use.
- 5 This study substantiates and clarifies the relationships between NMPO use and protective factors with two findings:

- a) an inverse relationship between any NMPO use (compared to none) and school connectedness,
- and
- b) a strong inverse relationship between greater parental monitoring and additional substance use among NMPO users.

These key findings, as well as their implications, are further discussed below.

7.1.1 Description of NMPO Users

The first objective of this project was to describe high-school student NMPO users in relation to users of other substances. The prevalence of NMPO use and that of other substances in this sample of Atlantic Canada students was consistent with other North American reports (51,53–55,64,65). Overall, the profile of students who misused prescription opioids resembled that of students whose substance use crossed socially-normative boundaries – i.e. progressed beyond alcohol and occasional cannabis use to heavier, frequent cannabis use and the use of other illicit drugs (154). The descriptive characterization supports the posit that these youth are not a new and unique group of adolescent substance users; rather, prescription opioids appear better characterized as simply an addition to the dynamic repertoire of ‘hard’ substances used by adolescents that share common social and emotional correlates (28). Notable exceptions are that NMPO use is more prevalent overall, and - unlike frequent cannabis use and other illicit drug use, which appears relatively more prevalent among socially disadvantaged youth (155,156) - NMPO use appears more evenly distributed across socioeconomic strata. The finding of NMPO use extending across social classes is in contrast to other Canadian results, which suggest a greater likelihood of NMPO use among students of lower socioeconomic status (14,15). Yet this lack of social status boundaries provides indirect support for several lines of thought regarding how NMPO use is perceived among mainstream youth. First, others have suggested that the increase in prescribing correlates to the availability of prescription drugs, and the greater availability of a substance has been suggested to result in not only easier access but also increased social acceptability (11,157,158). A report from the Partnership for Drug-Free Kids in the United States notes that adolescents report prescription

opioids are easier to obtain than any other illicit substance except cannabis (159). Arguably, the misuse of prescription opioids is easier to conceal from authoritative figures than the use of other illicit substances. In addition, long-term studies of student drug use through surveys such as the MTF (55) have shown that the use prevalence of any individual substance reflects, at least in part, its perceived risk profile; as such, NMPOs being pharmaceuticals—rather than clandestinely manufactured illicit drugs—likely contributes to their lower societal stigma and lower perceived risk than that associated with the use of other illicit drugs (55,60,158).

7.1.2 Correlates of Infrequent and Frequent NMPO Use

I next looked to determine if differences exist between high-school students who engage in infrequent versus frequent NMPO use. The second major finding of this study was that adolescents who engaged in any prescription opioid misuse, regardless of how frequently, shared several individual and interpersonal factors. Experimental and non-experimental NMPO users carried the same mental health burden, appeared similarly affected by social protective factors, and were similarly likely to engage in other substance use. The only exception was that students who infrequently used other illicit drugs were more likely to be experimental NMPO users, whereas frequent illicit drug use was not associated with non-experimental, relative to experimental, NMPO use. This suggests that those who are infrequent illicit drug users also engage in NMPO use only experimentally, adding further support to concluding that NMPO users are similar to other illicit drug users.

Although experimental and non-experimental NMPO users did not significantly differ from each other on our psychosocial measures, they did differ from NMPO abstainers in several respects, and the results of this study contribute to the literature in several ways. In contrast to other Canadian reports (14,15), there were no significant associations between NMPO use and subjective socioeconomic status or urbanicity of residence. Although some reports point to greater prevalence of any NMPO use among female adolescents (13,62,105), other data suggest equal prevalence (54,65). I found males to be more likely to report *experimental* NMPO use, but there were no sex differences in the prevalence of *non-experimental* NMPO use. Using the same dichotomization for frequency, Pulver et al. (14) similarly noted that sex did not predict frequent NMPO use (i.e. three or

more instances in the past year) among Canadian grade 9 and 10 students. The results of this study may indicate that male adolescents are more likely to experiment with NMPOs than females. Alternatively, it is plausible that females are quicker to progress to more frequent use. Taken together, the above variability in sociodemographic associations across studies underlines the importance of understanding regional differences in the creation of prevention efforts.

The results support earlier findings of an association between NMPO use and depression among adolescents (as described in Chapter 2: Background). Compared to abstainers, experimental NMPO users were more likely to report somewhat elevated depressive symptoms, and non-experimental NMPO users were additionally more likely to report very elevated depressive symptoms. Although this suggests a gradient relationship, there was no significant difference in burden of depressive symptoms among non-experimental, relative to experimental, NMPO users. Considering the above discussion regarding greater social acceptability and lower perceived risks of NMPO use, it is possible that adolescents who are even slightly troubled by low mood or struggling to tolerate such negative emotional states may reach for opioid drugs in an attempt to relieve pain – a motive for NMPO use suggested by others (160). In this regard, the lack of association between very elevated depressive symptoms and experimental NMPO use, relative to NMPO abstainers, could be the result of highly depressed students either abstaining from NMPO use or quickly increasing the frequency of their use of NMPOs (resulting in the observed association between very elevated depressive symptoms and more frequent, non-experimental NMPO use). Alternatively, it is plausible that NMPO use is a *risk factor* for later development of depression, and the reason why we didn't observe a significant difference in extent of depressive symptomatology between non-experimental and experimental NMPO users is related to time, i.e. the increase in severity of depressive symptoms with greater NMPO use develops over time with more chronic use. In this regard, longitudinal studies would be better poised to untangle the observed relationships.

Contrary to my initial suspicion that I would find a positive, independent association between anxiety symptoms and NMPO use, none was observed. Though anxiety was moderately associated with NMPO use frequency in bivariate analyses, virtually no relationship to NMPO use was evident after adjustment for other covariates. A couple of considerations are required in interpreting this finding. First, anxiety is a challenging, heterogeneous construct, ranging from adaptive and developmentally-appropriate fear, to maladaptive but transient distress, to persistent

and pathological anxiety that impairs function (152,130). The measure of anxiety used in the SDUSAP, the 5-item SCARED scale, originates from a 38-item scale developed for, and validated in, *clinical* populations of children and adolescents (143); the 5 items are based on subscales directly related to DSM anxiety disorder symptom dimensions (as described in section 5.3.4 Explanatory Variables - Psychosocial Measures). Although Hale et al. (144) reported good psychometric properties of the full SCARED scale from a large sample of adolescents from the general Dutch population, I have not found literature specifically supporting the validity of the 5-item SCARED scale in a general student adolescent sample. Taken together, it is possible that the threshold for elevated symptoms on the 5-item SCARED scale is too high to detect anxious distress in a *general* sample of adolescents. The findings, then, only speak to a lack of association between these clinical disorders and NMPO use, and do not exclude the possibility that certain anxiety syndromes may relate to NMPO use among adolescents.

Second, although the validity of a scale is often tested in isolation, there is significant comorbidity and symptom overlap between anxiety and depressive phenomenology (152,161). Anxiety is not only often comorbid with depression (one-quarter to one-half of adolescents with depression have a comorbid anxiety disorder, and 10-15% of adolescents with an anxiety disorder have comorbid depression (162)), but the accompanying symptoms often overlap (e.g. restlessness, difficulty with focus, decrease in energy, and disturbance in sleep). When the relationships between depressive symptoms and the outcome variables (whether NMPO use frequency or patterns of substance use in conjunction with NMPOs) were examined with and without adjusting for anxiety in the multinomial regressions, the associations between depressive symptoms and patterns of NMPO use remained unchanged. Although collinearity between the anxiety and depression measures was not considerable, the CES-D scale is known to capture not only symptoms of depression, but also generalized anxiety and panic (163) (e.g. CES-D items such as “I had trouble keeping my mind on what I was doing”, and “My sleep was restless” may reflect depressive symptoms, anxiety, or anxious distress accompanying depression). Additionally, although post-traumatic stress disorder and acute stress disorder are no longer under the umbrella of anxiety disorders in the DSM-V, negative changes in cognitions and mood, and heightened arousal and anxiety are prominent features (152) that may be captured by the CES-D items. In this regard, others have suggested that anxiety and depression in childhood and adolescence are manifestations of negative affectivity, i.e. best conceptualized as a single construct representing internalization of emotional distress (161).

Taking these considerations together, the associations between the measure for depression and NMPO use found in this study may be best summarized as a reflection of a strong positive relationship between NMPO use and tendency to internalize emotional distress.

The findings also contribute to the limited literature exploring the relationships between NMPO use and suicidality among high-school students. Fischer et al. (15) point to a relationship between suicidal ideation and NMPO use among high-school female students in Ontario. In this sample, this relationship persisted even among experimental users. In addition, such experimental use was also positively associated with a history of suicide *attempts*. This supports recent findings among student youth in China, also showing a positive association between suicide attempts and prescription opioid misuse (164,165). Despite the multitude of social, cultural, and environmental differences between youth in China and Canada—and subsequent limitations in generalizing results from regional studies—this work points to the persistence of the relationship across countries.

The relationship between history of suicide attempts and NMPO use is certainly multifactorial, but two explanations can be speculated. First, it is plausible that the reported suicide attempts were with an opioid drug, and these students were not misusing opioids for recreational purposes; this is supported by literature demonstrating that opioids are the most commonly used substance in intentional overdoses in North America (e.g.(8,61,90,166)). It is also possible that, given the ability of opioids to modulate emotions (63,83), students struggling with suicidality are experimenting with opioids to numb their psychological distress (97), and their overdose is in part unintentional. Regardless, the association between even occasional misuse of prescription opioids (i.e. one or two instances) and suicidality is an important consideration for intervention planning, and particularly important for physicians prescribing opioids to adolescents.

7.1.3 Medical and Non-Medical Prescription Opioid Use

Approximately one third of Atlantic Canada high-school students who reported using an opioid as prescribed also indicated the use of opioids non-medically. This means that one of five students with a prescription for opioids misused an opioid three or more times, and one out of eight misused an opioid once or twice, over the prior year. Having a prescription for opioids was the factor most strongly correlated with opioid misuse in our regression models. Although others have

pointed to other substance use as the strongest correlate of NMPO use (e.g. (73)), these results suggest that having a legitimate prescription for opioids is at least as robust a correlate. After adjusting for sociodemographic factors, mental health problems, and social protective factors, students who used opioids medically were five times more likely to misuse opioids at least once or twice, and over six times more likely to misuse opioids more often, over the prior year. Taken together, the results build on earlier research that showed significantly elevated risk of opioid misuse among adolescent medical opioid users in the United States and Canada (17,96,97). Based on the finding from this study, however, it appears that despite these earlier contributions to the literature, prevention efforts have not been sufficiently strengthened to result in significant change.

The increased risk of misuse among adolescent medical opioid users points to two proximal targets for prevention efforts: patients and physicians. Research exploring diversion and motives for misuse has revealed that most students source prescription opioids from an old prescription (97), their home (17,159), and some directly from their parents (96), suggesting a need for increased education of all medical opioid users regarding the potential risks and harms associated with misuse. Arguably, there is evidence to suggest that some students may misuse with the intent of self-medication rather than to get high (69,97). As such, the motivations underlying parental permission to misuse may be well-intentioned (e.g. parents sharing their prescription in an effort to relieve their child's pain (96)). However, using opioids in any other way than prescribed may increase the misperception that these potentially dangerous drugs are 'safe'. This study further supports previous research suggesting that regardless of underlying motive, students who misuse opioids are more likely to engage in other substance use (67), and carry an increased mental health burden (95,105). As already reviewed (see Chapter 2: Background), prescription opioid misuse – regardless of motive – is associated with a multitude of individual and social harms, including unintentional overdose (2,16,21,92).

The risks associated with misuse of opioids need to be clearly communicated by the prescriber. Adolescence is a time of increasing independence, and many become responsible for managing their own medication. It is important that appropriate prescribing of opioids not be thwarted by efforts to decrease misuse, as under-treatment of pain may tempt adolescents to self-medicate; in this regard, appropriate management of pain, which may include judicious prescribing of opioids, may contribute to future reductions in NMPO use (97). Since over one-third of NMPO

use is sourced from an adolescent's own left-over prescription (79,167), physicians need to carefully consider alternate forms of pain control, arrange frequent follow-up appointments for monitoring of pain management, actively discourage all patients from sharing their medications, and more carefully consider the potency and quantity of prescribed opioids and number of refills (168). However, counseling on disposal of unused medicines is absent from Canadian practice guidelines on opioid prescribing (85), suggesting this may not be a common consideration. Similarly, the evidence base for recommendations on pain management for patients with substance use disorders is limited (169). The fact that youth with mental health problems who are seeking treatment for a pain condition have been found more likely to receive a prescription for opioids (84) further underlines the importance of screening for psychiatric comorbidity and carefully considering benefits and risks of treatment with opioids. We must strike a better balance between avoiding stigmatization of prescription opioids among prescribers and patients, and concurrently deter risk of prescription opioid misuse.

On a governing level, prescriber practices can be targeted through education, regulation, and limits on drug funding (80). Placing limits on which formulations are covered by provincial plans can decrease availability (80). Another approach is prescription drug surveillance, including prescription monitoring programs (PMPs); the latter have been shown to result in positive changes in prescribing practices (80,170,171). Currently, PMPs are in place in seven Canadian provinces, including Nova Scotia and Newfoundland & Labrador, and New Brunswick is in the process of PMP development (171). Although Canadian physician regulatory bodies have developed programs to educate physicians about safe prescribing practices, recent evidence suggests that *voluntary* completion of coursework aimed to improve opioid prescribing does not result in significant change (reviewed in (93)). In contrast, it appears that disciplinary action and mandatory programs can mitigate inappropriate prescribing (reviewed in (93)). The fact that recently, the Canadian College of Family Physicians rejected the call by the Federation of Medical Regulatory Authorities of Canada for mandatory education on safe opioid prescribing, shifting the responsibility to instate such mandatory training to the provincial medical regulatory bodies (172), raises questions about who is responsible for ensuring that physicians are aware of their role in Canada's prescription drug problem. Though recommendations in this regard are beyond the scope of this work, it is clear that improvements and further evaluation of the above strategies are needed.

7.1.4 Correlates of NMPO User Subgroups

The second objective of this project was to determine the substance use patterns by which NMPOs are used, and whether these patterns of use differentially associate with mental health or protective social factors. Consistent with the mounting evidence (reviewed by Young et al. (2012) and Nargiso et al. (2015)), I found that alcohol, cannabis, and other illicit drug use were robust correlates of NMPO use. *Most* NMPO users engaged in use of other substances. Three subgroups of past-year NMPO users who reported use of other substances emerged: NMPO and alcohol users, NMPO and cannabis users (with or without additional use of alcohol), and NMPO users who also used other illicit drugs (with or without additional use of alcohol or cannabis). However, it is noteworthy that a substantial proportion of NMPO users – more than one in ten – reported *exclusive* NMPO use (denied past-year use of alcohol, cannabis, and other illicit drugs). This surprising finding supports recent work by Austic et al. (2015) who found a greater proportion of high-school students initiating NMPO use at the same time or before their initial use of alcohol, cannabis, and other illicit drugs, suggesting that some adolescents initiate into substance use with opioids. A ‘reverse gateway’ hypothesis - where the traditional progression of substance use is reversed - has previously been proposed for cannabis preceding tobacco smoking (173), and may be what we are observing for misuse of prescription opioids. As suggested over two decades ago (157), initiation into, and progression of, substance use is influenced by availability, perception of risk, legal frameworks, and social approval of specific substances, rather than actual harm. Thus, given accessibility and misperception of safety, the misuse of prescription opioids may now be more common at an earlier stage of an adolescent’s ‘drug use’ trajectory. The results of this study further support these ideas with the seemingly anomalous finding of a relative decrease in risk of non-experimental NMPO use with increasing grade level.

The fourth chief finding of this work is that, for the most part, NMPO users shared similar characteristics despite heterogeneity in patterns of additional substance use. In particular, elevated depressive or anxiety symptoms did not correlate to a greater likelihood of any particular substance use repertoire. With the exception of past-year suicidal ideation among NMPO-illicit drug users, the subgroups of NMPO users were grossly similar in their relationships to mental health outcomes. This is somewhat surprising, particularly given mounting evidence that membership in subgroups

based on greater range of substance use correlates with higher risk of mental health problems (174). For example, high-school students furthest along the substance use continuum have been shown to suffer the greatest burden of depressive symptoms (175). However, in most of these studies, engaging in prescription drug misuse is combined with general illicit drug use into a 'greatest range' or highest risk subgroup (174). This report is, to the best of my knowledge, the first to show that, among high-school NMPO users, subgroup membership based on additional substance use patterns does not correlate with anxiety or depressive symptom burden.

Interestingly, a provincial difference in patterns of additional substance use among NMPO users was observed, and some variation related to degree of urbanicity. The provincial differences seen are most likely a reflection of differences in cultural, social, and educational factors that influence local drug sub-cultures, and access and attitudes towards prescription misuse relative to other drug use. The consumption of alcohol has historically been higher in Newfoundland compared to other Canadian regions (176), and in a recent report on provincial alcohol prevention and harm reduction policies, Newfoundland ranked among the bottom provinces (177). Although our descriptive comparisons of past-year alcohol use among students do not show distinctly higher prevalence rates in Newfoundland, the above may give to greater acceptability of use among youth, potentially contributing to the observed decrease in risk of additionally using alcohol among NMPO users in Nova Scotia (one of the highest ranking provinces for alcohol policy (177)) relative to Newfoundland. Similarly, effects of access, culture, and law enforcement are likely to account for the differences observed for students in New Brunswick. These observations again underline the importance of monitoring local trends in substance use in development of prevention programming.

Among rural students reporting NMPO use, greater proximity to an urban centre decreased the relative risk of also engaging in other illicit drug use. Although no association between degree of urbanicity and experimental or non-experimental NMPO use was observed, there was a greater likelihood of exclusive use of NMPOs (i.e. lower likelihood of NMPO use in conjunction with other illicit drugs, relative to exclusive NMPO use) in moderate and strong MIZs (i.e. rural areas with the two highest degrees of urban influence). In this regard, my work indirectly supports that of Pulver et al. (14), who found NMPO use most commonly reported by students living in strong MIZs. Although in their review of the role of rurality in substance use among adolescents, the recent report by the Canadian Centre on Substance Abuse described urban and rural Canadian high-school

students as generally equally likely to engage in use of cannabis, other illicit drugs, and prescription drug misuse (178), their analysis was methodologically constrained to a dichotomous urban vs rural classification based on Canada Post Forward Sortation Area codes. This study, with that of Pulver et al. (14), helps shed more light on the nuances of geographic influence.

7.1.5 Associations between NMPO Use Patterns and Protective Factors

Several lines of research demonstrate the importance of protective social factors, such as school connectedness and parental monitoring, in decreasing health risk behaviours and promoting mental health of students (e.g. (147,150,179–183)). This study supports and expands on earlier work by clarifying the presence of inverse relationships between NMPO use patterns and these protective factors. In examining factors associated with *frequency* of NMPO use, bivariate analyses suggested an inverse relationship with both school connectedness and parental monitoring; however, although the correlation with school connectedness persisted, the effect of parental monitoring became insignificant once other covariates were considered. In contrast, *among NMPO users*, the buffering effects of school connectedness were lost, and parental monitoring had the most robust effect in the fully adjusted models.

Underlying differences in how these factors are purported to exert their effects may explain the findings. The concept of school connectedness as a protective factor in health behaviour is rooted in social control (also termed social bond) theory, which purports that a stake in conformity – and hence an investment in conventional pastimes, such as extracurricular involvement – would be jeopardized by behaviour that deviates from the norm, such as marginal substance use (as proposed by Hirschi, 1969; reviewed in (73)). As previously discussed, school connectedness is now a well-established protective factor against a variety of health risk behaviours (e.g. (147,179–183)), including use of substances that are considered socially normative among high-school students, such as alcohol and cannabis (184,185). This project helps refine the understanding of school connectedness in that, among the sample of high-school adolescents, even an average level of school connectedness was strongly inversely correlated with both experimental and non-experimental NMPO use. However, neither average nor high levels of school connectedness differentiated experimental from non-experimental NMPO users. Taken together, these findings substantiate

those of Ford (73) and Currie et al. (13), but also suggest that once a student engages in opioid misuse, their connection to school does not appear to curb their use.

The finding that student NMPO users reporting a high degree of school connectedness, compared to low, were *not* less likely to engage in *additional* substance use (i.e. no significant correlations between school connectedness and the different NMPO user subgroups based on additional substances used were evident) may indicate social connectedness within substance-using crowds, rather than connection to pro-social groups and teachers. In this regard, the construct has been suggested to comprise of two domains: one reflecting perceived support from authoritative figures at school, the other reflecting social, including peer, connection (186). Arguably, in asking about how safe, happy, and close to other people a student feels at school, the SDUSAP items blend both domains, but are somewhat more reflective of students' social connection. Thus, one can speculate that once a student chooses to identify with a higher-risk (or more deviant) crowd and endorses use of prescription opioids, the particular choice of additional substance use is irrelevant.

A large body of literature demonstrates that bonds to parents promote healthy behaviours and deter health risk behaviours, including substance use (150). In research, family bonding has generally been operationalized into two dimensions: one, a measure of the child's sense of emotional closeness to parents and perceived parental support; and two, a measure of perceived parental monitoring, reflective of parental knowledge of the child's activities (150). It is the latter dimension that is captured by the SDUSAP measure, and has been shown to be one of the strongest deterrents of adolescent delinquency (150). In adolescence, parental awareness of their child's activities is achieved through a combination of direct monitoring and the child's disclosure, i.e. both the adolescent and parent are active agents (150). The adolescent values the closeness and does not want to behave in a way that could harm the relationship (73). In this regard, the Partnership for Drug-Free Kids in the United States has highlighted that one fifth of adolescents believe their parents would care less if they misused prescription medication than illicit drugs, and one sixth of parents believe that misusing prescription drugs for recreational purposes is safer than using illicit drugs (159). One can further speculate that prescription opioids are more attractive in that their use is easier to conceal than the more discoverable use of alcohol, cannabis, and other illicit drugs. Taken together, these considerations may account for the observed relative decrease in risk of any

additional substance use among NMPO users reporting greater parental monitoring, as use of these drugs appears relatively less likely to result in family conflict.

7.2 Study Limitations

A few limitations need to be considered in applying the findings of this study. Given data were cross-sectional, we cannot infer temporal sequence and hence cannot infer causation between NMPO use and the examined correlates. Non-response bias may be present, given the characteristics of students absent or refusing to participate in the survey are unknown. The results apply only to adolescents enrolled in the public school system, and thus do not represent Aboriginal youth on reserves, youth who are in private schools, have dropped out, are heavily street-involved, or are in day-treatment programs, hospitals, or other institutional settings. This sample is representative of high-school students in Nova Scotia, New Brunswick, Newfoundland & Labrador; generalizing to other populations, both within and outside of Canada, is limited by regional socioeconomic and cultural factors. The data rely on self-report, which introduces response bias and thus threatens the validity of our findings. In particular, social desirability bias (i.e. bias resulting from the desire to conform to societal pressures) needs to be considered, as drug use may be over-reported by students who consider it ‘cool’. Conversely, it is possible that under-reporting occurred, given the sensitive nature of the topic. Strategies employed to mitigate response bias in the 2012 SDUSAP include confidentiality measures (e.g. students were seated in an exam-like arrangement, and asked to seal their envelopes before giving them to the research staff) and the inclusion of a fictitious substance use item (those responding affirmatively were excluded). Despite the above, anonymous self-report surveys in school settings have good validity and reliability, and are frequently used in the literature (187).

Important limitations of the mental health measures are noted in the Discussion section above. In addition, the CES-D scale does not incorporate an item on irritability, a common symptom of depression in adolescents (113,141). The CES-D and SCARED scales do not *diagnose* psychiatric disorders, but rather screen for the risk of depressive and anxiety disorders. Similarly, we cannot differentiate between depressive symptoms resulting from a depressive versus a bipolar illness (113). Although the CES-D measures depressive symptoms over the past 7 days and the 5-item SCARED measures anxiety symptoms over the past month, these scales have been shown to

have acceptable validity and reliability for the purpose of gauging risk of mental health problems and resultant psychosocial impairment (141,144). Nonetheless, anxiety that is comorbid with depression may present as episodic, whereas an independent anxiety disorder would present independently of the co-occurrence of depression; additionally challenging is that transient anxiety may be developmentally appropriate and complicate the differentiation of pathological from normal anxiety (130).

Subgrouping of NMPO users was based solely on clustering of additional substance use examined through cross-tabulations. The use of other statistical approaches, such as latent class analysis (which would include other variables in the prediction of subgroup membership), may have yielded different subgroups. In addition, given the measures, I was limited to examining patterns of past-year use and unable to distinguish adolescents who engage in simultaneous use (i.e. co-ingestion of NMPOs with other substances). I was unable to control for some researched correlates of NMPO use, such as race (66), as they were not measured by the SDUSAP.

It is likely that a proportion of the NMPO users studied engaged in other prescription drug misuse, given the elevated prevalence of overlap described by others (11,13,66). Other NMPDU, such as misuse of sedatives / tranquilizers and stimulants, was not assessed in this study; NMPDU was not controlled for in the regressions of frequency of NMPO use, and was not assessed in the determination of patterns of other substance use among NMPO users. As misuse of stimulants or sedatives / tranquilizers may also be a risk factor for NMPO use, confounding may be present, particularly with respect to the magnitude of the observed associations. However, as the basic drivers of NMPO use (particularly low perceived risk of harm and high availability), correlations with other substance use, and protective effects of pro-social and pro-family factors appear similar across other types of NMPDU (e.g., as reviewed by Nargiso et al. (11)), it is very unlikely that the direction of associations found in this study would be altered by adjusting for other NMPDU.

Although any misuse of prescription opioid medicine can be considered problematic, the measure of NMPO use is explored only in the domain of frequency, limiting the interpretation of the results. First, there is no information pertaining to the specific type or dosage of opioid used. Adolescents misusing more potent formulations of opioids are arguably at greater risk of harm related to their use (e.g. accidental overdose). Misuse of higher versus lower potency opioids may be differentially associated with our psychosocial outcome measures, regardless of frequency of use.

Similarly, opioid potency may be a factor in the formation of specific substance user subgroups; e.g. those choosing ‘riskier’, higher potency opioids also engaging in other ‘hard’ illicit drug use, compared to those generally limited to use of alcohol and cannabis experimenting with lower-potency opioids only. In this regard, there is also no information on the misuse of low-potency opioids that are available over-the-counter in Canada, e.g. codeine found in Tylenol #1 (this formulation includes 8mg of codeine, as well as acetaminophen and caffeine). Construct validity of the NMPO measure may be threatened by the terminology used, as adolescents may not know they are misusing a ‘pain relief pill’ and the examples of prescription opioids provided may not be common among adolescents in certain regions. The NMPO use measure does not differentiate on motive for misuse – i.e. self-treatment versus recreation - and there may be differences in substance use patterns and psychosocial outcomes among those who use to self-medicate and those who use recreationally (66,69,110,127). There was no information on route of administration, which affects onset of drug action; related to motivation for use, there may be meaningful differences in association with our outcome measures between those who use opioids orally versus via other methods (e.g. snorting).

7.3 Study Strengths

This project has several methodological and conceptual strengths. First, it uniquely addresses how *patterns* of NMPO use relate to mental health, particularly depression, suicidality, and anxiety, refining earlier findings. It is impossible to address all possible heterogeneity within the NMPO user group; this project contributes to the characterization and typology of NMPO users by addressing frequency of use and patterns of additional substance use, from the perspective that unsanctioned use (whether used recreationally or for self-treatment, at low or high potency) carries significant risk of dependence, overdose, and other opioid-related harms. As discussed, this study extends our understanding of the role of *modifiable* factors in NMPO use, including connections to school and family, and prescribed, medical opioid use. Including a broad range of factors previously demonstrated to correlate with NMPO use and statistically controlling for these variables boosts confidence in the uniqueness and strength of associations found. Furthermore, this study benefits from a high response rate to the SDUSAP (89.9% of students present on day of survey, and 77.2% of all students enrolled as of day of survey) and correspondingly a large sample size. The complex

survey design ensures the sample is representative of Atlantic Canada students. Non-response bias is reduced by the weighting strategy. In addition, the CES-D scale and the 5-item version of the SCARED scale are validated screening instruments (141–143), the parental monitoring and school connectedness measures are adapted from validated scales with good internal consistency previously demonstrated in the target population (16,147,148), and the items used to assess substance use are consistent across other provincial surveys. These features contribute to the generalisability of the results, and contribute to the limited Canadian literature on the topic.

7.4 Future Directions

This work raises several questions that can be addressed through further research to deepen our understanding of the factors that shape NMPO use among mainstream youth. First, a qualitative research approach would shed more light on adolescents' perspectives and attitudes towards prescription drug misuse, deepening our understanding of individual and contextual factors related to NMPO use (e.g. eliciting perceived risk of misuse, peer attitudes, route of administration, most common compounds, and their motivations for misuse). A qualitative study of *parents'* perspectives on medication misuse would help elucidate our findings regarding the role of parental monitoring, and would provide valuable information for targeted, multi-modal prevention planning. Information from qualitative work with adolescents could also improve the construct validity of items regarding NMPO use on cross-sectional school-based drug surveys, which in comparison are a more feasible means of obtaining information on greater number of related variables and a larger sample size. Future studies could examine whether potency and frequency of medical opioid use is associated with patterns of opioid misuse. A longitudinal study design examining some of the emerging correlates would allow for observation of temporal sequence, and thus lend to inferring causality; for example, from a preventive lens, it is particularly relevant to explore the associations between NMPO use, and mental health correlates, i.e. depression and suicidality.

The research raises important questions about the effectiveness of current prevention and intervention practices aimed at curbing pharmaceutical drug misuse generally, and adolescent NMPO use in particular. This work suggests a need to increase awareness among parents of the popularity of medication misuse and the associated harms. This could be achieved through general public health campaigns, or through communication at the school community level, e.g. during

parent-teacher meetings. Similarly, there has been a call for tighter regulation of opioids at the healthcare level, and particularly with respect to physician prescribing practices. It may be helpful to examine physician knowledge of NMPO use among adolescents, particularly across medical disciplines (e.g. family physicians versus surgical specialties versus oncology). Given the complexities of diversion and misuse, a multifaceted approach that includes multiple levels and departments of government, the pharmaceutical industry, and medical regulatory agencies, is required.

Chapter 8: Conclusions

Considerable concern has emerged over the past decade regarding the misuse of prescription opioids. This study refines our understanding of the relationship between mental health and social factors and the misuse of prescription opioids among high-school students, and points to modifiable factors that can inform prevention and intervention efforts. The findings fill important gaps in the literature by showing that both *experimental and non-experimental* misuse are associated with similarly increased burden of mental health problems, and that different *patterns* of use of other substances do not significantly modify these relationships. This research highlights the importance of positive attachments to school in deterring all illicit substance use, inclusive of opioid misuse. However, it also suggests that, despite these youth resembling illicit drug users in several other aspects, the misuse of prescription opioids has become attractive to adolescents for whom the bond with parents effectively discourages other substance use. A possible implication is that resources aimed at strengthening families and increasing parental knowledge of the potential harms associated with misuse of opioids could substantially help curb NMPO use. Unlike other drugs of abuse, the availability of prescription opioids is predominantly controlled by the healthcare system. The results raise questions about physician prescribing practices and how to best support physicians in increasing their awareness of the scope and correlates of NMPO use among adolescents; emphasizing safer prescription practices may in turn help deter misuse by decreasing perceived acceptability and access. Finally, this research contributes to the very limited literature on the topic in the Canadian context. Given the socioeconomic burden attributed to opioid misuse, an investment in strengthening known promotive factors in adolescence - a pivotal stage of development that significantly contributes to life trajectories in adulthood - is likely to have significant positive economic and social impact.

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Appendix 1 – Student Drug Use Survey in the Atlantic Provinces



START HERE

1. What are the first 3 digits of the postal code where you live?

Example: If your postal code is A1B 2C3, you would fill in:

| | | |
|---|---|---|
| A | 1 | B |
|---|---|---|

| | | |
|--|--|--|
| | | |
|--|--|--|

I do not know

2. Are you male or female?

- Male
 Female

3. What language do you usually speak at home?

- English
 French
 English and French
 English and another language
 French and another language
 Another language

4. What grade are you in?

- Grade 7
 Grade 8
 Grade 9
 Grade 10 / level I
 Grade 11 / level II
 Grade 12 / level III

5. How old are you?

- 11 years or younger
 12 years
 13 years
 14 years
 15 years
 16 years
 17 years
 18 years
 19 years or older

6. So far in this school year, what is your average on all your courses at school?

- 80% or higher
 70% - 79%
 60% - 69%
 50% - 59%
 Below 50%
 I do not know

Office Use Only

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
 0 1 2 3 4 5 6 7 8 9
 A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

The next question asks about your parents or guardians. By parents or guardians we mean whomever you consider your parents. They could be biological parents, adoptive parents, step-parents, same sex parents, or foster parents.

13. Please indicate how much you agree or disagree with the following statements:

| | Strongly Agree | Agree | I do not know | Disagree | Strongly Disagree |
|---|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| a) My parent(s) or guardian(s) usually know where I am when I am not at home | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| b) My parent(s) or guardian(s) usually know who I am with when I am not at home | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| c) It is important that I do not let down or disappoint my parent(s) or guardian(s) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

14. Please indicate how much you agree or disagree with the following statements:

| | Strongly Agree | Agree | I do not know | Disagree | Strongly Disagree |
|---|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| a) People say "Hello" and often stop to talk to one another on the street | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| b) It is safe for younger children to play outside during the day | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| c) You can trust people around here | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| d) I could ask for help or a favour from my neighbours | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

15. Please choose which of the following two statements you agree with. (Please choose one only)

- Most of the people I go to school with can be trusted
OR
 You can't be too careful of the people I go to school with

16. Please choose which of the following two statements you agree with. (Please choose one only)

- Most of the time, the people I go to school with try to be helpful
OR
 Most of the time, the people I go to school with look out for themselves

17. Please indicate how much you agree or disagree with the following statements:

| | Strongly Agree | Somewhat Agree | Somewhat Disagree | Strongly Disagree |
|--|-----------------------|-----------------------|-----------------------|-----------------------|
| a) I feel safe in my school | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| b) I feel close to people at my school | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| c) I feel happy at my school | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

18. How long have you had a license to drive a car or a motorcycle?

- I do not have a license to drive
 I have a beginner's license or a temporary license
 I have had a license less than one year
 I have had a license one to two years
 More than two years

19. In the past 12 months, have you been in a motor vehicle accident with YOU as the driver?

- Yes
 No

26. Have you tried to quit smoking in the past 6 months?

- Yes
- No
- I have never smoked or I have smoked only a few times

27. How old were you when you first drank alcohol?

- I have never drunk alcohol
- 10 years or younger
- 11 years
- 12 years
- 13 years
- 14 years
- 15 years
- 16 years
- 17 years
- 18 years
- 19 years or older

28. In the past 12 months, how often did you drink alcohol - beer, wine, coolers or hard liquor (rum, whisky, vodka, gin, etc.)?

- Not at all
- Just a sip
- Once a month or less often
- Two or three times a month
- Once a week
- Twice a week
- Three times a week
- Four or five times a week
- Almost every day - six or more times a week

29. The **LAST TIME** you drank alcohol, how did you get it?

- I bought it myself
- I had a friend buy it for me
- My friend or friends offered it to me
- My parents offered it to me
- Other adults offered it to me
- I got it from my home without my parent's permission
- I do not drink alcohol

30. In the past 12 months, has drinking affected your school work or exams so that you did not do as well as you could?

- Yes
- No
- I do not drink alcohol

31. In the past 12 months, has your drinking caused tension or disagreement with family or friends?

- Yes
- No
- I do not drink alcohol

39. In the **past 12 months**, how often have YOU driven a motor vehicle within an hour of drinking two or more drinks of alcohol?

- Never
- Once
- Twice
- Three or more times
- I do not drink alcohol / I do not drive

40. In the **past 12 months**, have you been in a motor vehicle accident with YOU as the driver, after drinking in the two previous hours?

- Never
- Once
- Twice
- Three or more times
- I do not drink alcohol / I do not drive

41. In the **past 12 months**, how often were you a PASSENGER in a vehicle with a driver who had too much to drink?

- Never
- Once
- Twice
- Three or more times

42. In the **past 12 months**, how often did you use CANNABIS (marijuana, grass, weed, pot, hash, hash oil)?

- I do not know what cannabis is
- I have never used cannabis
- I did not use cannabis in the past 12 months
- One time
- Two times
- Three or four times
- Five to eight times
- Nine to 12 times (about once a month)
- Thirteen to 26 times (about twice a month)
- Twenty-seven or more times (more than twice a month)

43. How old were you when you first tried CANNABIS?

- I have never tried cannabis
- 10 years or younger
- 11 years
- 12 years
- 13 years
- 14 years
- 15 years
- 16 years
- 17 years
- 18 years
- 19 years or older

48. In the past 12 months, have you used COCAINE (snow or coke) or CRACK COCAINE (rock)?

- I do not know what cocaine is
- Not at all
- One time
- Two times
- Three or four times
- Five to eight times
- Nine to 12 times (about once a month)
- Thirteen to 26 times (about twice a month)
- Twenty-seven or more times (more than twice a month)

49. In the past 12 months, have you used ECSTASY or MDMA?

- I do not know what Ecstasy and MDMA are
- Not at all
- One time
- Two times
- Three or four times
- Five to eight times
- Nine to 12 times (about once a month)
- Thirteen to 26 times (about twice a month)
- Twenty-seven or more times (more than twice a month)

50. In the past 12 months, have you used METHAMPHETAMINE (crystal meth, speed, crank, chalk, ice)?

- I do not know what methamphetamine is
- Not at all
- One time
- Two times
- Three or four times
- Five to eight times
- Nine to 12 times (about once a month)
- Thirteen to 26 times (about twice a month)
- Twenty-seven or more times (more than twice a month)

51. In the past 12 months, have you used SALVIA DIVINORUM (sally-D, magic mint, sadi)?

- I do not know what salvia divinorum is
- Not at all
- One time
- Two times
- Three or four times
- Five to eight times
- Nine to 12 times (about once a month)
- Thirteen to 26 times (about twice a month)
- Twenty-seven or more times (more than twice a month)

52. In the past 12 months, have you used COUGH OR COLD MEDICINE, such as Robitussin DM, Benylin DM (robos, dex, DXM) in order to get high?

- I do not know what cough or cold medicine is
- Not at all
- One time
- Two times
- Three or four times
- Five to eight times
- Nine to 12 times (about once a month)
- Thirteen to 26 times (about twice a month)
- Twenty-seven or more times (more than twice a month)

53. In the past 12 months, have you used **MEPHEDRONE** (drone, bubbles, m-cat)?

- I do not know what mephedrone is
- Not at all
- One time
- Two times
- Three or four times
- Five to eight times
- Nine to 12 times (about once a month)
- Thirteen to 26 times (about twice a month)
- Twenty-seven or more times (more than twice a month)

54. In the past 12 months, have you used **CAFFEINATED ENERGY DRINKS**, such as Red Bull, Monster, Rockstar and Full Throttle?

- I do not know what caffeinated energy drinks are
- Not at all
- One time
- Two times
- Three or four times
- Five to eight times
- Nine to 12 times (about once a month)
- Thirteen to 26 times (about twice a month)
- Twenty-seven or more times (more than twice a month)

55. In the past 12 months, how often did you use **STIMULANTS** such as diet pills and stay awake pills (also known as “uppers”, “bennies”, “dexies”, “pep pills” etc.) without a prescription?

- I do not know what stimulants are
- Not at all
- One time
- Two times
- Three or four times
- Five to eight times
- Nine to 12 times (about once a month)
- Thirteen to 26 times (about twice a month)
- Twenty-seven or more times (more than twice a month)
- Used without a prescription, but not in the past 12 months

56. Sedatives or tranquilizers are sometimes prescribed by doctors to help people sleep, calm them down or relax their muscles. In the past 12 months, how often did you use **SEDATIVES** or **TRANQUILLIZERS** (such as Valium, Ativan, Xanax) with a prescription or because a doctor told you to?

- I do not know what sedatives or tranquilizers are
- Not at all
- One time
- Two times
- Three or four times
- Five to eight times
- Nine to 12 times (about once a month)
- Thirteen to 26 times (about twice a month)
- Twenty-seven or more times (more than twice a month)
- Used with a prescription, but not in the past 12 months

61. In the **past 12 months**, have you used pain killers, speed or cocaine, by injection or needles?

- I used one or more of these drugs by injection
- I used one or more of these drugs, but not by injection
- I did not use these drugs at all

62. In the **past 12 months**, has your drug use (other than alcohol) affected your school work or exams so that you did not do as well as you could?

- Yes
- No
- I do not use drugs

63. In the **past 12 months**, has your drug use (other than alcohol) caused tension or disagreement with family or friends?

- Yes
- No
- I do not use drugs

64. In the **past 12 months**, have you been in trouble with the police as a result of your drug use (other than alcohol)?

- Yes
- No
- I do not use drugs

65. In the **past 12 months**, has the cost of drugs (other than alcohol) caused you to give up buying other things?

- Yes
- No
- I do not use drugs

66. In the **past 12 months**, have you damaged things after having used drugs (other than alcohol)?

- Yes
- No
- I do not use drugs

67. In the **past 12 months**, has your drug use (other than alcohol) caused you to injure yourself?

- Yes
- No
- I do not use drugs

68. In the **past 12 months**, how many times have YOU driven a motor vehicle within an hour of using cannabis?

- Never
- Once
- Twice
- Three or more times
- I do not use cannabis / I do not drive

75. In the past 30 days, how often did you take RITALIN® or CONCERTA® (methylphenidate) as prescribed for you by your doctor?

- I am not on prescribed Ritalin® or Concerta®
- In the past 30 days, I took prescribed Ritalin® or Concerta® once a day
- Twice a day
- Three times a day
- Four times a day

76. In the past 30 days, how often did you take TRANQUILIZERS (Valium®, Ativan®, Xanax®, Tranqs, 5s, 10s) as prescribed for you by your doctor?

- I am not on prescribed tranquilizers
- In the past 30 days, I took prescribed tranquilizers once a day
- Twice a day
- Three times a day
- Four times a day

The next section asks about some of your decisions concerning sexual behaviour. You may skip any question which makes you uncomfortable.

Please read the following definition of vaginal sex and then answer questions #77 and #78:

“Vaginal sex occurs when a male’s penis enters a female’s vagina. When this happens, both people are having vaginal sex.”

77. In the past 12 months, have you had vaginal sex?

- Yes
- No
- I have never had vaginal sex

78. How old were you when you had vaginal sex for the FIRST TIME?

- I have never had vaginal sex
- 10 years or younger
- 11 years
- 12 years
- 13 years
- 14 years
- 15 years
- 16 years
- 17 years
- 18 years
- 19 years or older

Please read the following definition of anal sex, and then answer question #79:

“Anal sex occurs when a male’s penis enters another person’s anus or rectum. When this happens, both people are having anal sex.”

79. In the past 12 months, have you had anal sex?

- Yes
- No
- I have never had anal sex

87. People have different feelings about themselves when it comes to questions of being attracted to other people. Which of the following best describes your feelings?

- 100% heterosexual (attracted to persons of the opposite sex)
- Mostly heterosexual
- Bisexual (attracted to both males and females)
- Mostly homosexual
- 100% homosexual ("gay/lesbian"; attracted to persons of the same sex)
- Not sure

The next section asks about gambling.

88. In the past 12 months, how often have you done the following:

| | Never | Less than monthly | Monthly | Weekly | Daily |
|--|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| Played cards for money | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Played bingo for money | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Bet on sports activities | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Played Sports Select lottery | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Played a lottery other than Sports Select | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Played any video gambling machines | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Played scratch tabs | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Played break-opens | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Played on Internet gambling websites for money | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Played on Internet gambling websites with play money or points | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

89. In the past 12 months, has your betting money caused any problems for you such as arguments with family and friends, or problems at school or work?

- Yes
- No
- I do not gamble

90. In the past 12 months, have you gambled more than you had planned to?

- Yes
- No
- I do not gamble

91. In the past 12 months, has anyone criticized your betting or told you that you had a gambling problem, regardless of whether you thought it was true or not?

- Yes
- No
- I do not gamble

92. In the past 12 months, have you skipped or been absent from school or work due to betting activities?

- Yes
- No
- I do not gamble

The next section asks about your feelings.

100. Please indicate how much you agree or disagree with the following statements:

| | Strongly Agree | Somewhat Agree | Somewhat Disagree | Strongly Disagree |
|--|-----------------------|-----------------------|-----------------------|-----------------------|
| a) I like new and exciting experiences, even if I have to break the rules. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| b) I prefer friends who are exciting and unpredictable. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| c) I like to explore strange places. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| d) I like to do frightening things. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

101. Please mark the response that best describes how you felt in the PAST 7 DAYS.

| | Never or rarely | Sometimes | Often | Always |
|--|-----------------------|-----------------------|-----------------------|-----------------------|
| a) I did not feel like eating; my appetite was poor. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| b) I felt like I could not shake off the blues even with help from my family or friends. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| c) I had trouble keeping my mind on what I was doing. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| d) I felt depressed. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| e) I felt like I was too tired to do things. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| f) I felt hopeful about the future. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| g) My sleep was restless. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| h) I was happy. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| i) I felt lonely. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| j) I enjoyed life. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| k) I had crying spells. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| l) I felt people disliked me. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

102. Please mark the response that best describes how you felt in the PAST 30 DAYS.

| | Not true | Sometimes true | Often true |
|--|-----------------------|-----------------------|-----------------------|
| a) I got really frightened for no reason at all. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| b) I was afraid to be alone in the house. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| c) People told me that I worry too much. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| d) I was scared to go to school. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| e) I was shy. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

103. In the past 12 months, did you feel you needed help because you felt...

| | | | |
|---------------|---------------------------|--------------------------|--|
| a) Depressed? | <input type="radio"/> Yes | <input type="radio"/> No | <input type="radio"/> I did not feel depressed |
| b) Stressed? | <input type="radio"/> Yes | <input type="radio"/> No | <input type="radio"/> I did not feel stressed |
| c) Anxious? | <input type="radio"/> Yes | <input type="radio"/> No | <input type="radio"/> I did not feel anxious |

104. In the past 12 months, did you use any services or receive help because you felt...

| | | | |
|---------------|---------------------------|--------------------------|--|
| a) Depressed? | <input type="radio"/> Yes | <input type="radio"/> No | <input type="radio"/> I did not feel depressed |
| b) Stressed? | <input type="radio"/> Yes | <input type="radio"/> No | <input type="radio"/> I did not feel stressed |
| c) Anxious? | <input type="radio"/> Yes | <input type="radio"/> No | <input type="radio"/> I did not feel anxious |

The next 2 questions ask about school drug education and rules.

105. How many classes did you have in this school year that talked about decision-making, peer pressure, assertiveness or refusal skills?
 None
 One or two classes
 Three or more classes

106. Does your school have a rule against using tobacco on school property or at school events?
 Yes
 No
 I don't know

ADDITIONAL INFORMATION

Is there anything else you would like to tell us related to the questions in this survey?

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If you would like to speak to someone about your alcohol use, other drug use, or gambling, or you want help or information, you may contact the Addiction Services office in your area.

Thank you for participating in this survey.

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