Substance Use and Marginalization Among Youth Living with Mental Health Conditions in Ontario

by

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Author's Declaration

I hereby declare that this thesis consists of material all of which I authored or co-authored: see Statement of Contributions included in the thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

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Statement of Contribution

This thesis consists in part of three manuscripts written for publication. Oluwakemi Olanike Aderibigbe was the sole author for Chapters 1, 2, and 6 which were written under the supervision of Dr. Christopher M. Perlman and were not written for publication.

Oluwakemi Olanike Aderibigbe was the sole author for Chapter 4 and 5 which were written under the supervision of Dr. Christopher M. Perlman and are being prepared for publication.

Oluwakemi Olanike Aderibigbe was the lead author for Chapter 3 which was co-authored with Dr. Shannon Stewart, Dr. John Hirdes, and Dr. Christopher M. Perlman and has been published.

Exceptions to sole authorship of material are as follows:

Research presented in Chapters 3:

This research was conducted at the University of Waterloo by Oluwakemi Olanike Aderibigbe under the supervision of Dr. Christopher Perlman. Oluwakemi Olanike Aderibigbe conceptualized the research, designed the study methodology, completed the data analysis, interpreted the result, wrote the original draft and designed the visuals of this manuscript. Dr. Shannon Stewart provided support on the methodology, reviewing and editing of this manuscript. Dr. John Hirdes and Dr. Christopher Perlman also reviewed and edited the manuscript for publication. This research was funded by the Kitchener Waterloo Community Foundation Community Fund, Alice (Braley) Judges-Walter Judges Fund (https://www.kwcf.ca/fund-listing, accessed on 19/04/2022).

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Chapter 4 and 5:

These studies were conducted at the University of Waterloo by Oluwakemi Olanike Aderibigbe under the supervision of Dr. Christopher M. Perlman. Oluwakemi Olanike Aderibigbe conceptualized, designed the methodology, completed the data analysis, interpreted the result, wrote the original draft and designed the visuals of these studies. Dr. Shannon Stewart and Dr. John Hirdes provided support on the methodology. Dr. Christopher M. Perlman reviewed and edited these manuscripts in preparation for publication.

As lead author of these chapters, I was responsible for developing the research questions, conducting background research, leading the study designs, conducting the statistical analyses, interpreting the results, and writing the initial drafts of the manuscripts.

Stewart SL, Hirdes JP, Perlman C. provided guidance during each step of the research and provided feedback on draft manuscripts.

Overview: Kindly note that there might be overlap of the contents of this dissertation because the research was designed as three stand alone manuscripts for journals

Abstract

Background: Approximately 70% of mental health problems have their onset in childhood or adolescence. In 2019, data from the Canadian population showed that mental and substance use conditions were highest among youth and young adults, where more than half reported poor mental health and one-third reported substance use. Mental health and addiction-related service use among children and youth in Ontario has also increased over time. Concurrent substance use can be particularly problematic for youth with mental health concerns. It interferes with treatment for mental health disorders, worsens outcomes and long-term prognosis, and increases the cost of care. Furthermore, with so many potential causes, many theories and models have attempted to explain the substance use condition and the relationship between substance use and mental disorders. However, social determinants of health are common factors conceptualized as key risk factors for substance use and mental illness. Therefore, there is a need to improve the integration of proactive and timely substance use and mental health care for children and youth.

Purpose: This study examines the impact of clinical and social circumstances, including the experience of marginalization, on co-occurring mental health and substance use problems among youth across different mental health care facilities in Ontario, Canada.

Methods: The first part of this research uses a cross-sectional study design to examine the patterns and factors associated with substance use among youth (12–18 years) assessed in the community (n = 47,418) and residential (n = 700) mental health care facilities in Ontario, Canada. The second part uses a cross-sectional study design to examine how the experience and severity of marginalization are associated with substance use among 9,142 youth living with mental health conditions. Lastly, the third part of this research uses a retrospective cohort design to examine if

the experience of marginalization precedes substance use among 19,514 youth living with mental health conditions in Ontario.

Results: The first study found that 22% of youth reported the use of substances in the community settings and 37% in residential settings. Older age group (Youth older than 16 years), being a victim of abuse, having experienced self-injurious ideation/attempt, being at risk of disrupted education, and having a parent/caregiver with addiction or substance use disorder were significantly associated with substance use. Several factors reduced the risk of substance use, including being a female, having anxiety symptoms, and having cognitive problems.

Study 2 shows that after controlling for other variables, having no strong/supportive family relationship, being a victim of abuse, being at risk of disrupted education, caregiver distress, and having a parent with SUD significantly increased the relative risk of substance use among the study sample. However, having no friends and living with a cognitive/intellectual disability reduced the risk of substance use. A sex-based analysis shows a similar pattern among males and females, except for caregiver distress which was not significantly associated with substance use among females. About 91% of the entire sample had experienced at least one indicator of marginalization. The average number of MI experienced by youth was 3 (Standard Deviation = 2.0). The risk model for a sum of MI shows that the risk of substance use among youths increased with increasing cumulation of the experience of MI. Those who experienced four marginalization indicators had twice the risk of substance use compared to those who did not experience any of the MI (RR=1.97, 95% CI: [1.64, 2.30]). Those who experienced eight or more MI had two to four times the risk of substance use compared to those who did not experience any MI (RR=3.12, 95% CI: [2.44, 3.98]).

Lastly, using a longitudinal study design, study 3 shows that about 2.0 % of the total youth in the longitudinal data initiated substance use within the two-year follow-up period. Among those that used substances at follow-up, 42% were males, and 58% were females. About 67% of those that initiated substance use at follow-up were within the older age group (14 – 16 years old) at baseline while 33% were 12 – 13 years old. Interestingly, when examining unique indicators of marginalization only victim of abuse was a significant predictor of future substance use (HR: 1.36 [1.10, 1.68]; p-value 0.01). However, the adjusted model of the cumulative effect of MI on future substance use shows that after controlling for age, sex, and severity of clinical symptoms, the probability of reporting substance use within two-year follow-up among youth that experienced 1 - 2 MI compared to those that did not was approximately 1.5 (P-value=0.003). Among those that experienced 3 - 4 MI, the probability of reporting substance use at two-year follow-up compared to those that did not experience any MI was approximately 2.0 (P-value <.0001).

Conclusion: This study reinforces the need for an early, holistic, patient-centered, trauma-informed, family-based, multidisciplinary/integrated care approach that addresses the broader social determinants of health in the management of youth with mental and substance use conditions. This research demonstrates that social determinants, including indicators of marginalization are risk factors that precede substance use among youth. These risk factors (MI) could persist across the life course and in multiple social levels, i.e., at individual, family, school, and the community. This study also establishes that the more indicators of marginalization a youth experiences the higher the risk of future substance use. The findings from this study provides hypotheses that addressing these MI can influence multiple outcomes that are associated or predicted by them. The results of this research have implied that the implementation and evaluation

of modeled or promising prevention programs/interventions and broader dissemination would have a substantial impact on the prevalence of substance use and related consequences.

Keywords: youth; co-occurring mental health and substance use conditions; marginalization; social determinants; integrated care; interRAI; assessment; predictors of substance use

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Dedication

I dedicate my dissertation work to my four amazing children, Israel, Zion, Salem, and Shiloh. Thank you for your love, patience, and understanding when I was distracted or not fully present for you during this project. You are indeed treasures from the Lord.

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List of Abbreviations

ADHD	Attention deficit hyperactivity disorder
AKT1	Protein kinase B
ANX	Anxiety
CAP	Collaborative Action Plans
ChYMH	interRAI Child Youth Mental Health Assessment
ChYMH-S	interRAI Child Youth Mental Health Screener
CIHI	Canadian Institute for Health Information
CMHA	Canadian mental health association
D2A1	Dopamine D2 receptor gene
DAT1	Dopamine transporter gene 1
GEE	Generalized Estimating Equations
ID	Identification
interRAI-MH	interRAI-Mental Health assessment
IQR	Interquartile range
LGBTQ+	Lesbian, Gay, Bisexual, Transgender, Queer or Questioning
MBID	mild to borderline intellectual disability
MI	Marginalization indicator, Marginalization indicators
MIS	Marginalization indicator sum
MIS_CAT	Marginalization indicator sum category
OHIP	Ontario Health Insurance Plan
OR	Odds ratio
PTSD	Post-traumatic stress disorder
RR	Risk ratio
SUD	Substance use disorder

Chapter 1

General Introduction

1.1 Background

Youth is a time of significant development and change. It is also a period when substance use begins to emerge(1). Substance use disorders are one of the three most common types of mental illnesses experienced by Canadians, with young people aged 15–24 years having the highest rates of substance abuse or dependence (2). Initiation of substance use may include experimentation or heavier and higher risk patterns of us (3–5). Alcohol has been the most commonly used substance among youth, followed by tobacco, cannabis, and opioids (5,6). The burden of youth substance use is alarming. School surveys in Canada have reported that up to 75% of students in grades 7–12 reported lifetime use of various substances(6-9). While there may be various reasons for substance use among youth, these trends are concerning. At least a portion of these youth may be using substances to cope with mental health circumstances and the other long-term implications of substance use on health outcomes.

Substance use among youth can have a cumulative impact, contributing to costly social, physical, and mental health problems (3–5,8,9). Substance use conditions are also associated with problems such as poor academic performance, job instability, teen pregnancy, the transmission of sexually transmitted diseases, accidents, crimes, violence, overdoses, drug tolerance effects, withdrawal symptoms, and other longer-term physical health issues (9–11). Other problems associated with problematic substance use include loss of interest in social activities, disorganized thinking, reduced problem-solving performance, and social isolation (2–4,10).

Neurodevelopmental research has demonstrated that the brains of youth may be more vulnerable to the effects of substances. Hence, they are at risk of developing patterns of behavior

that result in substance abuse (continued use regardless of physical or psychosocial problems or dependence) and substance dependence (physiologic dependence demonstrated by withdrawal symptoms or the development of tolerance to alcohol or other drugs) (3,12–15). These adverse outcomes are particularly concerning for youth who use substances to cope with difficult situations such as trauma or victimization due to the dual neurological vulnerability created by traumatic life events and the engagement in substance use (16–22).

Substance use during a young age might disrupt vital developmental transitions as the brain undergoes cognitive, emotional, and psychosocial development(2). In addition, this period also coincides with the onset of a variety of mental health conditions (1,23,24). There is a consistent relationship between mental health conditions and problematic substance use among youth (16,25–28). Co-occurring mental and substance use conditions are highest among youth aged 15–24 years in Ontario and Canada (2,29)]. Substance use is associated with comorbid illnesses such as anxiety, ADHD, depression and bipolar disorders, post-traumatic stress disorder, psychotic symptoms, and disruptive behavioral disorders in both in-patient and outpatient settings (30–32).

Substance use may precede psychopathologies, as youth who use substances may engage in risky behavior that increases their risk of experiencing trauma leading to PTSD (33). Conversely, psychopathology may precede youth substance use. For instance, youth with a behavioral or psychological problem may use substances to cope with their symptoms or may have impaired learning or impulsivity, leading to an inability to conceptualize the consequences of substance use. Furthermore, the relationship between self-harm and substance use among youth in this study also raises the possibility of substance use as self-harm(34,35). Youth with psychological or behavioral problems may also be experiencing school failure leading to associations with deviant peers and self-medication (3,10,18,21,33,35,36). However, the

association between youth substance use and mental illness may be due to shared vulnerability of childhood psychosocial factors, including the exposure to different dimensions of marginalization like victimization, vulnerability, deprivation, isolation, lack of social support, and resources.

In general, a myriad of other psychosocial factors may promote the use of substances(25). Factors contributing to youth's increased likelihood of substance use can be broadly categorized into individual, familial, social, and environmental factors. Factors at the individual level include being a male, LGBTQ+, early exposure to traumatic life events, individuals with a family history of a substance use disorder, prenatal exposure to alcohol and other drugs, sleep problems, and co-occurring psychopathology (e.g., ADHD, depression)(3,26,27,37). Social factors include peer substance use and involvement in romantic relationships at an early age (18,38,39). Environmental risks include family dysfunction, lack of parental supervision and monitoring, and being street-involved (3–5,8,9). There are also protective factors, including self-efficacy, social competence, academic achievement, personal and social controls against norm-violating behaviors, church attendance, and a sense of morality (16,28,31,32,40,41). Nurturing home environments with open communication and parental support as well as positive school experience and positive peer role models may also be protective (16,41).

Broadly, social determinants of health are common factors conceptualized as crucial risk factors for health, including challenges to education, low family income, race, ethnicity, geographic location, gender, and sexual orientation (36,42–44). With so many potential causes, many theories and models have explained the cause of substance use and the relationship between substance use and mental disorders. However, social determinants of health are common factors conceptualized as key risk factors for substance use and mental illness.

Social or environmental factors associated with increased risk of substance use and mental health disorders have been well researched. Research has consistently shown that these environmental factors or social determinants are associated with an increased risk of both substance use and mental illness(25,45–48). These factors include stress, trauma and childhood adverse experiences(35,48–52), dysfunctional environmental factors like dysfunctional families (19,48,53–56) and residential instability(57–59), lack of supportive family relationship and parental substance use or mental illness (38,55,56,60–63), and peer influence (19,64). A study among youth living with mental health conditions in Ontario shows that the social determinants, including exposure to indicators of marginalization like victimization, isolation, deprivation, lack of social support, and resources, are strongly associated with increased risk of substance use(65). Individuals who experience disparities or inequities in social determinants have been referred to as being marginalized (66,67).

Marginalized populations with concurrent substance use and mental health conditions have been found to experience inequitable access to care and poorer health outcomes compared to non-marginalized counterparts (68,69). Furthermore, in Ontario, Canada, the burden of mental illness has been disproportionately distributed among the population, with a greater disease burden among those experiencing marginalization(70). The dual experience of marginalization and mental health concerns can have broad impacts on the person, their families, the communities in which they live, the health care system, and the country's productivity(71,72). However, limited research has examined these associations specifically among youths in different mental health care facilities in Ontario, Canada.

1.2 Conceptual/Theoretical Framework

1.2.1 The Concept of Marginalization

The term marginalization is sometimes used interchangeably with social exclusion or vulnerability to describe a process that creates an uneven or socially patterned distribution of resources within a society (73,74). Marginalization has been defined as an intended or unintended process of relegating or treating individuals or groups as insignificant within the context of nations, regions, social groups, or among individuals in a single group based on geographical, cultural, social, or economic, political, or historical reasons (66,73,75). Usually, marginalized people have a sense of being overlooked or excluded from the system (67,76). This process blocks or limits the marginalized from the benefits of the society, such as meaningful employment, adequate housing, education, recreation, clean water, quality of health, access to health care, health outcomes, and other social determinants of health impacting both individual and community health (76,77).

Thus, those marginalized experience health inequalities, disparities, and inequities as evidenced by differences in the presence of disease, quality of health, access to health care, and quality of health between population subgroups (78). Together, the experience of marginalization and health inequities form the basis for social inequality(79). Therefore, understanding the association between marginalization and the social determinants of health is vital for improving the identification of inequities in health care delivery and disparities in disease burdens among vulnerable groups (67). The Canadian Institute for Health Information (CIHI) also defined equity stratifiers for measuring health inequality as sociodemographic characteristics(80). Table A1 in the appendix shows the definition of the equity stratifiers.

There has been a lack of consensus on the definition of marginalization among youth due to diverse types, approaches, and measures of marginalization. For example, marginalization has

been used to represent the results of racial/ethnic underrepresentation, victimization and discrimination of sexual minorities, alienation from the host culture and the culture of origin, effects of educational policies on students labeled with learning disabilities, and social isolation of overweight children (45,46,81–83). Although these diverse types, approaches, and measures of marginalization show the different and unique forms of social exclusion experienced by youth, there is a need to bring them together under a single conceptual umbrella. Therefore, Causadias and Umana-Taylor (2019) defined marginalization as a multidimensional, dynamic, context-dependent, and diverse web of processes rooted in power imbalance and systematically directed toward specific groups and individuals, with probabilistic implications for development(83).

To define marginalization operationally, the social determinants of the mental health framework, as defined by Shim et al.(42), can be used to enhance our understanding of inequities in mental health. The social determinants of mental health framework is a multilevel framework developed based on studies establishing the relationships between social factors and mental illness(42–44,84). This framework shows that stressors affecting people at different stages in life, the community in which people grow, live, work, and age, and the political, socioeconomic, environmental, cultural, norm, and historical context of the country of residence affect people's mental health(44). Figure1 below shows the illustration of the social determinants of mental health.

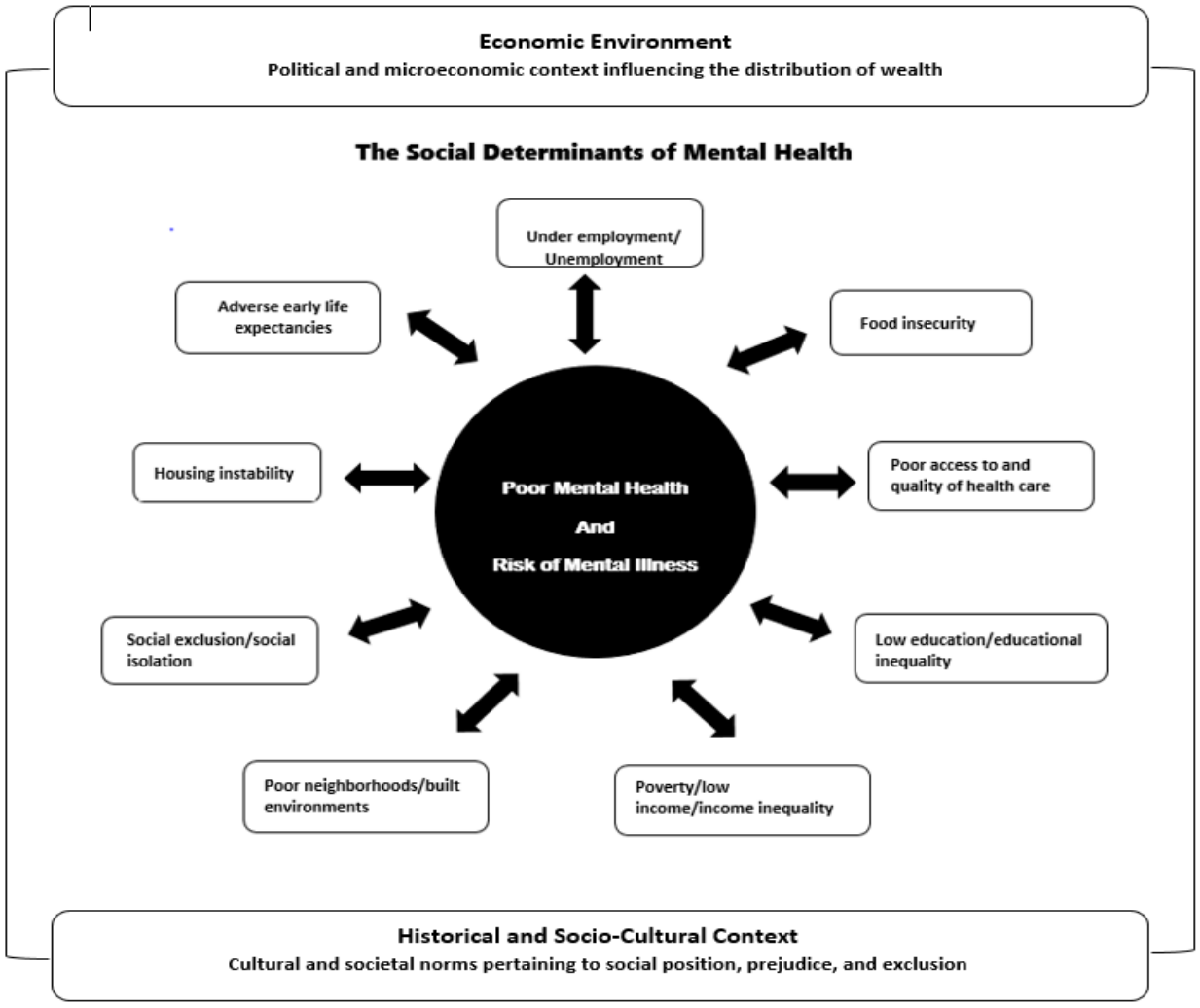

Figure 1: Social Determinants of Mental Health Framework (Source: Shin et al., 2014)

The social determinants of mental health framework (42) explains that interventions that effectively address social determinants of mental health may have the most significant impact on the entire population. The development or improvement of policies related to income inequality, adverse early childhood experiences, food insecurity, racism, and other social determinants of mental health would be helpful to address this issue upstream before mental illness, or substance use occurs. Relevant sectors like health, education and children, community and social services could invest in more programs that improve child welfare, family social circumstances, and a healthy community. A specific example is a community program that assigns a nurse practitioner

or social worker to a family or school to support youth in accessing clinical and social-related resources. Another example is investment in affordable housing and community programs that engage youth in a healthy and meaningful way and make them available to all would also have a population-level impact(42,44).

In the social determinants of mental health framework(42), some social determinants are experienced at the individual level (e.g., adverse early life expectancies; poor social support and lack of connectedness; and social exclusion based on race, ethnicity, sexual orientation, or disability). Other determinants are derived from the broader contextual (societal/political) sphere (e.g., poverty, food insecurity, and adverse features of the built environment). In general, social determinants of mental health are shaped by the distribution of money, power, and resources. In turn, these factors become the main drivers of health inequity – i.e., when people experience differences in health based on social group or geographical conditions. People that experience these disparities have been referred to as the marginalized(42).

Marginalization can be examined individually or contextually and encompass multi-dimensional risk factors and outcomes. For example, marginalization risk and outcome can be understood by the range of indicators of marginalization proposed in the literature, including: gender identity, ethnicity, victimization, bullying, peer exclusion, homeless status, physical health issues including disability and overweight, involvement with juvenile justice, disengagement from education (school dropout) or employment, education achievements, immigration status, being children of low-income immigrants, foster care, bearing responsibility for raising young children, and those experiencing or at high risk of poverty, abusive behaviors, mental health challenges, and compromised developmental outcomes(76,85,86,87). These diverse types, approaches, and

measures of marginalization show the different and unique forms of social exclusion experienced by youth.

1.2.2 Measurement of Marginalization

The measurement of marginalization has typically involved the use of surveys and questionnaires. For example, measures of marginalization that have been used among persons with mental health conditions include: the Social Inclusion Questionnaire User Experience (71,72), which measures domains related to productivity, consumption, access to services, political engagement, and social integration(88); the Social and Community Opportunities Profile, which measures leisure time, housing, work, finances, safety, education, health, and family and friends, quality of life and subjective well-being(89); and the Social Inclusion Scale, which features subscales that measure social isolation, social relations, and social acceptance and these subscales correlate with measures of empowerment and clinical outcomes(90).

Since marginalization is both a process and a condition, its measurement should include a broader analysis of the causes and conditions of deprivation by which people become marginalized(91). Using this approach, Rios and colleagues derived a measure of marginalization based on a comprehensive assessment system among persons admitted to inpatient psychiatry (92). The marginalization index was developed from the interRAI-Mental Health (interRAI-MH) assessment, a standard instrument used in multiple Canadian and international jurisdictions(93). The index included items related to different dimensions of marginalization, including victimization, social support, isolation, resources, and deprivation. The index is a simple cumulative sum of indicators that ranges from 0 to 14. Higher scores were found to be associated with greater odds of addictions and substance use, police interventions, and being homeless(92).

As such, the interRAI marginalization index represents an indicator of cumulative processes that may lead one to various consequences of the condition of marginalization.

Youth are vulnerable to experiencing marginalization because this period is critical for establishing identity and other multiple domains of self-concept that impact development. The experience of marginalization increases the likelihood of adverse outcomes and reduces the likelihood of positive outcomes. Some outcomes of marginalization among youth include being a victim of bullying, suicidality, racism, discrimination, stigma, and being socially excluded from accessing opportunities and resources, it could lead to poorer health outcomes, including mental health and substance use problems. Moreso, youth living with mental health or substance use conditions are more vulnerable to the experience of marginalization or already marginalized.

1.2.3 Models of the Relationship between Substance Use, Mental Disorders, and Marginalization

The focus of this study is substance use and not substance use disorder. A pattern of harmful use of any substance for mood alteration purposes is substance use; while the prolonged and repeated use of any substance at high dose and frequency can significantly impair health and functioning, leading to diagnosable substance use disorder (SUD) that requires treatment(94). However, not all youth who use substances develop substance use disorder. But, youth who use substances are more likely to develop substance use disorder than those who did not use substances(95,96). Given the strong relationship between substance use the development of substance use disorders this dissertation provides an overview of some theories of substance use disorders/addictions in an attempt to identify potential risk factors for early substance use, particularly the role of social vulnerabilities like marginalization.

Theories of substance use among youth posit various possibilities for the specific factors and directions of relationships between social factors, mental illness, and substance use. A review of these theories is critical because, for youth with mental health concerns, there is a need to understand why youth may engage in substance use and how that use might relate to their mental health concern. Early theories included the gateway hypothesis and the biomedical model of substance use disorder. The gateway hypothesis suggests that adolescent's early experimentation with licit drugs like alcohol or tobacco escalates to more problematic use of illicit drugs into adulthood, potentially due to how the use of one drug enhances the effects of the other drugs as well as increases curiosity and risk-taking related to use of substances, especially during early and mid-adolescence(97,98). This hypothesis has a primary focus on the specific role that drug use might play on the biological and psychological aspects of health behaviour but does little to acknowledge the broader determinants that might drive substance use.

The biomedical model of substance use disorder views addiction as a chronically relapsing brain disease caused by genetic and biochemical factors. (99). This model views other dimensions of addiction like social, psychological, and behavioural dimensions as less necessary in the aetiology and treatment of addiction (99). This model is problematic because it cannot explain why some recreational substance users do not develop SUD, nor does it help to identify precursors to the initiation of substance use prior to the development of addiction.

Several models and frameworks have also been proposed for the increased risk of substance use disorder among people with mental illness. The secondary psychiatric disorder model posits that substance use contributes to the onset of mental illness(100–102), perhaps through the biochemical effect of drugs on the brain(101–105). Ethanol-induced depressive state and cannabis-induced psychosis are examples that support this model(104,105). Psychoactive substances

strongly associated with mental health disorders include stimulants, depressants, hallucinogens, and cannabis(102–104). However, it could be that substance use triggers or exacerbates an undiagnosed mental illness. Other factors contributing to this relationship include the complex interactions among multiple genes and genetic interactions with environmental influences(104–108). For example, frequent cannabis use during adolescence is associated with an increased risk of psychosis in adulthood, specifically among individuals who carry a particular gene variant (catechol-O-methyltransferase, DAT1, and AKT1)(107). However, a gene could also influence how individuals respond to stress and risk-taking behaviours, which could impact the initiation of substance use, SUD, and mental illness, and these gene alterations can be inherited(106,107). Also, environmental factors like exposure to substances, early childhood trauma experience, and chronic stress may alter gene expression that can impact behaviour (106). Therefore, it is challenging to confirm that a mental health concern emerges purely from substance use.

The secondary substance use disorder model posits that serious mental illness increases the person's chances of engaging in and developing substance use disorder(101,102). A common hypothesis underlying this secondary substance use disorder model is the self-medication hypothesis which states that self-regulation vulnerability and difficulties with controlling mental health symptoms might cause youth to self-medicate with drugs(104–106). That is, youth could use drugs to cope with depression, anxiety, and psychosis symptoms. This association could also be a coping strategy for other consequences of mental illness like victimization, isolation, or hopelessness(51,52,101,102,104,106). However, self-medication cannot explain all the reasons for high comorbidity rates among individuals who suffer from mental disorders. For instance, substance use generally exacerbates rather than relieves symptoms of underlying mental diseases(105). Therefore, mental illness might not be the cause of substance use but, instead,

influence the transition from substance use to substance use disorder. Other schools of taught have posited the bidirectional model to explain that either substance use or a mental illness can increase the vulnerability of the other disorder(101,102,104,105). However, evidence shows that a single factor cannot explain why some people are able to use substances without progressing to addiction, while others abuse or become dependent on substances.

More broadly, the biopsychosocial model may be the most comprehensive in understanding youth substance use. It explains that biological, genetic, personality, psychological, cognitive, social, cultural, and environmental factors interact to cause substance use and substance use disorder(13). The biopsychosocial model provides a comprehensive explanation of the complex interactions that can occur leading to substance use. Genetic and biological risks include being children of alcohol-dependent parents or the presence of the alcohol dehydrogenase enzyme and dopamine D2A1 gene. For instance, a study examining the association between the gene responsible for alcohol dehydrogenase and alcohol use among the Asian population found that those deficient in this enzyme are less likely to use the substance (109). However, not all persons with such predispositions develop problems with substance use. Furthermore, research establishing psychosocial factors (e.g., comorbid psychiatric disorders, personality disorder, childhood abuse or trauma, use of substances for its desired effect, self-efficacy); and environmental factors (e.g., family, peers, availability, public policies, neighbourhood, ethnicity, and culture) as possible causes and/or effects of substance use provide evidence that substance use or addiction is a multifactorial problem(25). At the same time, psychological factors like motivation and self-efficacy are important in the process of natural recovery or use of medication (replacement) in the treatment of substance use or addiction problem.

Similar to the biopsychosocial model, the common factor model (or shared vulnerability) takes a different approach from directional models, arguing that risk factors may be shared across both substance use and severe mental illness(100–102,104–106). An example of the shared factors common to mental health and substance use disorders includes genetic vulnerabilities, epigenetic influences, neurotransmitters and pathways/circuits in the brain, and environmental factors like chronic stress, trauma, adverse childhood experiences, and dysfunctional environmental factors related to families or parents. (35,47,101,102,104,106). For instance, evidence shows an overlap between genes identified in people with a diagnosis of schizophrenia and those with addictive behaviours. In addition, research on the link between substance use and mental health disorders shows that the mesolimbic and mesocortical pathways in the brain have been linked to reward mechanisms and positive symptoms and neuroadaptation mechanisms and negative symptoms respectively(105,106). Therefore, genes responsible for neurotransmitters in these pathways would influence addictive and mental health problems(107).

Across many theories and frameworks there is greater understanding of the role of a social environment and exposures in combination with biological factors in promoting substance use. It is likely an evolving interplay between the reasons why someone might initiate substance use (e.g., to experiment or cope) and the impact of the biological or psychological response that the substance has on the person. These processes are important to consider in real world contexts in order to help design prevention, early intervention, and intensive treatment approaches. Therefore, it is important to understand the current health system context for children and youth with mental health concerns and who use substances.

1.3 Child and Youth Mental Health Services in Ontario

Approximately 13% of Canadian children aged 4–17 years are living with mental health disorders at any given time, but only a third of them would receive the necessary treatment(110). In Ontario, about 18% of the population aged 4 – 17 years are living with mental illness, with only 16% of those living with mental illness receiving services(110).

Treatment programs for youth with mental health concerns in Ontario include care in the community and residential settings. Community care consists of community-based programs like counseling and therapy, intensive treatment, specialized consultation and assessment, and crisis support for children and youth (from birth to 18 years of age) and their families who are experiencing or at risk of experiencing mental health problems, illnesses or disorders such as depression, anxiety, and attention-deficit/hyperactivity disorders. The purpose of these services to foster health in the community ranges from early identification of mental health problems to timely and high-quality mental health care. These services are accessed through different means. Primary health care settings are where most youth with mental illness are diagnosed, treated, and referred for either specialist or tertiary services. Youth may also receive services through child welfare and juvenile justice agencies if they are under the government's carer charged with breaking the law(111,112).

Usually, services to support youth with substance use problems focus on harm reduction and the youth's school and home/family environment. Substance use or addiction services for youth may also include community or residential treatment. Community-based treatment for substance use/addiction includes community treatment offered to individuals at home, school, or the treatment facility, group therapy, case management, day treatment, and peer-based treatment program. Residential or inpatient treatment for substance use/addiction is more intensive and

requires that the youth stay in the treatment facility for 24 hours a day and last for three weeks to several months (112,113).

Mental health services for children and youth (0-18) in Ontario are funded and administered by the Ministry of Children and Youth Services (MCYS), the Ministry of Health and Long-Term Care, and the Ministry of Education, depending on the setting. While a multipronged approach to government oversight may be beneficial for ensuring mental health is considered across sectors, it may also have created challenges to accountability and integration.

Ideally, services to support youth with mental health and substance use challenges should be integrated because of the link between mental health and substance use problems. That is, service providers across education, health, mental health, child welfare, and others should be part of an integrated continuum of services and provide necessary support ranging from prevention to intensive intervention depending on the profile and needs of the youth(114). Furthermore, youth should be able to enter the pathway to care through at first contact with either the schools, primary care, hospitals, mental health facilities, addictions treatment settings, child welfare, and/or juvenile justice. Once youth have accessed a service, the first contact agency should screen and identify youths' level of need without referring them to another service to do so. Then the youth should be cared for within the current service or referred to the appropriate treatment that matches their needs and have a system navigation support staff to help youth navigate the complex system and get optimum care. Furthermore, the integrated services should also include information-sharing systems(115–117).

However, achieving integration in Ontario has been limited, potentially due to historical issues with funding, ministerial oversight, and a mix of public and private administration. In addition, different agencies provide services for different age categories in Ontario. Transitional

youth can have additional challenges to access services because different ministries fund children/youth and adult services in Ontario. Therefore, navigation through the systems can become complex for youth and their families. Also, different treatment sectors (the adult vs youth sector) may not always share records, leading to a loss of therapeutic rapport with providers as a person transitions families(111,113,114).

The increasing trend of children and youth mental health-related visits represents a significant and growing burden for the emergency department. It highlights the need to reassess the allocation of health resources to optimize prevention, risk assessment, early identification, and treatment in the community mental health services. Mental health and addiction-related service use among young people in Ontario have increased over time, with about 1 in 6 receiving the needed mental health services(118–120). In addition, youth seen in residential/inpatient settings and those admitted into outpatient settings are likely to have greater clinically complex or advanced substance use conditions(118,119). Furthermore, evidence shows a significant delay between the onset of mental health or substance use conditions and access to care, with only the severe cases receiving timely services, particularly in the emergency department(118–120) Emergency departments (EDs) are often the first point of care for children and children experiencing mental health emergencies, particularly when other services are inaccessible or unavailable. For instance, anxiety disorders were the most common reason for ED visits among youth(118).

An unknown proportion of youth utilizing private services to have quicker access to care due to the long wait time to receive government-funded services is an equity issue because private services are paid for out of pocket or by the employer. This issue further marginalizes youth from

disadvantaged social circumstances that could not afford direct pay for mental health or substance use-related services.

The increasing number of youths presenting in high-intensity acute care facilities with substance use and mental conditions shows a need to allocate limited mental health care resources effectively. Therefore, appropriate strategies must focus on the early identification of treatable comorbid mental health conditions and modifiable known risk factors associated with substance use. Furthermore, early identification of these treatable or modifiable factors could prevent hospitalization, which is critical to reducing the direct and indirect cost of the limited services for mental health and substance use disorders (121–123).

A comparative study examining the correlates of youth substance use in outpatient and inpatient mental health settings will help identify treatable comorbid mental health conditions and modifiable risk factors associated with substance use. This strategy can help develop an early intervention to potentially reduce the risk of developing substance use disorders or facilitate remission from a substance use condition before it becomes severe and more difficult to treat or requires more expensive inpatient care. Towards this goal, common and comprehensive assessment systems are being used more frequently. These tools provide a source of data that can be used to support care planning, service allocation, and evaluation for children and youth.

1.4 Rationale and Objectives

Concurrent substance use can be particularly problematic for youth with mental health concerns. It interferes with treatment for mental health disorders, worsens outcomes and long-term prognosis, and increases the cost of care. Furthermore, with so many potential causes, many theories and models have explained the substance use condition and the relationship between substance use and mental disorders. Therefore, there is a need to improve the integration of

proactive and timely substance use and mental health care for children and youth. Since social determinants of health are commonly conceptualized as key risk factors for substance use and mental illness, evidence is needed on the impact of such factors on youth in real-world contexts. This will provide information on the magnitude and scope of the issue of substance use, potentially informing prevention, early intervention, and the development of effective treatment plans to address the needs at different levels and reduce/curb the trajectory of mental health and substance use problems among youth.

Therefore, this dissertation aims to examine the patterns of substance use among a large sample of youth accessing mental health services in Ontario, Canada. Specifically, this research examines:

1) The patterns of substance use among youth in mental health contexts, including clinical and social circumstances associated with substance use;
2) The indicators of marginalization experienced among youth and whether these indicators are associated with substance use, and;
3) Whether marginalization predicts future substance use among youth accessing mental health services in Ontario, Canada

Chapter 2

General Methods

2.1 Materials and Methods

This research project uses cross-sectional and longitudinal study designs to examine the pattern of substance use and its relationship with marginalization indicators among youth in different mental health settings in Ontario.

2.2 Study Sample

The sample comprised youth (12–18 years) assessed in the community residential mental health agencies in Ontario, Canada, with either the interRAI Child Youth Mental Health Assessment (interRAI ChYMH) or the interRAI ChYMH Screener (ChYMH-S) between 1 January 2012 data, and 31 October 2020. Referrals were made to the agencies through family physicians, pediatricians, school personnel, parents, or other allied professionals. As part of the license to use the interRAI ChYMH data, sharing agreements are in place for agencies to submit anonymized data to interRAI Canada at the University of Waterloo.

2.3 Data Source

Data collected by InterRAI Child and Youth Mental Health Assessment (ChYMH) and InterRAI Child and Youth Mental Health Screener (Rapid Screener) was examined for this study. InterRAI Child and Youth Mental Health Assessment (ChYMH) is used as part of the standard of care in many agencies and organizations that provide service to children and youth across Ontario. The ChYMH data has been shared with the University of Waterloo through a data-sharing agreement between interRAI Canada at the University of Waterloo, sites using the assessments in Ontario, and where it is stored on the University of Waterloo server. The interRAI Canada approved the permission to access the data for the duration of the study.

The data are shared with interRAI Canada at the University of Waterloo. All collected non-identifiable data elements are shared with interRAI Canada (all organizations using interRAI Child and Youth instruments sign an agreement to de-identify the data before sending it to interRAI Canada). The source dataset on the interRAI Canada server at the University of Waterloo includes records for cases that meet and do not meet eligibility criteria (e.g., all age groups). In preparing the data for this analysis, SAS code was developed to select only eligible cases for this study to keep only variables of interest.

2.4 Instrument

Data were collected using interRAI ChYMH assessment instruments. interRAI assessments are comprehensive, standardized instruments that are part of the interRAI integrated assessment system. Instruments are based on a semi-structured interview format that supports the collection of a broad range of common mental health problems. Instruments consist of items and definitions that guide structuring a clinical assessment, providing service providers the ability to assess key domains of functioning, mental and physical health, social support, and service utilization.

The assessment includes over 400 items to inform treatment planning, including identification information, intake and initial history, mental state indicators, substance use or excessive behavior, harm to self and others, behavior, strengths and resilience, cognition and executive functioning, independence in daily activities, communication and vision, health conditions, family and social relations, stress and trauma, medications, preventions, service utilization and treatments, nutritional status, education, environmental assessment, diagnostic and other health information, service termination and discharge information. Items in the assessment are completed by trained clinicians overseeing the person's care. Assessors use a semi-structured

interview approach that incorporates all available information, including observation, clinical record review, parent report, and self-report(124). The ChYMH also includes the interRAI Adolescent Supplement Assessment Form. This supplement to the ChYMH is used when assessing youth aged 12 to 17. It includes additional information on substance use or excessive behavior, independence in daily activities, service utilization, and strengths. The interRAI-ChYMH has demonstrated good psychometric properties in clinical settings(125).

The ChYMH-S is a brief screener that provides an initial assessment for early identification, triaging, and prioritizing services. The assessment takes approximately 15–20 min to complete. It includes the following domains: (1) Mental State Indicators (e.g., mood disturbance, anxiety), (2) substance use or excessive behaviour, (3) harm to self and others, (4) behaviour, (5) cognition, communication, and development, (6) stress, trauma, and social relationships, and (7) education. The screener demonstrated strong inter-item reliability on all measured scales and good convergent validity(126).

In addition to these items, this study examined three scales embedded in the ChYMH and the ChYMH-S: Anxiety Scale, Distraction/Hyperactive Scale, and Depression Severity Index. The Anxiety Scale is a seven-item scale that assesses the frequency of several anxiety symptoms (i.e., repetitive anxious concerns, unrealistic fears, obsessive thoughts, compulsive behavior, intrusive thoughts or flashbacks, episodes of panic, and nightmares). The total sum of the frequency of each symptom (4-point scale where 0 = not present to 4 = Exhibited daily in the last 3 days, 3 or more episodes, or continuously) ranges from 0 to 28. Thus, higher scores indicate higher levels of anxiety(125). The Cronbach's alpha for the Anxiety Scale was 0.75 in the current sample. Hyperactive/Distraction Scale is a 4-item scale that assesses the frequency of four facets of distractibility and hyperactivity. That is impulsivity, ease of distraction, hyperactivity, and

disorganization). The total sum of the frequency of each behavior (0 = not present to 4 = Exhibited daily in the last 3 days, 3 or more episodes or continuously) ranges from 0 to 16. Higher scores indicated higher levels of distractibility and hyperactivity(125). The Cronbach's alpha for the Hyperactive/Distraction scale was 0.77 in the current sample. The Depression Severity Scale comprises five items, capturing various depressive expressions of the individual, including sad or pained facial expressions, made negative statements, self-deprecation, expressions of guilt/shame, and hopelessness. Possible scores for each of the items are 0 ("Not present"), 1 ("Present but not exhibited in last 3 days"), 2 ("Exhibited on 1–2 of last 3 days"), and 3 ("Exhibited daily in last 3 days"). Higher scores indicated higher levels of depressive symptoms(127). The Cronbach's alpha for the Depression Severity scale was 0.83 in the current sample. The Cronbach's alphas for the three scales in this study sample were more than 0.7, indicating good internal consistencies.

This assessment is administered by trained professionals and stored/managed by interRAI Canada. interRAI is a non-profit research group committed to improving the quality of life for vulnerable persons. interRAI's goal is to promote evidence-based clinical practice and policy decisions by collecting and interpreting high-quality data about the characteristics and outcomes of persons served across a variety of health and social services settings. These interRAI instruments are a suite of assessment tools with multiple applications, including treatment planning guidelines, outcome measures (scales to evaluate present status or change over time), quality indicators, and resource allocation indicators. The analysis of secondary data from interRAI has been used to inform decision-making at different levels, from front-line planning by healthcare providers to high-level health care policy definition by administrators. Moreover, it is used to develop quality indicators, outcome measures, clinical assessment protocols, and interRAI instrument development and refinement.

2.5 Data Storage

Restrictions apply to the availability of the data analyzed for this study. Like other ethics proposals using interRAI data (e.g., ORE 30173), data will be retained indefinitely in a secure location that is the interRAI Canada data server at the University of Waterloo. As part of the licensing agreement within interRAI, all instruments are provided to agencies, organizations, and facilities free of charge. In return for using the instruments, data from each agency and organization, de-identified data is given to interRAI to improve instruments, develop quality indicators, case-mix systems, and evidence-informed care planning initiatives to improve the care of vulnerable patients populations. However, for this study, investigators would only have access to the data for the duration of this project.

2.6 Variables

Study 1:

Dependent Variable: The primary variable of interest was the use of any substance, including misuse of medication and alcohol, in the 14 to 30 days prior to assessment. The ChYMH Adolescent Supplement assesses the most recent instance a youth reported using a given substance, including opiates, cannabis, cocaine, stimulants, inhalants, hallucinogens, and intentional misuse of prescription or over-the-counter medication. Use is coded if the person used the substance in the three days, seven days, 30 days, one year, and more than one year before assessment. In addition, the ChYMH-S assesses whether the person used substances or intentionally misused prescription or over-the-counter medication in the 14 days before the assessment.

Independent Variables: The interRAI ChYMH and ChYMH-S include a range of clinical, functional, social, and familial variables that were considered in the biopsychosocial model in the examination of factors associated with youth substance use.

Study 2:

The dependent variable was substance use within 14-30 days of assessment.

The ChYMH Adolescent Supplement assesses the most recent instance a youth reported using a given substance, including opiates, cannabis, cocaine, stimulants, inhalants, hallucinogens, and intentional misuse of prescription or over-the-counter medication. Use is coded if the person used the substance in the three days, seven days, 30 days, one year, and more than one year before assessment. Intentional misuse of prescription or over the counter medications and alcohol use were included in substance use.

The primary independent variables were the 12 marginalization indicators (MI) and marginalization indicator sum (MIS). The indicators and dimensions of marginalization that they represent are in Table 4.2.

Covariates: Covariates from prior research (53) examining factors associated with substance use among this sample were considered in the model, including behavioural symptoms, self-injurious ideation/attempt, problematic sexual behaviour, sleep problem, hyperactivity, anxiety symptoms, and depression symptoms. This study did not examine diagnosis due to uncertainty about the reliability of substance use or mental disorder diagnosis among this age group at first assessment.

Study 3:

Dependent Variable: The primary dependent variable was substance use within two years of follow-up. From the instruments, there were several ways that substance use was ascertained. For

youth assessed with the ChYMH Adolescent Supplement, the most recent instance a youth reported using opiates, cannabis, cocaine, stimulants, inhalants, hallucinogens, alcohol, or intentional misuse of prescription or over-the-counter medication is coded if the person used the substance in the three days, seven days, 30 days, one year, and more than one year before assessment. For youth assessed with the ChYMH-S, the item on substance use asks if the person used substances (alcohol, illegal and legal drugs, OTC) within the 14 days before the assessment.

Independent Variables: The main independent variables for this study were marginalization indicators and Marginalization Indicator Sum. The indicators examined in this study represent different dimensions of marginalization relevant to youth. They were chosen based on the result of the previous study among this study population that identified seven common MI within the full ChYMH and CYMH-S. However, only five of the seven MI were significantly associated with substance among this study population. One MI, cognitive/intellectual disability, was negatively associated with substance use among youth, hence not included in this current study. The Marginalization Indicator Sum (MIS) was developed to examine the cumulative impact of four marginalization indicators associated with substance use: having no strong family relationship, having a parent with an addiction/substance use problem, and being a victim of abuse. These marginalization indicators represent different dimensions of marginalization relevant to youth, including social support, resources, victimization, and vulnerability (68,81,86,87,92,157). The MIS was scored by summing these indicators. Two versions of this variable were examined, the full sum ranging from 0 to 4 and a version of the MIS that includes 3 categories (MIS = 0, 1-2, 3 – 4). This category was based on a previous study that shows a similar association with substance use for those that experienced 1 - 2 MI compared to those that reported no MI [RR for MIS-1: 1.4;

RR for MIS-2: 1.5] and those that experienced 3 – 5 MI compared to those that reported no MI [RR for MIS-3 to MIS-5: 2.0](65).

Covariates: Prior research examining factors associated with substance use among this sample considered the following in the models: age, sex, and severity of clinical symptoms. Age was categorized into two (12 – 13 and 14 – 16 years). Only male and female sex were included in this study. The severity of clinical symptoms (anxiety, depression, and hyperactivity) was measured using three scales embedded in the ChYMH and the ChYMH-S: Anxiety Scale, Distraction/Hyperactive Scale, and Depression Severity Index.

Chapter 3

Substance Use among Youth in Community and Residential Mental Health Care facilities in Ontario, Canada

This study is published in the *International Journal of Environment and Public Health*, a special issue on Adolescent Health Risk Behaviors and Mental Health (128)

3.0 Abstract

There is a need to improve the integration of substance use and mental health care for children and youth. This study examines risk and protective factors for substance use among youth with mental health conditions who received community-based or residential care services between 2012 and 2020 in Ontario, Canada. In this study, a cross-sectional design was used to examine patterns and factors associated with substance use among youth (12–18 years) assessed in the community (n = 47,418) and residential (n = 700) mental health care facilities in Ontario, Canada. Youth were assessed with the interRAI Child and Youth Mental Health Assessment (ChYMH). Substance use is identified by any substance use (including alcohol) 14 to 30 days prior to assessment. Logistic regression with generalized estimating equations was used to examine clinical, psychosocial, and environmental factors associated with substance use. This study shows that 22% of youth reported the use of substances in community settings and 37% in residential settings. Older age group (Youth older than 16 years), being a victim of abuse, having experienced self-injurious ideation/attempt, being at risk of disrupted education, and having a parent/caregiver with addiction or substance use disorder were significantly associated with substance use. Several factors reduced the risk of substance use, including being a female, having anxiety symptoms, and having cognition problems. In conclusion, the study found that individual and parental factors increase youth's risk of substance use, highlighting the importance of a holistic approach that includes consideration of social and biological risk factors for prevention/risk reduction, risk assessment, management, and recovery.

3.1 Introduction

Substance use disorders are one of the three most common types of mental illnesses experienced by Canadians, with young people aged 15–24 years having the highest rates of substance abuse or dependence (2). Initiation of substance use may include experimentation or heavier and higher risk patterns of use(3–5). Alcohol has been the most commonly used substance among youth, followed by tobacco, cannabis, and opioids(7,130). School surveys in Canada have reported that up to 60% of students in grades 7–9 reported lifetime use of various substance(131,132). In Ontario, Canada, 75% of youth in grade 12 reported lifetime alcohol use, 26% cannabis, and 26% nicotine(7). Another study that examined current users of substances (use of substances in the last 30 days) shows that among youth in grades 7 to 12 in a general Canadian population sample, 27% reported current use of alcohol, 19% reported cannabis use, and 8% reported other drugs(15). Substance use among youth can have a cumulative impact, contributing to costly social, physical, and mental health problems(3–5,8,9). Substance use conditions are associated with problems such as poor academic performance, job instability, teen pregnancy, the transmission of sexually transmitted diseases, accidents, crimes, violence, overdoses, drug tolerance effects, withdrawal symptoms, and other longer-term physical health issues(9–11). Other problems associated with problematic substance use include loss of interest in social activities, disorganized thinking, reduced problem-solving performance, and social isolation(3–5,8).

The biopsychosocial model provides a comprehensive explanation of the complex interactions that can occur leading to substance use. This model explains that biological, genetic, personality, psychological, cognitive, social, cultural, and environmental factors interact to produce substance use disorder(133). Genetic and biological risks include being children of alcohol-dependent parents or the presence of the alcohol dehydrogenase enzyme and dopamine

D2A1 gene. For instance, a study examining the association between the gene responsible for alcohol dehydrogenase and alcohol use among the Asian population found that those deficient in this enzyme are less likely to use the substance(109). However, not all persons with such predispositions develop problems with substance use. A myriad of other psychosocial factors may promote the use of substances, including individual, familial, social, and environmental factors(25)]. Factors at the individual level include being a male, LGBTQ+, early exposure to traumatic life events, individuals with a family history of a substance use disorder, prenatal exposure to alcohol and other drugs, sleep problems, and co-occurring psychopathology (e.g., ADHD, depression)(3,4,26,27). Social factors include peer substance use and involvement in romantic relationships at an early age(18,38,39). Environmental risks include family dysfunction, lack of parental supervision and monitoring, and being street-involved(3–5,8,9). There are also protective factors, including self-efficacy, social competence, academic achievement, personal and social controls against norm-violating behaviors, church attendance, and sense of morality(16,28,32,40,41,134). Nurturing home environments with open communication and parental support as well as positive school experience and positive peer role models may also be protective(16,28).

Substance use during a young age might disrupt vital developmental transitions as the brain undergoes cognitive, emotional, and psychosocial development(2). In addition, this period also coincides with the onset of a variety of mental health conditions(1,23,31). Neurodevelopmental research has demonstrated that the brains of youth may be more vulnerable to the effects of substances. Hence, they are at risk of developing patterns of behavior that result in substance abuse (continued use regardless of physical or psychosocial problems or dependence) and substance dependence (physiologic dependence demonstrated by withdrawal symptoms or the development

of tolerance to alcohol or other drugs)(3,12,15,24,133,135). These adverse outcomes are particularly concerning for youth who use substances in an attempt to cope with difficult situations such as trauma or victimization due to the dual neurological vulnerability created by traumatic life events and the engagement in substance use(14,17,19–21,28).

There is a consistent relationship between mental health conditions and problematic substance use among youth(16,25–28). Co-occurring mental and substance use conditions are highest among youth aged 15–24 years in Ontario and Canada(3). Substance use is associated with comorbid illnesses such as depression and bipolar disorders, post-traumatic stress disorder, psychotic symptoms, and disruptive behavioral disorders in both in-patient and outpatient settings(22,29,32). For youth with mental health conditions, early initiation of treatment is significantly associated with a reduced likelihood of developing substance use disorders(32).

Mental health and substance-related service use among young people in Ontario, Canada, has increased over time, with about 1 in 6 receiving needed mental health services(30) . Co-occurrence of substance use also interferes with the treatment of and recovery from mental health disorders, thus requiring specific consideration within the treatment plan and the need for integrated health services(120,136). Although best practice promotes the integration of mental health and substance use services, evidence suggests this is rarely the case(137). In Ontario, some historical barriers to integration have included variation in the public funding and administration of youth mental health services and substance use care, as well as variations in the eligibility criteria for services, particularly related to the presence of substance use(111,114,137). Consequently, youth have experienced challenges accessing and navigating services across multiple service sectors in Ontario(111,113,114,138). There are also substantial delays between the onset of mental health or substance use conditions and access to care, with only the severe

cases receiving timely services(139,140). While recent amendments to public policy have been made to the public administration of child and youth mental health services in Ontario(141), gaps often remain in the integration of mental health and substance use care at the provider level. Youth seen in outpatient settings and those admitted into residential/in-patient settings may demonstrate greater clinical complexity and/or higher rates of substance use compared to youth in the general population.

There is a need to improve the early identification of comorbid mental health conditions and modifiable risk factors associated with substance use. This will help to develop early intervention strategies to potentially reduce the risk of developing substance use disorders and the utilization of high-intensity services. Therefore, this study examines individual factors associated with substance use among youth (12–18 years) accessing services in community-based and residential mental healthcare settings in Ontario, Canada.

3.2 Materials and Methods

3.2.1 Study Sample

The sample comprised 48,118 youth (12–18 years) assessed in the community (N = 47,418) or residential (N = 700) mental health agencies in Ontario, Canada, with either the interRAI Child Youth Mental Health Assessment (interRAI ChYMH) or the interRAI ChYMH Screener (ChYMH-S) between 1 January, 2012 data, and 31 October, 2020. Referrals were made to the agencies through family physicians, pediatricians, school personnel, parents, or other allied professionals. Data from the first assessment of all youth were selected for the analyses. As part of the license to use the interRAI ChYMH data, sharing agreements are in place for agencies to submit anonymized data to interRAI Canada at the University of Waterloo.

3.2.2 Instruments

The interRAI ChYMH is used as part of the standard of care in many agencies and organizations that provide service to children and youth across Ontario. The assessment includes over 400 items to inform treatment planning, including identification information, intake and initial history, mental state indicators, substance use or excessive behavior, harm to self and others, behavior, strengths and resilience, cognition and executive functioning, independence in daily activities, communication and vision, health conditions, family and social relations, stress and trauma, medications, preventions, service utilization and treatments, nutritional status, education, environmental assessment, diagnostic and other health information, service termination and discharge information. Items in the assessment are completed by trained clinicians overseeing the care of the person. Assessors use a semi-structured interview approach that incorporates all available information, including observation, review of the clinical record, and parent report as well as self-report(142). The ChYMH also includes the interRAI Adolescent Supplement Assessment Form. This supplement to the ChYMH is used when assessing youth aged 13 to 17. It includes additional information on substance use or excessive behavior, independence in daily activities, service utilization, and strengths. The interRAI-ChYMH has demonstrated good psychometric properties in clinical settings(143).

The ChYMH-S is a brief screener that provides an initial assessment for early identification, triaging, and prioritizing services. Taking approximately 15–20 min to complete, the assessment includes the following domains: (1) Mental State Indicators (e.g., Mood disturbance, Anxiety), (2) Substance Use or Excessive Behaviour, (3) Harm to Self and Others, (4) Behaviour, (5) Cognition, Communication and Development, (6) Stress, Trauma, and Social Relationships, and (7) Education. The screener demonstrated strong inter-item reliability on all measured scales and good convergent validity(126).

3.2.3 Variables

Dependent Variable: The primary variable of interest was the use of any substance, including misuse of medication and alcohol, in the 14 to 30 days prior to assessment. The ChYMH Adolescent Supplement assesses the most recent instance a youth reported using a given substance, including opiates, cannabis, cocaine, stimulants, inhalants, hallucinogens, and intentional misuse of prescription or over-the-counter medication. Use is coded if the person used the substance in the three days, seven days, 30 days, one year, and more than one year before assessment. The ChYMH-S assesses whether the person used substances or intentionally misused prescription or over-the-counter medication in the 14 days before the assessment.

Independent Variables: The interRAI ChYMH and ChYMH-S include a range of clinical, functional, social, and familial variables that were considered in the biopsychosocial model in the examination of factors associated with youth substance use. The biopsychosocial model posits that biological, genetic, personality, psychological, cognitive, social, cultural, and environmental factors interact, leading to the use of substances and substance use disorders(133). Using this model as a framework, variables in the ChYMH and ChYMH-S could be grouped into demographic factors that include age, sex, education, employment, and insurance coverage. Cultural factors included aboriginal identity and if an interpreter was needed to complete the assessment. Clinical characteristics included psychological, personality, and cognitive factors, and psychosocial categories included developmental needs, housing, income and family-related variables, community, and education engagements (See Table 3.1 and Table 1A). However, the psychosocial model of adolescent substance use was preferred because it contains modifiable factors that could be addressed. Therefore, variables for the final model were social factors that are available interRAI assessment instruments.

Table 3.1. Description of independent variables available from the interRAI ChYMH or ChYMH Screener

Categories of Independent Variables	Biopsychosocial Model	Variables
Demographic information	Biological/genetic	Age, gender
Psychosocial needs	Psychosocial	Residential instability, family functioning, social support, education engagement
Environmental factors	Environmental	Hazardous or inhabitable home environment
Clinical characteristics	Psychological, Cognitive, personality	Mental health symptoms, cognition, harm to self, behavior, history of trauma or stress
Interventions		Treatment, control intervention, adherence to treatment, prevention
Service use history		Community mental health agency, residential/in-patient, emergency room

In addition to these items, this study examined three scales embedded in the ChYMH and the ChYMH-S: Anxiety Scale, Distraction/Hyperactive Scale, and Depression Severity Index. The Anxiety Scale is a seven-item scale that assesses the frequency of several anxiety symptoms (i.e., repetitive anxious concerns, unrealistic fears, obsessive thoughts, compulsive behavior, intrusive thoughts or flashbacks, episodes of panic, and nightmares). The total sum of the frequency of each symptom (4-point scale where 0 = not present to 4 = Exhibited daily in last 3 days, 3 or more episodes or continuously) ranges from 0 to 28. Thus, higher scores indicate higher levels of anxiety(143). The Cronbach's alpha for the Anxiety Scale was 0.75 in the current sample. Hyperactive/Distraction Scale is a 4-item scale that assesses the frequency of four facets of distractibility and hyperactivity. That is impulsivity, ease of distraction, hyperactivity, and disorganization). The total sum of the frequency of each behavior (0 = not present to 4 = Exhibited daily in the last 3 days, 3 or more episodes or continuously) ranges from 0 to 16. Higher

scores indicated higher levels of distractibility and hyperactivity(143). The Cronbach's alpha for the Hyperactive/Distraction scale was 0.77 in the current sample. The Depression Severity Scale is comprised of five items, capturing various depressive expressions of the individual, including sad or pained facial expressions, made negative statements, self-deprecation, expressions of guilt/shame, and hopelessness. Possible scores for each of the items are 0 ("Not present"), 1 ("Present but not exhibited in last 3 days"), 2 ("Exhibited on 1–2 of last 3 days"), and 3 ("Exhibited daily in last 3 days"). Higher scores indicated higher levels of depressive symptoms(144). The Cronbach's alpha for the Depression Severity scale was 0.83 in the current sample. The Cronbach's alphas for the three scales in this study sample were more than 0.7, indicating good internal consistencies.

3.2.4 Analytic Approach

Separate analyses were done for the residential and community datasets. Descriptive analysis of the study population performed includes frequency and percentages for categorical data for both settings. Bivariate relationships between the independent variables and substance use were examined using chi-square analyses due to the categorical nature of the data.

Modified Poisson GEE regression model was used to estimate the effect size of the association between the independent variables and substance use for variables with significant bivariate associations to estimate the relative risk for community and residential datasets. Regression models using GEE are considered marginal, or population-averaged, models that account for clustering of observations (i.e., correlation of responses) within organizations by including organization identification number (ID) as a source of random error in each model(145–147). The GENMOD Procedure in the Statistical Analysis Software version 9.4 was used to assess the risk ratio with a 95% confidence interval using a REPEAT statement to specify the GEE

procedure. The organization ID in the ChYMH dataset was entered as the clustering variable using the Subject option (subject identifier). The independent correlation structure assumes that each individual and individual subject is independent(148).

The variables were entered in blocks into the model (e.g., biological factors, psychosocial factors, environmental factors, and clinical factors). Different combinations of the independent variables were examined to rule out order-of-entry, deletion effects, and multicollinearity(148,149). For inclusion in the final risk model, variables needed to be statistically related to substance use (i.e., parameter estimates with p-values less than 0.01) with risk ratios greater than 1.3 or below 0.77.

Many methods to evaluate the goodness of fit for GEE regression models have been proposed in simulation studies(150,151). For instance, the goodness of fit statistics QIC and QICu can compare the models' strengths with lower QIC and QICu values indicating better model performance(151). However, these methods are not routinely implemented in SAS output, and consensus on the goodness of fit statistic for GEE models has not been established. Therefore, final risk models using GEEs identified in the ChYMH dataset were subjected to logistic regression. Using logistic regression, the model's discriminatory power was evaluated using the c statistic(152). The c statistic measures how well the model discriminates those who experience an event (e.g., outcome) from those who do not(153). For example, a c statistic of 0.5 indicates the model is no more discriminating than chance, while a statistic of 1.0 indicates perfect discriminatory power.

3.3 Results

3.3.1 Descriptive and clinical characteristics of the community and residential sample

Descriptive and clinical characteristics of the community and residential sample are in Table 3.2. The community sample was predominantly female (60.4%), while just over half of the residential sample were male (53.9%). About a third of youth in the community sample were victims of physical, sexual, or emotional abuse (36.4%) compared to 59.0% within the residential sample. The majority of youth assessed in the residential and community settings had contacts with community mental health agencies or professionals prior to assessment, 87% and 69%, respectively.

There were several differences in clinical characteristics among males and females in the community agencies. For instance, a larger proportion of females reported self-injurious ideation (67.7%), anxiety (87.1%), and abuse (41.0%), compared to males (43.7%, 76.1%, and 29.3%, respectively). Alternatively, a higher proportion of males experienced behavioral symptoms (62.9%) and cognitive problems (23.6%) compared to females (49.6% and 13.4%, respectively). In the residential settings, a higher proportion of females reported a lack of strong family support (40.6%), having a parent with MH issues (53.9%), history of self-injurious ideation/attempt (79.6%), abuse (63.5%) and anxiety (81.1%) compared to males (28.4%, 46.4%, 6.4%, 53.3%, 55.2%, and 73.7% respectively). More males experienced cognitive problems (54.9%), and HDS (91.0%) compared to females (26.0%, 36.8%, and 85.2%, respectively). The proportion of youth who reported any substance use in the 14–30 days before the assessment was larger in the residential settings (37.1% females and 36.9% males) than in the community setting (22.1.0% females and 22.5% males).

Table 3.2. Characteristics of the study population

		Community Total (N = 47,418)		Male (n = 18,790)		Female (n = 28,628)		Residential Total (N = 700)		Male (n = 377)		Female (n = 323)	
Characteristics	**Level**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Instrument	ChYMH-S	38,972	82.2					4	0.6				
	ChYMH	8446	17.8					694	99.4				
Sex	Male	18,790	39.6					377	53.9				
	Female	28,628	60.4					323	46.1				
Age group	12–14	13,623	28.7	6350	33.8	7273	25.4	178	25.4	107	28.4	71	22.0
	15–16	18,149	38.3	6782	36.1	11,367	39.7	302	43.1	158	41.9	144	44.6
	17–18	15,646	33	5658	30.1	9988	34.9	220	31.4	11	29.7	108	33.4
Risk of disrupted education	Yes	27,580	58.6	11,859	63.6	15,721	55.2	417	61.6	236	65	181	57.6
	No	18,934	40.2	6503	34.9	12,431	43.7	238	35.2	111	30.6	127	40.5
	Not applicable	582	1.2	277	1.5	305	1.1	22	3.2	16	4.4	6	1.9
No Strong and supportive relationship with family	Yes	8542	18	2958	15.7	5584	19.5	238	34	107	28.4	131	40.6
	No	38,876	82	15,832	84.3	23,044	80.5	462	66	270	71.6	192	59.4
Parent/caregiver has mental health issue	Yes	17,150	36.2	6423	34.2	10,727	37.5	349	49.9	175	46.4	174	53.9
	No	30,268	63.8	12,367	65.8	17,901	62.5	351	50.1	202	53.6	149	46.1
Parental addiction/substance use	Yes	7537	20.1	3531	18.8	6006	21	279	39.9	153	40.6	126	39
	No	37,881	79.9	15,259	81.2	22,622	79	421	60.1	224	59.4	197	61
	≥5	1719	3.6	681	3.6	1038	3.6	43	6.1	23	6.1	20	6.2
Use of any substance in the last 14–30 days	Yes	10,587	22.3	4150	22.1	6437	22.5	259	37	139	36.9	120	37.1
	No	36,831	77.7	14,640	77.9	22,191	77.5	441	63	238	63.1	203	62.9
Behavior symptom	Yes	26,014	54.9	11,821	62.9	14,193	49.6	579	82.7	332	88.1	247	76.5
	No	21,404	45.1	6969	37.1	14,435	50.4	121	17.3	45	11.9	76	23.5
Self-injurious ideation or attempt	Yes	27,605	58.2	8217	43.7	19,388	67.7	458	65.4	201	53.3	257	79.6
	No	19,813	41.8	10,573	56.3	9240	32.3	242	34.6	176	46.7	66	20.4

		Community Total (N = 47,418)		Male (n = 18,790)		Female (n = 28,628)		Residential Total (N = 700)		Male (n = 377)		Female (n = 323)	
Characteristics	**Level**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Problematic sexual behavior	Yes	2683	5.7	954	5.1	1729	6	74	10.6	39	10.3	35	10.8
	No	44,735	94.3	17,836	94.9	26,899	94	626	89.4	338	89.7	288	89.2
Victim of abuse	Yes	17,247	36.4	5505	29.3	11,742	41	413	59	208	55.2	205	63.5
	No	30,171	73.6	13,285	70.7	16,886	59	287	41	169	44.8	118	36.5
Distraction and hyperactivity scale	0-None	9550	20.1	3056	16.3	6494	22.7	82	11.7	34	9	48	14.9
	1-Low	28,063	59.1	10,692	56.9	17,371	60.7	403	57.6	207	54.9	196	60.7
	2-Moderate	3719	7.8	1685	9	2034	7.1	61	8.7	34	9	27	8.4
	3-High	3023	6.4	1570	8.4	1453	5.1	78	11.4	56	14.9	22	6.8
	4-Very high	3063	6.5	1787	9.5	1276	4.4	76	10.9	46	12.2	30	9.3
Anxiety scale	0-None	8145	17.2	4484	23.9	3661	12.8	160	22.9	99	26.3	61	18.9
	1-Low	13,262	28	5751	30.6	7511	26.2	191	27.3	109	28.9	82	25.4
	2-Moderate	16,275	34.3	5844	31.1	10,431	36.4	204	29.1	107	28.4	97	30
	3-High	7839	16.5	2269	12.1	5570	19.4	105	15	54	14.3	51	15.8
	4-Very high	1897	4	442	2.3	1455	5.1	40	5.7	8	2.1	32	9.9
Depression severity Index	0-None	1921	4.1	993	5.3	928	3.2	40	5.7	24	6.4	16	5
	1-Low	20,186	42.6	9362	49.8	10,824	37.8	304	43.4	191	50.7	113	35
	2-Moderate	12,675	26.7	4828	25.7	7847	27.4	176	25.1	89	23.6	87	26.9
	3-High	5356	11.3	1708	9.1	3648	12.7	67	9.6	33	8.7	34	10.5
	4-Very high	7280	15.3	1899	10.1	5381	18.8	113	16.2	40	10.6	73	22.6
Sleep problem	Yes	29,868	63	10,853	57.8	19,015	66.4	415	59.3	222	58.9	193	59.8
	No	17,550	37	7937	42.2	9613	33.6	285	40.7	115	41.1	130	40.2
Cognitive problem	Yes	8254	17.4	4429	23.6	3825	13.4	326	46.6	207	54.9	119	36.8
	No	39,164	82.6	14,361	76.4	24,803	86.6	374	53.4	170	45.1	204	63.2

		Community Total (N = 47,418)		Male (n = 18,790)		Female (n = 28,628)		Residential Total (N = 700)		Male (n = 377)		Female (n = 323)	
Characteristics	**Level**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Last contact with CMH agency in the last year	No contact	14,973	31.6	6600	35.1	8373	29.2	91	13.2	47	12.7	44	13.7
	≥31	10,897	23	4435	23.6	6462	22.6	153	22.1	85	23	68	21.2
	≤30	21,547	45.4	7754	41.3	13,793	48.2	447	64.7	238	64.3	209	65.1

3.3.2 Pattern of substance use among youth assessed in community and residential settings

Bivariate analyses of factors associated with substance use in the 14–30 days prior to assessment for the community sample are shown in Tables 3.3 and 3.4 for the residential sample. While most variables had a significant bivariate association in community settings, variables associated with substance use in residential settings were limited to age, self-injurious ideation/attempt, behavioral symptoms, cognitive problem, being a victim of abuse, being at risk of disrupted education, lack of family support, and having parent/caregiver with SUD. There was no statistically significant difference in the proportion of males compared to females that have used substances in the last 14–30 days in the community (bivariate OR = 1.02, 95% CI: [0.98, 1.07]; p-value = 0.31) and residential (bivariate OR = 1.01, 95% CI: [0.74, 1.38]; p-value = 0.94) settings. However, the proportion of youth who used substances significantly increased as youth age increased. In the community setting, the proportion of youth who used substances increased with age from 5.0% of youth aged 12–14 to 36.8% of youth aged 17–18. In the residential setting, the proportion of youth who used substances increased from 16.0% among youth aged 12–14 to 49.6% of youth aged 17–18. This pattern of substance use across age categories was similar among males and females in both community and residential settings. However, the proportion increased more by age for females compared to males.

Table 3.3. Pattern of substance use among youth assessed in community settings stratified by gender

		Total Community Sample				Males (n=18,780)			Females (n=28,628)		
Characteristics	Level	n	%	X^2	p-value	n	%	p-value	n	%	p-value
Sex	Male	4150	22.1	1.04	0.308						
	Female	6437	22.5								
Age group	12–14	683	5.0	4255.86	<0.0001	263	4.1	<0.0001	420	5.8	<0.0001
	15–16	4141	22.8			1652	24.4		2489	21.9	
	17–18	5763	36.8			2235	39.5		3528	35.3	
Contact with CMH	No contact in the last year	2823	18.9	172.06	<0.0001	1400	21.2	0.01	1423	17	<0.0001
	31+ days	2450	22.5			953	21.5		1497	23.2	
	30 days or less	5314	24.7			1797	23.2		3517	25.5	
Distraction and hyperactivity scale	0-None	1305	13.7	597.13	<0.0001	462	15.1	<0.0001	843	13	<0.0001
	1-Low	6614	23.6			2487	23.3		4127	23.8	
	2-Moderate	1104	29.7			445	26.4		659	32.4	
	3-High	805	26.6			379	24.1		426	29.3	
	4-Very high	759	24.8			377	21.1		382	29.9	
Anxiety Scale	0-None	1753	21.5	134.17	<0.0001	1052	23.5	0.032	701	19.2	<0.0001
	1-Low	2707	20.4			1243	21.6		1464	19.5	
	2-Moderate	3573	22.0			1255	21.5		2318	22.2	
	3-High	1991	25.4			487	21.5		1504	27	
	4-Very high	563	29.7			113	25.6		450	30.9	
Depression severity Index	0-None	317	16.5	758.76	<0.0001	188	18.9	<0.0001	129	13.9	<0.0001
	1-Low	3623	18.0			1831	19.6		1792	16.6	
	2-Moderate	2852	22.5			1064	22		1788	22.8	
	3-High	1422	26.6			483	28.3		939	25.7	
	4-Very high	2373	32.6			584	30.8		1789	33.3	

Sleep problem	No	3300	18.8	199.47	<0.0001	1527	19.2	<0.0001	1773	18.4	<0.0001
	Yes	7287	24.4			2623	24.2		4664	24.5	
Self-injurious ideation or attempt	No	2865	14.5	1214.5	<0.0001	1868	17.7	<0.0001	997	10.8	<0.0001
	Yes	7722	28.0			2282	27.8		5440	28.1	<0.0001
Behavior symptom	No	3690	17.2	614.59	<0.0001	1250	17.9	<0.0001	2440	16.9	<0.0001
	Yes	6897	26.5			2900	24.5		3997	28.2	
Problematic sexual behavior	No	7547	21.3	442.98	<0.0001	3892	21.8	0.0002	5655	21.0	<0.0001
	Yes	1040	38.8			258	27		782	45.2	
Cognitive problem	No	9299	23.7	260.42	<0.0001	3530	24.6	<0.0001	5769	23.3	<0.0001
	Yes	1288	15.6			620	14		668	17.5	
Victim of abuse	No	5073	16.8	1453.67	<0.0001	2499	18.8	<0.0001	2574	15.2	<0.0001
	Yes	5514	32.0			1651	30		3863	32.9	
No Strong family relationship	No	7577	19.5	1001.43	<0.0001	3067	19.4	<0.0001	4510	19.6	<0.0001
	Yes	3010	35.2			1083	36.6		1927	34.5	
Parental addiction/substance abuse	No	7207	19.0	1183.86	<0.0001	2933	19.2	<0.0001	4274	18.9	<.0001
	Yes	3380	35.4			1217	34.5		2163	36	
Parent with MH issue	No	6253	20.7	134.29	<0.0001	2655	21.5	0.005	3598	20.1	<.0001
	Yes	4334	25.3			1495	23.3		2839	26.5	
Risk of disrupted education	No	2795	14.8	1042.04	<0.0001	991	15.2	<0.0001	1804	14.5	<.0001
	Yes	7545	27.4			3038	25.6		4507	28.7	
	NA	168	28.9			79	28.5		89	29.2	

Table 3.4. Pattern of substance use among youth assessed in residential settings stratified by gender.

		Total Residential Sample				Male (N = 377)				Female (N = 323)			
		n	%	X^2	p-Value	n	%	X^2	p-Value	n	%	X^2	p-Value
Sex	Male	139	36.9	0.006	0.94								
	Female	120	37.2										
Age group	12–14	29	16.3	48.82	<0.0001	20	18.7	24.1	<0.0001	9	12.7	25.39	<0.0001
	15–16	121	40.1			63	39.9			58	40.3		
	17–18	109	49.6			56	50.0			53	49.1		
Contact with Community Mental Health in Prior Year	No contact	31	34.1	2.09	0.35	24	51.1	5.06	0.08	7	15.9	11.21	0.004
	31+ days	51	33.3			27	31.8			24	35.3		
	30 days or less	175	39.2			86	36.1			89	42.6		
Distraction/hyperactivity scale	0-None	30	36.6	3.15	0.53	13	38.2	6.35	0.18	17	35.4	5.75	0.22
	1-Low	152	37.7			86	41.6			66	33.7		
	2-Moderate	27	44.3			12	35.3			15	55.6		
	3-High	27	34.6			17	30.4			10	45.5		
	4-Very high	23	30.3			11	23.9			12	40.0		
Anxiety Scale	0-None	77	48.1	11.83	0.02	56	56.6	23	0.0001	21	34.4	4.07	0.4
	1-Low	61	31.9			33	30.3			28	34.2		
	2-Moderate	69	33.8			33	30.8			36	37.1		
	3-High	39	37.1			14	25.9			25	49.0		
	4-Very high	13	32.5			*				10	31.3		
Depression severity Index	0-None	16	40	1.15	0.89	11	45.8	5.02	0.29	5	31.3	4.52	0.34
	1-Low	111	36.5			76	39.8			35	31.0		
	2-Moderate	65	36.9			26	29.2			39	44.8		
	3-High	28	41.8			14	42.4			14	41.2		
	4-Very high	39	34.5			12	30.0			27	37.0		

Sleep problem	No	95	33.3	2.77	0.1	55	35.5	0.2	0.64	40	30.8	3.8	0.05
	Yes	164	39.5			84	37.8			80	41.5		
Self-injurious ideation or attempt	No	64	26.5	17.67	<0.0001	58	33.0	2.17	0.14	6	9.1	27.97	<0.0001
	Yes	195	42.6			81	40.3			114	44.4		
Behaviour symptom	No	32	26.5	6.99	0.008	15	33.3	0.27	0.6	17	22.4	9.3	0.002
	Yes	227	39.2			124	37.4			103	41.7		
Problematic sexual behaviour	No	231	36.9	0.03	0.88	130	38.5	3.56	0.06	101	35.1	4.93	0.03
	Yes	28	37.8			9	23.1			19	54.3		
Cognitive problem	No	170	45.5	24.63	<0.0001	85	50.0	22.93	<0.0001	85	41.7	4.83	0.028
	Yes	89	27.3			54	26.1			35	29.4		
Victim of abuse	No	68	23.7	36.95	<0.0001	43	25.4	17.18	<0.0001	25	21.1	20.3	<0.0001
	Yes	191	46.3			96	46.1			95	46.3		
No Strong family relationship	No	147	31.8	15.65	<0.0001	87	32.2	8.83	0.003	60	31.3	7.06	0.008
	Yes	112	47.1			52	48.6			60	45.8		
Parental addiction/substance abuse	No	122	29.0	29.16	<0.0001	62	27.7	20.03	<0.0001	60	30.5	9.69	0.002
	Yes	137	49.1			77	50.3			60	47.6		
Parent with MH issue	No	130	37.0	0	0.98	76	37.6	0.11	0.745	54	36.2	0.1	0.75
	Yes	129	37.0			63	36.0			66	37.9		
Risk of disrupted education	No	55	23.1	28.18	<0.0001	22	19.8	18.68	<0.0001	33	26.0	10.5	0.005
	Yes	180	43.2			101	42.8			79	43.7		
	NA	11	50.0			8	50.0			*	*		

3.3.3 Factors Associated with Substance Use among Youth Assessed in Outpatient and in-Patient Mental Health Agencies in Ontario

Table 3.5 shows the results of the GEE models showing factors associated with substance use among the total samples and by gender in community and residential mental health settings. Only variables that were statistically significant are shown in the models. Among youth assessed in the community (N = 47,418), holding all other variables constant, the relative risk of substance use is significantly lower among females compared to males (RR = 0.87, 95% CI: [0.82, 0.93]). Contact with mental health agencies, sleep problems, DSI, and having parents/caregivers with mental health issues were not significantly associated with substance use in the community sample. Factors associated with a decreased relative risk of substance use include being female, having anxiety symptoms (ANX Scale), and cognition problems were associated with reduced risk of substance use in the community sample.

In residential/inpatient settings (N = 700), similar factors to those in the community sample were associated with substance use (See Table 2.5). However, several factors not associated in the residential setting include being female (RR = 0.91, 95% CI: [0.71, 1.16]), parent mental health issue (RR = 0.92; 95% CI: [0.76, 1.12]), no strong family relationship (RR = 1.11, 95% CI: [0.93, 1.33]), behavioral symptoms (RR = 1.33, 95% CI: [0.98, 1.82]), problematic sexual behavior (RR = 1.11, 95% CI: [0.75, 1.64]), sleep problem (RR = 1.15, 95% CI:[0.93, 1.42]), DSI, hyperactivity and distractibility symptoms and anxiety scales include 1:00 (no difference in risk).

Table 3.5. Multivariate logistic regression models using generalized estimating equations (GEE) to examine factors associated with substance use among the community and residential settings, by gender.

	Community			Residential
	Total Sample Model	**Male Model**	**Female Model**	**Total Sample Model**
Variables	RR (95% CI)	RR (95% CI)	RR (95% CI)	RR (95% CI)
Sex (Ref = M)	0.88 (0.28, 0.94)			
Age Category				
12–14 (Reference)				
15–16	4.19 (3.61, 4.85)	5.63 (4.81, 6.59)	3.28 (2.81, 3.84)	2.11 (1.56, 2.85)
17–18	6.50 (5.53, 7.64)	8.96 (7.65, 10.5)	5.03 (4.23, 5.99)	2.52 (1.73, 3.65)
Risk of disrupted education:				
None (Reference)				
Yes	1.46 (1.35, 1.57)	1.39 (1.24, 1.56)	1.48 (1.39, 1.57)	1.89 (1.37, 2.61)
Not Applicable	1.35 (1.15, 1.60)	1.31 (1.07, 1.61)	1.35 (1.11, 1.64)	1.88 (1.22, 2.90)
Hyperactivity and Distractibility Scale				
None (Ref)				
Low	1.38 (1.26, 1.50)	1.37 (1.23, 1.51)	1.35 (1.23, 1.49)	
Moderate	1.58 (1.40, 1.79)	1.61 (1.39, 1.87)	1.53 (1.35, 1.74)	
High	1.57 (1.39, 1.77)	1.64 (1.43, 1.88)	1.49 (1.30, 1.70)	
Very high	1.59 (1.42, 1.78)	1.64 (1.42, 1.90)	1.55 (1.34, 1.78)	
Anxiety: None (Ref)				
Low	0.82 (0.78, 0.88)	0.83 (0.78, 0.89)	0.85 (0.79, 0.92)	0.60 (0.45, 0.80)
Moderate	0.75 (0.69, 0.82)	0.75 (0.69, 0.83)	0.78 (0.71, 0.86)	0.62 (0.48, 0.79)
High	0.71 (0.65, 0.77)	0.65 (0.57, 0.73)	0.76 (0.70, 0.83)	0.74 (0.51, 1.06)
Very high	0.69 (0.63, 0.75)	0.64 (0.53, 0.76)	0.73 (0.66, 0.80)	0.62 (0.38, 1.0)
Self injurious ideation or attempt	1.46 (1.34, 1.60)	1.25 (1.16, 1.36)	1.75 (1.56, 1.97)	1.55 (1.17, 2.06)
Behaviour symptom	1.36 (1.27, 1.44)	1.39 (1.27, 1.52)	1.31 (1.23, 1.39)	
Problematic sexual behaviour	1.39 (1.32, 1.46)	1.13 (1.02, 1.24)	1.51 (1.44, 1.58)	
Cognitive problem	0.70 (0.64, 0.77)	0.65 (0.58, 0.72)	0.77 (0.70, 0.85)	0.66 (0.52, 0.84)
Victim of abuse	1.27 (1.20, 1.34)	1.16 (1.09, 1.23)	1.34 (1.26, 1.43)	1.46 (1.19, 1.78)
No Strong family relationship	1.24 (1.17, 1.30)	1.31 (1.22, 1.41)	1.20 (1.13, 1.27)	
Parental addiction/substance abuse	1.45 (1.38, 1.52)	1.48 (1.37, 1.61)	1.40 (1.32, 1.47)	1.35 (1.11, 1.65)
Parent with MH issue			1.07 (1.02, 1.23)	

3.4 Discussion

This study demonstrates the clinical complexity of youth who use substances and those who may require substance use treatment in the community and residential clinical settings across Ontario, Canada. Interestingly, the pattern of substance use among youth in community mental health setting is different than those in the general population. For instance, among youth in grades 7 to 12 in a general Canadian population sample, 27% reported current use (use in the last 30 days) of alcohol, 19% reported current cannabis use, and 8% reported other drugs(15), while this study shows that 11% of youth in the community mental health settings reported current alcohol use. Furthermore, the proportion of youth who reported use of illicit drugs is lower in the general population (8%) than community mental health (interRAI ChYMH) sample (17%), and 22% of youth in the community sample reported current use of any substance (including alcohol, cannabis, illicit drugs, and misuse of prescribed or over the counter medications). The nature of the items on the interRAI ChYMH-Screener, representing the majority of the sample, limited the ability to assess lifetime use of substances and alcohol. As might be expected, results from the residential sample confirmed that substance use is much more common among youth experiencing severe mental health concerns than those in the community sample in this study and general population samples from prior literature.

Understanding the reasons for substance use among youth can be challenging, as suggested by the biopsychosocial model of substance use and the wide range of psychosocial factors associated with substance use(25,133). Although the results of this study are cross-sectional, the findings do offer insights into a range of circumstances that may be related to youth substance use. This study found that individual, familial, social, and environmental factors contribute to the risk of substance use among youth. Most factors associated with substance use were similar across

clinical settings. This study found that several clinical variables that were statistically significant in the community were not significant for the residential sample. These included time since contact with CMHA, hyperactivity/distractibility symptoms, sleep problems, problematic sexual behavior, and having a parent with a mental health problem. However, we could not examine these differences extensively due to a lack of statistical power of the small sample size in the residential sample. Also, some of the differences may be due to the rarity of the clinical symptoms among children and youth (e.g., problematic sexual behavior). Furthermore, the difference may be related to the case-mix of youth admitted into residential care. For instance, barriers regarding access to care in the community may delay timely help-seeking resulting in complicated cases in need of urgent care or direct admission to residential care.

This study found that females (60.2% of the sample population) were more commonly assessed compared to males (39.8%) in the community settings, but more males (53.9%) than females (46.1%) in the residential settings. While there was no significant difference in the proportion of males and females who used any substance in community and residential settings, this study showed that females were more likely than males to report alcohol use and misuse of prescription or over-the-counter medication. In contrast, males were more likely than females to use illicit drugs. In the community sample for this study, the proportion of youth using substances was almost identical between males and females. However, after controlling for other variables, the relative risk of substance use was significantly lower among females compared to males. While the patterns of substance use were similar by sex, it is crucial to consider other unique factors related to substance use among youth of each sex. For example, we know that the brain, hormones, and metabolic systems differ between males and females, such as differences in body weight and metabolism of substances such as alcohol(154). These differences may relate to the experiences

and effects induced by drugs among each sex. For instance, the differences in the subjective effects (adverse or rewarding) experienced by males and females may affect the continued use of substances. Also, males are more likely than females to engage in risky behaviors, including substance use, in anticipation of perceived social rewards or peers' influence. Other factors that could be influencing this association include parental factors like gender, caregiving capacity, and substance use or addiction. This finding is important to consider within clinical practice and public health. For instance, substance use screening and counseling could be mandatory for prevention and early interventions for boys.

This study shows that substance use was common, particularly among those of older age and in residential settings. While the pattern of substance use by age was similar for male and female youths in the community and residential settings, the proportion of substance use by age categories increased more for females than males in the residential settings. The relationship between age and substance use observed in this study was not surprising but underscored the potential utility of this study's findings for early intervention. Previous studies have also shown a strong association between the onset of substance use and the development of substance use disorder later in life(155). For instance, excessive and early initiation of substances like cannabis increases the risk of schizophrenia among young adults(155). This association highlights the importance of early prevention efforts to reduce potential risky behaviors and long-term adverse health effects. The finding that a subset of youth aged 12–14 used substances shows that prevention and intervention should also target younger age groups (i.e., less than 12 years).

The finding that parental mental health status was related to substance use reinforces prior literature demonstrating strong associations between genetic/familial factors and substance use(156,157). Therefore, early and comprehensive interventions among youth with a history of

parental substance issues could prevent future use. For instance, children of alcohol-dependent parents were more likely to use a substance(158,159). While children of parents deficient in alcohol dehydrogenase enzyme and dopamine D2A1 gene are less likely to use the substance. Environmental factors like parental substance use and permission of substance use in the home increase the likelihood of offspring substance use. Parents that use substances could be modeling this behavior to their offspring or permit them to use substances under their supervision. Parents with substance use disorder may also lack the capacity to supervise or adequately parent their children. Therefore, care planning for this population should be based on multidimensional approaches that focus on the importance of intervening across multiple levels of socialization, including parents. For instance, parents should be engaged in the care planning and treatment of youth at risk or with substance use issues.

The results of this study reinforce prior theories on the roles that psychosocial factors like family and school experience play in substance use among youth, emphasizing the importance of their engagement in the prevention of substance use among young people. Strong parental/family support was found to be a protective factor against substance use among youth in this study, as were positive school experience and academic achievement. This study shows that even youth who were not at risk of disrupted education because they were homeschooled were more likely to use substances than those in school and at risk of disrupted education. This finding shows the importance that school enrollment may play in substance use. Perhaps the school environment provides social structure and engagement and a network for monitoring youth health behaviors even in light of existing mental health concerns. There is a need for further research on this finding.

Strong clinical predictors of substance use among this study sample include Hyperactive/Distraction, having a history of self-injurious ideation/attempt, and exposure to or

experienced traumatic life events (physical, sexual, and emotional abuse). Substance use may precede psychopathologies, as youth who use substances may engage in risky behavior that increases their risk of experiencing trauma leading to PTSD(33). Psychopathology may precede youth substance use. For instance, youth with a behavioral or psychological problem may have impaired learning or impulsivity, leading to an inability to conceptualize the consequences of substance use. They may also be experiencing school failure leading to associations with deviant peers and self-medication. Also, the association between youth substance use and these clinical predictors may be due to shared vulnerability of genetic predisposition and childhood psychosocial factors. However, in contrast to some previous studies, anxiety symptoms and cognitive impairment were associated with reduced risk of substance use among male and female youths in the community sample after controlling for other factors.

3.5 Limitations

This study is cross-sectional; therefore, these results should be interpreted with care since it did not test temporality or establish causality. Also, study sample selection was biased since only those referred to service providers were assessed. Furthermore, this study examined a small sample size for the residential sample, limiting the confidence of this study's conclusions about the findings. In addition, this study did not examine peer support which is another important factor considered in youth substance use. There is also no data on tobacco use or the types, dose, mode of administration, and frequency of substance use. In addition, this study did not examine the association between gender (socially determined roles) and substance use or the association between the sex of youth with substance use conditions and the treatment they receive. Finally, this study did not examine family structure or the sex of the parent/caregiver who used substances

to see if the pattern is similar (i.e., the male to female ratio of parents/caregivers who use substances).

3.6 Implications for Research and Practice

There are some important opportunities for future research to build upon from this study's findings. Given the cross-sectional nature of this study, there is a need to develop prospective cohort studies to examine how early childhood factors and experiences may relate to the initiation or continuation of substance use, particularly following first contact with health services. The broad use of the interRAI ChYMH in several jurisdictions will afford opportunities to identify these cohorts and examine changes and outcomes over time in relation to substance use. Further information about the dose and frequency of substance use will enhance the rigor of these longitudinal studies, such as using the interRAI Addictions Supplement to the ChYMH instrument. Qualitative studies will complement these longitudinal studies to explore with youth, and their families or caregivers, reasons for substance use and factors that they feel could be leveraged to prevent future substance use.

There are several opportunities for future research to address limitations in the sex and gender analysis of substance use in this study. Considering this study's patient type and setting (mental health), patterns of substance use by sex may have been subject to other factors not measured in this study (e.g., types of drugs). For instance, this study did not examine the association between gender (socially determined roles) and substance use or the association between the sex of youth with substance use conditions and the treatment they receive. Finally, this study did not examine family structure or the sex of the parent/caregiver who uses substances to see if the pattern is similar (i.e., the male to female ratio of parents/caregivers who use substances).

The different pattern of substance use among youth in the community and residential settings shows that care providers could intensify their efforts to identify and treat substance use conditions (initiation or disorder) among youth with less severe symptoms at first contact in all settings. Furthermore, based on the differences identified in the residential and community settings, treatments in the community setting could focus more on early identification, intervention, and monitoring, while the focus of treatment in the residential setting may be more about in-patient treatment and harm reduction. Also, comprehensive mental health assessment, including substance use assessment, should be completed for all youths seen in outpatient or residential settings at first contact. Substance use should also be considered within mental health treatment. Failure to treat mental health conditions that co-occur with substance use conditions and vice versa due to fragmented services would increase the burden on youth seeking treatment, leading to intensive treatment needs and premature termination, resulting in poor outcomes.

3.7 Conclusions

Individual and parental factors increase youth's risk of substance use, highlighting the importance of a holistic approach to prevention/risk reduction, risk assessment, management, and recovery. There is no single cause of problematic substance use among youth. This study shows that exposure to traumatic life events, history of self-injurious ideation, parental substance use, and negative school experiences are strong predictors of substance use among youth. In contrast, a strong and supportive relationship with family is a protective factor. These results show that psychopathology and social factors (especially family and school) are extremely important in preventing and treating substance use among youth. Therefore, the prevention of substance use will require collaboration among many sectors of society.

Chapter 4

Understanding the Vulnerabilities of Youth Experiencing Marginalization, Substance Use and Mental Health Conditions Through a Social Determinants of Health Lens.

Intended for publication in the *International Journal of Social Psychiatry*

4.0 Abstract

Background: Co-occurring mental and substance use conditions are highest among youth aged 15–24 years in Ontario and Canada. Social circumstances, including the exposure to indicators of marginalization, have a significant impact on mental illness and substance use problems and the quality and outcome of care. However, previous research has either examined the relationship between social factors and mental illness or social factors and substance use among youth, but rarely on co-occurring mental and substance use problems among youth. And those studies are limited by sample size and social dimensions examined (age, sex, and family income). Furthermore, limited research has examined these associations specifically among youths in different mental health care facilities in Ontario, Canada.

Purpose: This study aims to examine if youth who experienced marginalization are more likely to use substances compared to those that did not experience marginalization. The first part of this study examines if specific indicators of marginalization are associated with the risk of substance use among youth living with mental health conditions. The second part examines the cumulative effect of marginalization on substance use among the study population.

Methods: This study uses a cross-sectional study design to examine how the exposure to indicators of marginalization and severity of marginalization are associated with substance use among 9,142 Ontarian youth (aged 12 – 18) living with mental health conditions that were examined with the full ChYMH and adolescent supplement instrument between Canada between January 1^{st,} 2012, and October 31^{st,} 2020.

Results: This study shows that after controlling for other variables, having no strong/supportive family relationship, being a victim of abuse, being at risk of disrupted education, caregiver distress, and having a parent with SUD significantly increased the relative risk of substance use among the

study sample. However, having no friends and living with a cognitive/intellectual problem reduced the risk of substance use. A sex-based analysis shows a similar pattern among males and females, except for caregiver distress which was not significantly associated with substance use among females.

Conclusion: This study shows that youth with mental health conditions are exposed to different dimensions and different levels of marginalization, reinforcing the need to consider social determinants of health within care service planning related to mental health concerns and substance use among youth.

4.1 Introduction

In 2019, data from the Canadian population showed that mental and substance use conditions were highest among youth and young adults aged 15 - 30 years, where more than half reported poor mental health and one-third reported substance use (160,161). The notable increase in mental health service use over time among children and youth is indicative of these challenges (118). Concurrent substance use can be particularly problematic for youth with mental health concerns. It interferes with treatment for mental health disorders, worsens outcomes and long-term prognosis, and increases the cost of care (136,137). Indeed, mental health conditions are among the most expensive health conditions (121–123), with the economic burden of mental illness on the Canadian health and social support system estimated at $79.9 billion for 2021(71,162). Substance use alone is estimated to cost the Canadian economy almost $46 billion a year(163). Beyond monetary costs, there are immense costs to people living with mental health and substance use conditions, their families, and caregivers in terms of loss or inability to gain employment, disrupted education, homelessness, caregivers distress, and premature death(9–11,128).

The prevalence of mental health concerns and substance use among youth in Canada is alarming. A survey of youth in grades 7 – 12 in Ontario shows that about 39% of students reported moderate-to-serious symptoms of anxiety and depression, while 17% reported severe symptoms of mental illness(164). School surveys in Canada have reported that up to 60% of students in grades 7-9 reported lifetime use of various substances(15,131,132). In Ontario, 75% of youth in grade 12 reported lifetime alcohol use, 26% cannabis, and 26%. nicotine(7). Another study that examined current users of substances (use of a substance in the last 30 days) shows that among youth in grades 7 to 12 in a general Canadian population sample, 27% reported current use of alcohol, 19% reported cannabis use, and 8% reported other drugs(15).

Risk and protective factors for mental illness and substance use are well researched. Previous studies have consistently shown that mental health conditions often co-occur with problematic substance use among young people(14,16,26,27). In general, factors contributing to youth's increased likelihood of substance use can be broadly categorized into individual, familial, social, and environmental factors. Factors at the individual level include being a male, LGBTQ+, early exposure to traumatic life events, individuals with a family history of a substance use disorder, prenatal exposure to alcohol and other drugs, sleep problems, and co-occurring psychopathology (e.g., ADHD, depression)(3,26,27,37). Social factors include peer substance use and involvement in romantic relationships at an early age(18,38,39). Finally, environmental risks include family dysfunction, lack of parental supervision and monitoring, and being street-involved (3,5,8,9,37). Broadly, social determinants of health are common factors conceptualized as key risk factors for substance use, including challenges to education, low family income, race, ethnicity, geographic location, gender, and sexual orientation (36,42–44).

Individuals who experience disparities or inequities in social determinants have been referred to as being marginalized(66,67). There has been a lack of consensus on the definition of marginalization among youth due to diverse types, approaches, and measures of marginalization. For example, marginalization has been used to represent the results of racial/ethnic underrepresentation, victimization and discrimination of sexual minorities, alienation from the host culture and the culture of origin, effects of educational policies on students labeled with learning disabilities, and social isolation of overweight children(45,46,81–83). Although these diverse types, approaches, and measures of marginalization show the different and unique forms of social exclusion experienced by youth, there is a need to bring them together under a single conceptual umbrella.

The experience of marginalization among youth can be examined at an individual or contextual level. For example, some studies that examined individual influences of marginalization on youth mental health considered the following dimensions of marginalization related to identity like gender identity, ethnicity, immigration status, and being overweight. (45,46,77,81–83,165–169). Another dimension of marginalization relevant to youth is victimization, including being a victim of abuse, crime, bullying, or peer victimization(77,83,86,129,169,170). Indicators of marginalization related to isolation and social support have also been assessed among youth. These indicators include social connectedness and caregiver distress(77,83,86,129,169,170). Some studies have also defined youth aging out of foster care or in foster placement, homeless status, being children of low-income immigrants, or from poor/low-income families as marginalized(83,86,129,168,169,171). Some researchers categorized vulnerable youth living with a physical, cognitive, or mental disability, overweight, or those with parents that are living with addiction or mental illness as marginalized(82,83,169,171). Other indicators of marginalization that have been examined among youth include disengagement from education or employment, education achievements, school dropout or being at risk of disrupted education (10,83,169), involvement with juvenile justice, bearing responsibility for raising young children, and those at high risk of and vulnerable to poverty(168,171,172).

The experience of marginalization increases the likelihood of adverse outcomes and reduces the likelihood of positive outcomes. Some outcomes of marginalization among youth include being a victim of bullying, suicidality, substance use, racism, discrimination, stigma, and being socially excluded from accessing opportunities and resources could lead to poorer health outcomes, including mental health. For instance, marginalized youth living with concurrent substance use and mental health conditions experience inequitable access to care and poorer health

outcomes compared to non-marginalized counterparts (68,69). In addition, the dual experience of marginalization and co-occurring mental health and substance use concerns can have broad psychosocial impacts on the person, their families, the communities in which they live, the health care system, and the country's productivity. These psychosocial impacts include poor quality of life due to long-term disability, lost productivity, caregiver distress, and increased cost of health and social services (71,72).

Research on substance use among youth who experience marginalization shows a strong association between the exposure to indicators of marginalization and substance use. For instance, homeless youth or those from communities experiencing the most significant disadvantage (female-headed households with children 18 years of age or younger, public assistance income, service-level or clerical jobs, households income below poverty, and unemployed) are significantly more likely to engage in substance use than their peers residing in more affluent communities(17,56). A few studies have also demonstrated the relationship between marginalization, mental health, and substance use. A study among high school students shows that youth who experienced racial/ethnic marginalization in school are more likely to report poorer school attachment, more depressive symptoms, and a higher level of cannabis and alcohol use(45). Youth victimization by peers is significantly associated with depression and alcohol use(170)

In summary, social circumstances, including the exposure to indicators of marginalization, have a significant impact on mental illness and substance use problems and the quality and outcome of care. However, previous research has either examined the relationship between social factors and mental illness or social factors and substance use among youth. Limited studies have examined the impact of social determinants on co-occurring mental and substance use problems among youth. And those studies are limited by sample size and social dimensions examined (age,

sex, and family income). Furthermore, limited research has examined these associations specifically among youths in different mental health care facilities in Ontario, Canada.

Therefore, this study examines how exposure to indicators of marginalization and severity of marginalization are associated with substance use among youth living with mental health conditions. That is, this study examines if youth with mental health conditions who use substances are more likely to be experiencing marginalization compared to youth who do not use substances. The first part of this study examines if specific indicators of marginalization are associated with the risk of substance use among youth living with mental health conditions. The second part examines the cumulative effect of marginalization on substance use among the study population.

4.2 Materials and Methods

4.2.1 Study Sample

The study sample included 9,148 youth between the ages of 12 and 18 years who were assessed with the interRAI-Child and Youth Mental Health Assessment (ChYMH) in the community or residential mental health agencies in Ontario, Canada, between January 1^{st,} 2012, and October 31^{st,} 2020. Data from the first assessment of all youth (12 – 18 years) were included.

4.2.2 Instrument

The interRAI ChYMH is used as part of the standard of care in many agencies and organizations that provide service to children and youth across Ontario. The assessment includes over 400 items assessing demographics, history of health service use, mental state indicators, harm to self and others, behavior, strengths and resilience, cognition and executive functioning,

independence in daily activities, communication and vision, health conditions, family and social relations, stress and trauma, medications, preventions, service utilization and treatments, nutritional status, education, environmental assessment, diagnostic and other health information, and discharge information. Items in the assessment are coded based on all available information, including clinical observation, parent report, and self-report(142). The ChYMH also includes the interRAI Adolescent Supplement Assessment Form and an item-by-item manual for its use. This supplement to the ChYMH core assessment contains items used to collect assessment information within the following domains: substance use or excessive behaviour; parental status (youth as a parent); independence in daily activities; prevention, service utilization, treatments; strengths; mental health and well-being.

4.2.3 Variables

Marginalization Indicators: The twelve marginalization indicators (MI) derived from the full ChYMH included items related to different dimensions of marginalization. These dimensions of marginalization include victimization, vulnerability, social support, isolation, resources, and deprivation. The indicators examined in this study represent different dimensions of marginalization relevant to youth. They were chosen based on a review of existing indicators from the interRAI Mental Health instrument for adults(92) and a review of other literature. Items from the adult version of the interRAI marginalization index and the corresponding items in ChYMH instruments are shown in Table C1 of the Appendix. Each MI in the full ChYMH was dichotomized, as shown in Table C2 of the appendix. In addition to using the indicators individually, a Marginalization Indicator Sum (MIS) was created by adding the 12 indicators to examine the association between cumulative indicators of marginalization and substance use.

Dependent variable: The dependent variable was substance use within 14-30 days of assessment.

The ChYMH Adolescent Supplement assesses the most recent instance a youth reported using a given substance, including opiates, cannabis, cocaine, stimulants, inhalants, hallucinogens, and intentional misuse of prescription or over-the-counter medication. Use is coded if the person used the substance in the three days, seven days, 30 days, one year, and more than one year before assessment. Substance use in the prior 30 days (including 3 and 7 days) was of primary interest in order to identify youth who are current substance users. Alcohol and misuse of OTC were included.

Independent Variable: The primary independent variables were the 12 marginalization indicators (MI) and marginalization indicator sum (MIS). The indicators and dimensions of marginalization that they represent are in Table C3.

Covariates: Covariates from prior research(128) examining factors associated with substance use among this sample were considered in the model, including: behavioural symptoms, self-injurious ideation/attempt, problematic sexual behaviour, sleep problem, hyperactivity, anxiety symptoms, and depression symptoms. This study did not examine diagnosis due to uncertainty about the reliability of substance use or mental disorder diagnosis among this age group, given that the data were from initial assessments of each person.

4.2.4 Analytic Approach

SAS 9.4 software was used for all statistical analyses. Descriptive analysis of the study population includes summary statistics mean, standard deviation, and the range for continuous variables. First, frequency and percentages for categorical data were completed. Then bivariate relationships between independent variables (MI/MIS) and substance use were examined using bivariate OR and chi-square analyses. Finally, using logistic regression with generalized estimating equations (GEE), the relationship between the independent variables (MI/MIS) and substance use was evaluated while controlling for covariates. A modified Poisson GEE model was used to estimate

the effect size of the association between the independent variables (MI/MIS) and substance use for MI with significant bivariate associations to estimate the relative risk for ChYMH. The GENMOD Procedure in the Statistical Analysis Software version 9.4 was used to assess the risk ratio with a 95% confidence interval using a REPEAT statement to specify the GEE procedure. The organization ID in the ChYMH dataset was entered as the clustering variable using the Subject option (subject identifier). The independent correlation structure assumes that each individual and individual subject are independent (147). Different combinations of the independent variables (MI) were examined to rule out order-of-entry, deletion effects, and multicollinearity(148,149). For inclusion in the final risk model, MI needed to be statistically related to substance use (i.e., parameter estimates with p-values less than 0.01) with risk ratios greater than 1.3 or below 0.77. A similar procedure was repeated for the MIS model.

Many methods to evaluate the goodness of fit for GEE regression models have been proposed in simulation studies(150). For instance, the goodness of fit statistics QIC and QICu can compare the models' strengths with lower QIC and QICu values indicating better model performance (151). However, these methods are not routinely implemented in SAS output, and consensus on the goodness of fit statistic for GEE models has not been established. Therefore, final risk models using GEEs identified in the ChYMH dataset were subjected to logistic regression. The logistic regression model's discriminatory power was evaluated using the c statistic(152). The c statistic measures how well the model discriminates those who experience an event (e.g., outcome) from those who do not (153). For example, a c statistic of 0.5 indicates the model is no more discriminating than chance, while a statistic of 1.0 indicates perfect discriminatory power.

4.3 Results

4.3.1 Descriptive and clinical characteristics of the study sample

The sociodemographic and clinical profiles of youth assessed with the ChYMH is in Table 4.1. The study sample comprised 44.5% females and 55.5% males, with about 70% of the youth aged 14 to 17. The proportion of females that reported a history of self-injurious ideation was greater than males (71.7% and 46.2%, respectively), but the patterns of other characteristics were similar for females and males. About 25% of youth reported substance use 14-30 days before the assessment. The proportion of females who reported substance use was higher than males (26.6% and 22.4%, respectively). About 6.6% of youth aged 12-14 years, 26.3% of 15 – 16 years, and 40.6% of 17 – 18 years old reported substance use.

The percentage of youth who were exposed to indicators of marginalization is in Table 4.2. About 41% of youth reported physical, sexual, or emotional abuse. About 53% were at risk of disrupted education, 43% had a parent/caregiver living with mental issues, and 37% reported caregiver distress. The percentages of the marginalization indicators were similar for males and females. However, the proportion of males that reported cognitive problem (38.7%) was higher than females (21.6%). Also, more males (29.1%) than females (19.1%) reported having no friends, and 41.5% of males compared to 34.1 % of females reported caregiver distress. By contrast, a higher proportion of females (45.8%) reported being victims of abuse than males (35.9%).

Table 4.1. Characteristics of Youth Assessed with ChYMH instrument

	Total (N=9142)	Male (N=4068)	Female (N=5074)

Characteristics	Level	n	%	n	%	n	%
Patient type	Community	8446	92.4	3693	90.8	4753	93.7
	Residential	696	7.6	375	9.2	321	6.3
Sex	Male	4068	44.5				
	Female	5074	55.5				
Age group	12 – 14	2779	30.4	1445	35.5	1334	26.3
	15 - 16	3510	38.4	1491	36.7	2019	39.8
	17 - 18	2853	31.2	1132	27.8	1721	33.9
Use of any substance in the last 30 days	Yes	2263	24.8	912	22.4	1351	26.6
	No	6879	75.2	3156	77.6	3732	73.4
Behaviour symptom	Yes	5939	65	2954	72.6	2985	58.8
	No	3203	35	1114	27.4	2089	41.2
Self-injurious ideation or attempt	Yes	5515	60.3	1878	46.2	3637	71.7
	No	3627	39.7	2190	53.8	1437	28.3
Problematic sexual behavior	Yes	425	4.7	203	5	222	4.4
	No	8717	95.3	3865	95	4852	95.6
Distraction and hyperactivity scale	0 - None	1571	17.2	534	13.1	1037	20.4
	1 - Low	5204	56.9	2220	54.6	2984	58.8
	2 - Moderate	770	8.4	367	9	403	7.9
	3 - High	772	8.4	432	10.6	340	6.7
	4 - Very high	825	9	515	12.7	310	6.1
Anxiety scale	0 - None	1576	17.2	923	22.7	653	12.9
	1 - Low	2315	25.3	1188	29.2	1127	22.2
	2 - Moderate	2981	32.6	1231	30.3	1750	34.5
	3 - High	1766	19.3	593	14.6	1173	23.1
	4 - Very high	504	5.5	133	3.3	371	7.3
Depression severity Index	0 - None	494	5.4	269	6.6	225	4.4
	1 - Low	3751	41	1955	48.1	1796	35.4
	2 - Moderate	2361	25.8	1023	25.1	1338	26.4
	3 - High	1049	11.5	414	10.2	635	12.5
	4 - Very high	1487	16.3	407	10	1080	21.3
Sleep problem	Yes	5486	60	2283	56.1	3203	63.1
	No	3656	40	1785	43.9	1871	36.9

4.3.2 Pattern of Marginalization and Substance Use among Youths with Mental Health Conditions

Table 4.2 below shows the results of a bivariate analysis of the percentages and odds of substance use in the previous 30 days among twelve indicators of marginalization among youth assessed with the ChYMH assessment instrument.

Table 4.2. Proportion of youth with mental health conditions experiencing indicators of marginalization and reporting substance use.

	Percentage in Total Sample (N=9142)		**Row Percentage of Substance Use (N=9142)**		**Bivariate odds of substance use (N=9142)**	Percentage with Substance Use Among Males(N=4068)			Percentage with Substance Use Among Females (N=5074)		
Indicators of Marginalization	**n**	**%**	**n**	**%**	**OR (95% CI)**	**n**	**%**	**OR (95% CI)**	**n**	**%**	**OR (95% CI)**
Social support-Caregiver distress	3419	37.4	1037	30.3	1.70 (1.55, 1.88)	467	27.7	1.79 (1.54, 2.08)	570	32.9	1.71 (1.50, 1.95)
Social support-Caregiver status unknown/NA	181	2.0	99	54.7	4.73 (3.50, 6.38)	38	54.3	5.56 (3.43, 9.0)	61	55.0	4.26 (2.90, 6.24)
Social Support – No strong family relationship	2053	22.5	801	39.0	2.46 (2.22, 2.74)	315	38.3	2.75 (2.33, 3.25)	486	39.5	2.25 (1.96, 2.58)
Isolation – No Friend	2154	23.6	346	16.1	0.51 (0.45, 0.57)	169	14.3	0.48 (0.40, 0.58)	177	18.3	0.56 (0.47, 0.67)
Deprivation - Residential instability	931	10.2	444	48.0	3.20 (2.79, 3.68)	205	46.7	3.62 (2.95, 4.44)	239	48.6	2.95 (2.44, 3.56)
Deprivation - History of foster placement	1227	13.4	376	30.6	1.41 (1.24, 1.61)	173	28.2	1.44 (1.19, 1.75)	203	33.1	1.43 (1.19, 1.71)
Deprivation-Trade off	396	4.3	128	32.3	1.48 (1.19, 1.84)	50	26.7	1.28 (0.92, 1.73)	78	37.3	1.68 (1.26, 2.24)
Victimization - Victim of abuse	3785	41.4	1287	34.0	2.31 (2.10, 2.55)	440	30.1	1.95 (1.68, 2.26)	847	36.5	2.56 (2.25, 2.90)
Victimization - Victim of crime	398	4.3	217	54.5	3.93 (3.20, 4.81)	120	57.4	5.22 (3.93, 6.94)	97	51.3	3.05 (2.28, 4.09)
Resources - Risk of disrupted education	4717	52.7	1501	31.8	2.52 (2.27, 2.80)	650	28.1	2.76 (2.31, 3.29)	851	35.4	2.56 (2.25, 2.93)
Resources – Homeschooled	212	2.3	133	33.4	2.39 (1.76, 3.24)	31	27.7	2.70 (1.74, 4.20)	34	34.0	2.41 (1.57, 3.69)
Vulnerability - Parental addiction/substance abuse	2125	23.2	765	36.0	2.07 (1.87, 2.30)	316	35.1	2.33 (1.98, 2.74)	449	36.7	1.89 (1.65, 2.17)
Vulnerability - Parent with MH issue	3963	43.3	1072	27.1	1.24 (1.13, 1.37)	374	22.4	1.0 (0.86, 1.16)	698	30.5	1.43 (1.26, 1.62)
Vulnerability - Disability	2672	29.2	19.7	19.7	0.67 (0.60, 0.75)	268	17.0	0.59 (0.50, 0.69)	259	23.6	0.82 (0.70, 0.96)

Most of the MI were significantly associated with substance use at the bivariate level. Youth who reported lack of social support (caregivers' distress, lack of strong family support), deprivation (foster placement, trade-off, residential instability), victimization (abuse, crime), lack of resources (risk of disrupted education), and vulnerability (those that have a parent with substance use/addiction problems) were more likely to report substance use compared to those who did not report these indicators within the ChYMH sample. Substance use was less common among youth with cognitive problem compared to those without a cognitive problem (OR=0.67, 95% CI: [0.60, 0.75]) and those that have no friend compared to those that have at least one friend (OR=0.51, 95% CI: [0.45, 0.57]). This pattern is similar for males and females. However, the MI trade-off and having a parent with a mental health issue were not significantly associated with substance use among male youth (OR=1.28, 95% CI: [0.92, 1.73], OR=1.0, 95% CI: [0.86, 1.16], respectively).

Table 4.3. Multivariate regression models using GEE examining the association between substance use and indicators of marginalization (MI) after controlling for other variables for the total sample and stratified models by gender

		Total Sample	Male	Female
	QIC	**13518.01**	**5313.09**	**8278.06**
	QICu	**13508.78**	**5314.74**	**8279.42**
Variable (Indicators of Marginalization)		**Relative Risk (95% Confidence Interval)**	**Relative Risk (95% Confidence Interval)**	**Relative Risk (95% Confidence Interval)**
Sex	Male (Reference)			
	Female	1.03 (0.94, 1.12)		
Age group*	12 - 14(Reference)			
	15 - 16	3.53 (3.05, 4.09)	4.16 (3.39, 5.12)	2.97 (2.46, 3.59)
	17 - 18	5.28 (4.52, 6.17)	6.41 (5.14, 7.99)	4.36 (3.48, 5.47)
Social support-Caregiver distress	No (Reference)			
	Yes	1.10 (1.03, 1.19)	1.20 (1.04, 1.38)	1.04 (0.95, 1.14)
Social Support - No strong family relationship*	Yes	1.22 (1.15, 1.30)	1.22 (1.08, 1.37)	1.22 (1.11, 1.33)
Isolation - No Friend*	Yes	0.58 (0.51, 0.67)	0.55 (0.45, 0.68)	0.63 (0.55, 0.72)
Deprivation - Residential instability*	Yes	1.24 (1.15, 1.34)	1.38 (1.19, 1.59)	1.15 (1.03, 1.29)
Deprivation - History of foster placement	Yes	0.93 (0.81, 1.08)	0.90 (0.71, 1.15)	0.96 (0.82, 1.11)
Deprivation-Trade off	Yes	0.91 (0.76, 1.07)	0.93 (0.71, 1.22)	0.92 (0.76, 1.11)
Victimization - Victim of abuse*	Yes	1.21 (1.14, 1.28)	1.13 (1.03, 1.23)	1.26 (1.16, 1.36)
Victimization - Victim of crime*	Yes	1.34 (1.17, 1.53)	1.42 (1.2, 1.65)	1.22 (1.04, 1.42)
Resources - Risk of disrupted education*	No (Reference)			
	Yes	1.66 (1.52, 1.80)	1.83 (1.60, 2.09)	1.56 (1.42, 1.71)
	Homeschooled	1.37 (1.18, 1.59)	1.40 (1.20, 1.65)	1.31 (1.06, 1.63)
Vulnerability - Parental addiction/substance abuse*	Yes	1.32 (1.23, 1.42)	1.49 (1.35, 1.64)	1.20 (1.07, 1.36)
Vulnerability - Parent with MH issue	Yes	1.00 (0.91, 1.10)	0.88 (0.79, 0.98)	1.09 (0.99, 1.19)
Vulnerability - Disability (Cognitive problem)*	Yes	0.77 (0.71, 0.83)	0.73 (0.66, 0.82)	0.84 (0.76, 0.93)

*: Variables with significant associations.

Other variables that were adjusted for in the model: behavioral symptoms, self-injurious ideation/attempt, problematic sexual behavior, sleep problem, hyperactivity, anxiety, depression, and contact with CMH agency.

4.3.3 Association between substance use and indicators of marginalization among youth living with mental health conditions

The multivariate relationships between MI and substance use are in Table 4.3. After controlling for other variables, having no strong/supportive family relationship, being a victim of abuse, being at risk of disrupted education, caregiver distress, and having a parent with SUD significantly increased the study sample's relative risk of substance use. However, having no friends and living with a cognitive/intellectual disability reduced the risk of substance use. After controlling for other variables, marginalization indicators like the trade-off to purchase basic needs due to insufficient funds, foster placement, and having a parent with mental health issues were not significantly associated with substance use. A sex-based analysis shows a similar pattern among males and females, except for caregiver distress which was not significantly associated with substance use among females. There was no significant difference in the MI's risk ratio (RR) when variables with non-significant RR were removed from the model.

4.3.4 Association between the cumulative effect of marginalization and substance use among youth living with mental health conditions

About 91% of the entire sample had been exposed to at least one indicator of marginalization. See Tables C4 and C5 in the Appendix. The average number of MI experienced by youth was 3 (Standard Deviation = 2.0). The upper and lower quintiles are 2 and 4, respectively (IQR=2).

The risk model for MIS in Table 4.4 showed that the risk of substance use among youths increased with increasing cumulation of the MI. Those who were exposed to four marginalization indicators had twice the risk of substance use compared to those with no exposure to any of the MI (RR=1.97,

95% CI: [1.64, 2.30]). Those who were exposed to eight or more MI had two to four times the risk of substance use compared to those with no exposure to any MI (RR=3.12, 95% CI: [2.44, 3.98]). This pattern was similar for males and females in a sex-based analysis. In addition, there was no significant difference in the risk ratio (RR) when variables with non-significant RR were removed from the model.

Table 4.4. Risk of substance use by cumulative experience of marginalization (MIS) after controlling for other variables

		Total	**Males**	**Females**
	QIC:	13487.4006	5250.0646	8212.0916
	QICu:	13470.0804	5251.2408	8216.5431
		Relative risk (95% Confidence Interval)		
Sex	M (Ref)			
	F	1.11 (1.00, 1.23)		
Age	12 - 14(Reference)			
	15 - 16	3.83 (3.30, 4.43)	4.48 (3.64, 5.52)	3.23 (2.67, 3.90)
	17 - 18	6.07 (5.18, 7.11)	7.61 (6.06, 9.56)	4.93 (3.94, 6.18)
Marginalization Indicator sum	0(Reference)			
	1	1.39 (1.15, 1.67)	1.44 (1.06, 1.97)	1.31 (0.98, 1.75)
	2	1.57 (1.33, 1.85)	1.48 (1.12, 1.96)	1.59 (1.24, 2.04)
	3	1.80 (1.43, 2.27)	1.77 (1.28, 2.44)	1.77 (1.29, 2.42)
	4	1.98 (1.64, 2.39)	1.58 (1.13, 2.22)	2.25 (1.76, 2.88)
	5	2.05 (1.64, 2.57)	1.84 (1.33, 2.54)	2.10 (1.56, 2.84)
	6	2.31 (1.77, 3.02)	2.41 (1.65, 3.53)	2.22 (1.57, 3.14)
	7	2.56 (1.20, 3.29)	2.54 (1.79, 3.60)	2.53 (1.77, 3.62)
	8+	3.11 (2.44, 3.98)	3.59 (2.56, 5.03)	2.70 (1.90, 3.86)

4.4 Discussion

This research is the first study to use comprehensive multidimensional indicators of marginalization to examine the association between marginalization and substance use among a large sample of youth in mental health settings in Ontario, Canada. A previous study among this population shows that clinical and social factors are significantly associated with substance use (128). Extending this research, the findings from this study show that youth living with mental

health and substance use conditions have complex health and social needs. In addition, the high proportion of mental health and behavioral symptoms and high suicidal ideation among youth in this study shows that they are already vulnerable to substance use.

The pattern of marginalization indicators among youth assessed in various mental health agencies in Ontario shows that there was no single indicator of marginalization that was common across all youth, with less than 50% reporting having been exposed to any one of the MI. However, cumulatively, the overwhelming majority had been exposed to at least one indicator of marginalization. Both the percentages of youth who with each specific MI and the cumulative effects of the MIS indicate that marginalization is significantly higher in these clinical populations than youth in the general population. For instance, the few studies that have examined some of these indicators among a similar age group show that less than 1% of children in the general Ontario population are in out-of-home care (173), about 33% of Canadians reported childhood maltreatment(174) compared to 13.4% and 41.4% among youth living with mental health conditions in this study, respectively.

This study also shows that the direction of the association between marginalization and substance use was variable, depending on the indicator. Victimization (physical, emotional, and sexual abuse) were more common among youth living with mental health conditions in this sample compared to the general population(173) and was significantly associated with substance use. This finding adds further evidence about the detrimental implications of early childhood trauma on mental illness and substance use(33,35,175,176). It may be that victimized youth use substances as self-medication to cope with the suffering, pain, and other adverse effects of traumatic experiences or mental health symptoms, reinforcing the importance of early trauma-informed care for youth living with co-occurring mental and substance use conditions(35,177). Since this is a

study of association, whether the experience of victimization precedes substance use or mental illness could not be established. However, the association between youth substance use and mental illness among these youth may be due to shared vulnerability to childhood psychosocial factors like victimization.

Deprived early childhood experiences like residential instability, foster placement, hardship, or poverty could be devastating for young people placing them at risk of mental illness and substance use(17,57,165,172,177,178). Children and youth in foster placement have higher rates of mental health disorders than those of the general population(57). Youth living in poverty are likely to be exposed to adverse childhood experiences and are susceptible to stress and trauma(172). This study shows a significant association between deprivation and substance use among youth. Residential instability remains a significant risk factor after controlling for other variables. The significant association between indicators of deprivation and substance use among youth in this study could be linked to childhood traumatic or stressful experiences that led to them being removed from their homes or the experience of foster placement or homelessness and hardship. Deprived youth could engage in substance use as a form of self-medication to compensate for a lack of attachment strategies or cope with the psychological effect of traumatic experiences(51,52). It could also be due to exposure to substance-using peers, caregivers, or neighborhood factors(17–19,25,36). On the other hand, substance use among youth could make youth more susceptible to interpersonal violence, family violence, homelessness, or foster placement. These findings also show that prevention and early intervention strategies for substance use should prioritize deprived youth, and care should include family financial support.

Previous research on this population has discussed the impact of parental and school factors on youth substance use (128). In brief, these findings show that youth are more likely to use

substances if they lacked parental support or had a parent with mental health or addiction problems and if they were exposed to caregiver distress. These parental factors and negative school experiences make youth more vulnerable and increase the risk of substance use. This relationship could be linked to genetic/familial factors, secondary trauma in children of parents with mental illness, a home environment that permits substance use or inadequate supervision, and parenting due to caregiver distress or caregiver capacity(61,157–159). Also, youth at risk of disrupted education are more vulnerable to using substances than those whose education is stable. This relationship may be indicative of competing risks such as mental health or other stressful life events that may disrupt education leading to increased use of substances. Also, substance use may lead to or perpetuates disruptions in education.

Interestingly, several marginalization indicators were associated with a lower likelihood of substance use among youth. Social isolation was significantly associated with a reduced risk of substance use. This finding could be linked to peer substance use and the issue of access to drugs. For instance, evidence shows that peer group is a strong shaper of behavior, including drug use(16–19,25,26) which could explain why youth with no friends are less likely to use substances. For instance, youth with friends are more likely to be exposed to substance-using friends or peers than those with no friends. Future research could further examine the characteristics of these youth to understand why they do not have friends and other factors that could be contributing to this finding. For instance, a mixed-methods could examine whether these findings relate to stronger resilience to substance use or factors related to a lack of access.

Another indicator of marginalization associated with reduced risk of substance use among this study population was living with a disability (cognitive/intellectual impairment). This finding is in contrast to results from previous studies that showed an increased risk of substance use

disorder (SUD) among youth and adults with mild to borderline intellectual disability(179). Another review study that examined the prevalence of substance use and SUD among those living with mild – to – borderline intellectual disabilities (MBID) across ages shows that youth (11- 21 years) with MBID are less likely to use substances compared to those without MBID(180). However, youth with MBID who use substances are more likely to develop SUD than those without MBID. Other factors that increase the risk of SUD among youth living with MBID include being a male, being bullied by friends, spending extra time with friends, and having a role model that uses substances (180). In addition, factors contributing to increased risk of SUD among adults living with MBID include being a male, younger, homeless, living with comorbid psychiatric disorders, forensic involvement, and severe behavioral and emotional problems(180). Furthermore, those with moderate-to-severe intellectual disability are less likely to use substances than those with MBID(180). Therefore, a plausible explanation could be related to access. Youth living with any or with more severe disabilities are more likely to be under close supervision and thereby might not have access to drugs, including the capacity to desire or plan for the attainment of drugs. They might also have less exposure to substance-using peers.

It is important to note that individual indicators or marginalization are different. They may quantitatively and qualitatively affect youth substance use, the trajectories of use, and other outcomes differently. However, these indicators or dimensions of marginalization have shared variance, and they interconnect to influence substance use among youth. Furthermore, the cumulative measures of these indicators could indicate the severity or intensity of the process of marginalization. Therefore, the risk models from this study yielded the unique association of specific marginalization indicators and the cumulative effect on substance use among youth living with mental health conditions. This study shows that youth with mental health conditions

experience different dimensions and different levels of marginalization. It also shows that the experience of one or more MI is associated with an increased risk of substance use after controlling for sex, age, and other clinical variables. The association between different levels of marginalization and substance use could also be linked to significant variability in resilience (ability to cope) among youth living with mental health conditions. The indicators of marginalization present may be associated with less ability to maintain healthy behavior or adopt healthy coping mechanisms. And this suggests that strategies and supports for youth living with mental health and substance use cannot be one size fits all. The findings from this study reinforce the need for an early, holistic, patient-centered, trauma-informed, family-based, multidisciplinary/integrated care approach that addresses the broader social determinants of health.

With this in mind, it is important to reiterate that these findings are cross-sectional, so the association's direction cannot be understood. Specific indicators of marginalization may be pre-cursors to substance use, with substance use representing a potential mechanism for coping. For instance, youth with a history of childhood maltreatment (e.g., physical abuse, sexual abuse), residential instability, or those who lack parental support may use substances to cope with these traumatic events' adverse effects. Alternately, it may be that substance use leads youth to become vulnerable to disrupted education, being a victim of physical or sexual abuse, family violence that may lead to homelessness or disrupted education. Therefore, future research could use predictive methods to examine if these indicators of marginalization precede substance use among the study population. The next study in this series used a cohort study design to determine if these indicators of marginalization predict substance use among the study sample.

An exciting outcome of this study is the identification of potential MI that can be used to develop a marginalization index for risk assessment in mental health and addiction management.

MI that are predictors of substance use can be included in a marginalization index that will be incorporated into assessment instruments for substance use risk assessment. The Marginalization Index would be beneficial for early identification, prevention, and care planning for youth at risk or those already on substances.

About 70% of mental health problems have their onset in childhood or adolescence, highlighting the importance of aiming for prevention and early treatment of mental health and substance in this age group as early as possible. Furthermore, since youth are the most at risk of mental illness and problematic substance use in the community, they significantly influence the population's health. Hence, interventions and policies need to prioritize this population. This study shows the complexity of the needs of youth living with mental health and substance use disorders beyond healthcare. This finding also reiterates how health behavior, quality of health, and the health outcome of youth living with mental health conditions can be shaped by social circumstances beyond their control. Therefore, the care of youth living with co-occurring mental health and substance use condition should be proactive, timely, integrated, holistic, and patient-centered for a better outcome. Furthermore, policies should be reviewed to address the broader determinants of health.

4.5 Limitations

One of the limitations of this study is that substance use was not assessed among children because substance use data were not available for youth younger than 12 years old. Also, this study could not establish the temporality of MI and substance use. Also, the MI examined are limited to those in ChYMH assessment instruments. Further study could examine other MI like family income, race/ethnicity, gender identity, religion/religiosity, immigration status, and geographical location. Furthermore, there is a selection bias since the full ChYMH assessment was only completed on a

subset of youth seeking mental health services. Therefore, the results of this study could not be generalized to all youth with mental health concerns in the community, nor those who experience marginalization but may not have mental health concerns.

It is important to note that the measures of marginalization in this study are indicators of potential marginalization. The youths' subjective experience of marginalization could not be established because the concept of marginalization is complex, being a condition and process that requires more comprehensive methods to examine from the perspective of the youth. Since the MI and MIS in this study are checklists, this research does not intend to interpret them as standardized measures of marginalization.

4.6 Implications for Research and Practice

The variability that was observed among youth that reported exposure to indicators of marginalization and those that did not support the relevance of the selected MI among the target population. In other words, these factors differentiate the unique experiences of a subset of youth with mental health concerns and how these experiences are associated with substance use. Future research could examine if exposure to these MI predicts substance use among youth. Furthermore, this study's results also show a need for further research to develop a standard measure of marginalization and test its reliability in risk assessment for substance use among youth. The development and utilization of a marginalization index would be beneficial for risk assessment to identify children and youth at risk of substance use. Furthermore, the results can also contribute to the development of a holistic treatment plan that considers and addresses critical social determinants of youth's health and mental health.

There are policies and practice guidelines related to mental health and addiction among youth in Ontario, showing that the province recognizes the importance of comprehensive care for

those living with co-occurring mental health and substance use conditions. However, this study shows how the exposure to indicators of marginalization influence substance use among youth living with mental health in Ontario. Therefore, health and social policies and practices aimed at justice and addressing social determinants of mental health at individual, family, community, and system levels would improve this population's outcome.

Implications for practice include training care providers on the concurrent disorder, trauma-informed care, and the role that marginalization plays in their interaction. Care providers working with youth living with co-occurring mental health and substance use conditions need to learn how to integrate an intersectionality lens into the care of this population. They need to understand how exposure to indicators of marginalization influences mental and substance use problems among youth and to ensure that they are employing the right approach to care. Another important implication for practice is early identification through screening using a comprehensive, integrated assessment that includes the evaluation of indicators of marginalization. The fact that the ChYMH is already in use in many settings indicates that an integrated assessment is available at first contact and through follow-up over time. This provides more information to service providers to develop care plans for youth with mental or substance use conditions that are proactive, integrated, holistic, patient-centered, trauma-informed, family-based, multidisciplinary approach that addresses the broader social determinants of health.

Furthermore, understanding the interconnections between mental illness, substance use, and marginalization reflects the need for multidisciplinary care, which may be too complex for youth and their families to navigate. Therefore, agencies working with children, youth, and their families can use information from the assessment to assign case or community workers trained in

trauma-informed care to support youth and their families to navigate the system in their recovery journey.

Health and social policies should aim to treat or improve social determinants of health by ensuring that everyone has an equal chance at living a healthy and fulfilling life. The development or improvement of policies related to income inequality, adverse early childhood experiences, food insecurity, racism, and other social determinants of mental health would be helpful to address this issue upstream before mental illness, or substance use occurs. Relevant sectors like health, education and children, community and social services could invest in more programs that improve child welfare, family social circumstances, and a healthy community. Examples include investing in programs that assign a nurse practitioner or social worker to each family or school support program. Investment in community programs that engage youth in a healthy and meaningful way and make them available to all would also help improve marginalization. Marginalization screening tool or index could also be integrated into health, school, and other public system records.

Mental health professionals and other agencies working with children, youth, and their families could engage in advocating for the implementation, monitoring, and evaluation of existing policies or development of new policies that have been proven to reduce adverse early childhood experiences, ameliorating poverty and income inequality and improving education and employment for all.

4.7 Conclusion

Youths living with mental health conditions are already marginalized among their peers and within the community. They are also vulnerable to risky behaviors like substance use, poor quality of health, and health outcome. However, limited studies have examined the association

between multiple dimensions of marginalization and substance use among youth with mental health conditions using representative clinical data. This study builds on prior research examining factors associated with substance use, highlighting how those specific indicators of marginalization and the cumulative number of indicators experienced to increase the odds of substance use among youth living with mental health conditions. These findings reinforce the need to consider social determinants of health within care and service planning related to mental health concerns and substance use among youth.

Chapter 5

Predictors of Substance use, including Marginalization, Among Youth Living with Mental Health Conditions in Ontario

This chapter is intended for publication in the *Journal of Child & Adolescent Substance Abuse*

5.0 Abstract

Background: Most mental health conditions have an onset between childhood and early adulthood, emphasizing the need for interventions to aim at prevention or early identification, and treatment needs to focus on this age group at the first presentation of illness. Therefore, the knowledge of the predictors of mental illness and problematic substance use is vital for prevention, early intervention, and the development of an effective treatment plan to address the needs at different levels and reduce/curb the trajectory of mental health and substance use problems among youth. Research has consistently shown that environmental factors or social determinants are associated with an increased risk of both substance use and mental illness. However, limited studies have examined whether substance use precedes exposure to marginalization indicators or exposure to marginalization indicators precedes substance use among youth.

Purpose: This study examines factors predicting future substance use among youth with mental health conditions, particularly focusing on exposure to indicators of marginalization. In particular, this longitudinal study investigates the impact of cumulative indicators of marginalization on substance use within 2 years. This study also examined how the hypothesis for substance use aligns with the substance use prediction model.

Methods: This study uses a retrospective cohort design to examine if exposure to indicators of marginalization precedes substance use 2-year following the first assessment of 19,514 Ontarian youth living with mental health conditions that were examined with interRAI ChYMH and ChYMH-S and the interRAI Adolescent Supplement between January 1^{st,} 2016 data, and December 31^{st,} 2018.

Results: This study shows that about 2.0 % of the total youth in the longitudinal study initiated substance use within the two-year follow-up period. The unadjusted hazard model shows that all the individual indicators of marginalization predicted future substance use except having a parent with SUD. However, the adjusted predictive model shows that only being a victim of abuse was a significant predictor of future substance use (HR: 1.36 [1.10, 1.68]; p-value 0.01). The adjusted model of the cumulative effect of MI on future substance use shows that after controlling for age, sex, and severity of clinical symptoms, the hazard ratio, that is, the probability of reporting substance use within two-year follow-up among youth exposed to 1 - 2 MI compared to those that did not is approximately 1.5 (P-value=0.003). Among those exposed to 3 - 4 MI, the probability of reporting substance use at two-year follow-up compared to those that were not exposed to any MI was approximately 2.0 (P-value <.0001). And the overall P-value of 0.0003 shows that marginalization precedes substance use, and this association is statistically significant.

Conclusion: This study establishes a theoretical explanation of how exposure to key indicators of marginalization contributes to the incidence of substance use among youth through the attachment theory. The findings from this study provide a hypothesis that addressing these MI can influence future substance use and other multiple outcomes. Therefore, this study is evidence that youth substance use and its consequences can be prevented from developing in the first place.

5.1 Introduction

There is growing recognition of, and evidence for, the importance of considering socio-environmental circumstances in relation to youth substance use. Among youth with mental health conditions, social circumstances such as the experience of marginalization are strongly associated with substance use (65,128). Theories of substance use among youth posit various possibilities for the specific factors and directions of relationships between social factors, mental illness, and substance use. For instance, the secondary psychiatric disorder model posits that substance use contributes to the onset of mental illness(100–102). An explanation of this model is the biochemical effect of drugs on the brain(101–105). Ethanol-induced depressive state and cannabis-induced psychosis are examples that support this model(104,105). Psychoactive substances that are strongly associated with mental health disorders include stimulants, depressants, hallucinogens, and cannabis(102–105,155). It may also be that substance use triggers or exacerbates an undiagnosed mental illness. Other factors that could be contributing to this relationship include the complex interactions among multiple genes and genetic interactions with environmental influences(104–108). For example, frequent cannabis use during adolescence is associated with an increased risk of psychosis in adulthood, specifically among individuals who carry a particular gene variant (catechol-O-methyltransferase, DAT1, and AKT1)(107). However, a gene could also influence how individuals respond to stress and risk-taking behaviours, impacting the initiation of substance use, SUD, and mental illness. Also, environmental factors like exposure to substances, early childhood trauma experience, and chronic stress may alter gene expression that can impact behaviour(106,108,157). And these gene alterations can be inherited(105–107).

Those in support of the secondary substance use disorder model posit that serious mental illness increases the person's chances of developing substance use disorder(100–102). The hypothesis supporting secondary SUD explained that self-regulation vulnerability and difficulties with controlling mental health symptoms might cause youth to self-medicate with drugs(104–106) That is, youth could use drugs to cope with depression, anxiety, and psychosis symptoms. This association could also be a coping strategy for other consequences of mental illness like victimization, isolation, or hopelessness(51,52,101,102,104,106). However, self-medication cannot explain all of the reasons for high comorbidity rates among individuals who suffer from mental disorders since substance use generally exacerbates rather than relieves symptoms of underlying mental diseases(105). Therefore, mental illness might not be the cause of substance use from abstinence but, rather, an influence on the transition from substance use to substance use disorder. Considering these varying yet plausible perspectives, others have posited the bidirectional model to explain that either substance use or a mental illness can increase the vulnerability of the other disorder(101,102,104,105).

The common factor model (or shared vulnerability) takes a different approach from directional models, arguing that risk factors may be shared across both substance use and severe mental illness(100–102,104–106) An example of the shared factors common to mental health and substance use disorders includes genetic vulnerabilities, epigenetic influences, neurotransmitters and pathways/circuits in the brain, and environmental factors like chronic stress, trauma, adverse childhood experiences, and dysfunctional environmental factors related to families or parents. (35,47,101,102,104,106) In addition, evidence shows that there is an overlap between genes identified in people with a diagnosis of schizophrenia and those with addictive behaviours. For instance, research on the link between substance use and mental health disorders shows that the

mesolimbic and mesocortical pathways in the brain have been linked to reward mechanisms and positive symptoms and neuroadaptation mechanisms and negative symptoms respectively(105,106). Therefore, genes responsible for neurotransmitters in these pathways neurotransmitter would influence addictive and mental health problems(107).

Social or environmental factors associated with increased risk of substance use and mental health disorders have been well researched. Research has consistently shown that these environmental factors or social determinants are associated with an increased risk of both substance use and mental illness(25,45–48). These factors include stress, trauma and other childhood adverse experiences(35,48–52), dysfunctional environmental factors like dysfunctional families(19,48,53–56) and residential instability(57–59) , lack of supportive family relationship and parental substance use or mental illness(38,55,56,60–63), and peer influence (19,64). A study among youth living with mental health conditions in Ontario shows that the social determinants, including the experience of marginalization like victimization, isolation, deprivation, lack of social support, and resources, are strongly associated with increased risk of substance use(65). Many of these social factors are modifiable, thus crucial for prevention and intervention since addressing them would often reduce both substance use and mental illness. Recent research has examined substance use risk factors among youth living with mental health conditions in Ontario found that indicators of marginalization, including being a victim of abuse, residential instability, lack of supportive parental relationship, and parental SUD, are strongly associated with increased risk of substance use(65,128).

In contrast, having no friends and living with an intellectual/cognitive problem are associated with a reduced risk of substance use among youth(65,128). However, research on the predictors of substance use among youth has been mainly studies of association using cross-

sectional study designs. In addition, limited studies have examined whether the problematic use of substances precedes the experience of marginalization or marginalization predicts substance use among this population.

Few studies have examined longitudinal risk factors for substance use among youth. This research has found that psychosocial factors like psychological and psychiatric symptoms/diagnosis, disrupted family relationships, family history of substance use disorder (SUD), lack of parental support, inadequate supervision, peer substance use, and social connections with deviant youth predict future substance use among youth and onset of substance use disorder among youth living with mental illness(181,182). A four-year prospective study that examined the predictors of the onset of substance use disorders among youth diagnosed with bipolar spectrum disorder found that in addition to defiant and panic disorder, social factors like low family cohesiveness and family history of SUD increased the risk of SUD(182). This study also found that lifetime use of alcohol at baseline was significantly associated with an increase risk of SUD(182).

A 15-month longitudinal study that assessed the onset of use of cannabis and other illegal drugs separately among youth (19 – 21 years old) found that in addition to psychological, psychiatric, and personality factors, social or family-related factors were significant predictors of substance use among this population(181). Cannabis use was predicted by parental divorce, poor relationships with parents, inadequate parental supervision, and peer pressure (181). In contrast, religiosity was negatively associated with the onset of cannabis use(181). A similar pattern was found in the 'other drugs' sub-study. This study is limited because it did not assess the actual onset of substance use. After all, study participants might have used other types of substances (alcohol and tobacco for the cannabis study; and (alcohol, tobacco, and cannabis for the other drug study).

Since most mental health conditions have an onset between childhood and early adulthood, interventions must aim at prevention or early identification, and treatment needs to focus on this age group at the first presentation of illness(135,183). Therefore, the knowledge of the predictors of mental illness and problematic substance use is vital for prevention, early intervention, and the development of an effective treatment plan to address the needs at different levels and reduce/curb the trajectory of mental health and substance use problems among youth. Therefore, this study examines factors predicting future substance use among youth with mental health conditions, particularly focusing on indicators of marginalization. In particular, this longitudinal study investigates the impact of cumulative indicators of marginalization on substance use within 2 years. This study's results will help identify youth for whom preventive measures would be appropriate and see how the hypothesis for substance use aligns with the resulting prediction model.

5.2 Materials and Methods

5.2.1 Study Sample

The sample comprised youth assessed in community and residential mental health agencies in Ontario, Canada, with either the interRAI Child Youth Mental Health Assessment (interRAI ChYMH) or the interRAI ChYMH Screener (ChYMH-S) and the interRAI Adolescent Supplement between January 1^{st,} 2016 data, and December 31^{st,} 2018. Data from the first assessment of all youth were selected for the sample. Youth were excluded if they had reported substance use on the baseline assessment. Youth who were less than 12 years of age at the first assessment were excluded because information on substance use was not available for those less than 12 years of age. Youth older than 16 were excluded as two-year follow-up data were not available, given that youth transition into the adult mental health system at age 18. Youth that

reported substance use at follow-up within 30 days of the index assessment were excluded as there could have been overlaps in the observation period between assessments. The total study sample was 19279 youth aged 12 - 16 assessed with interRAI CHYMH and CHYMH-S between 2016 and 2018 that did not use substance use at baseline.

5.2.2 Instruments

The interRAI ChYMH is used as part of the standard of care in many agencies and organizations that provide service to children and youth across Ontario. The assessment includes over 400 items to inform treatment planning, including identification information, intake and initial history, mental state indicators, substance use or excessive behavior, harm to self and others, behavior, strengths and resilience, cognition and executive functioning, independence in daily activities, communication and vision, health conditions, family and social relations, stress and trauma, medications, preventions, service utilization and treatments, nutritional status, education, environmental assessment, diagnostic and other health information, service termination and discharge information. Items in the assessment are completed by trained clinicians overseeing the care of the person. Assessors use a semi-structured interview approach that incorporates all available information, including observation, clinical record review, parent report, and self-report(142). The ChYMH also includes the interRAI Adolescent Supplement Assessment Form(93). This supplement to the ChYMH is used when assessing youth aged 13 to 17. It contains additional information on substance use or excessive behaviour, independence in daily activities, service utilization, and strengths. The interRAI-ChYMH has demonstrated good psychometric properties in clinical settings(184).

The ChYMH-S is a brief screener that provides an initial assessment for early identification, triaging, and prioritizing services. The assessment takes approximately 15-20 minutes to complete

and includes the following domains: (1) Mental State Indicators (e.g., Mood disturbance, Anxiety), (2) Substance Use or Excessive Behaviour, (3) Harm to Self and Others, (4) Behaviour, (5) Cognition, Communication & Development, (6) Stress, Trauma, and Social Relationships, and (7) Education. The screener demonstrated strong inter-item reliability on all measured scales and good convergent validity (126).

In addition to items, this study included as covariates three scales embedded in the ChYMH and the ChYMH-S: Anxiety Scale, Distraction/Hyperactive Scale, and Depression Severity Index. The Anxiety Scale is a seven-item scale that assesses the frequency of several anxiety symptoms (i.e., repetitive anxious concerns, unrealistic fears, obsessive thoughts, compulsive behavior, intrusive thoughts or flashbacks, episodes of panic, and nightmares). The total sum of the frequency of each symptom (4-point scale where 0 = not present to 4 = Exhibited daily in the last 3 days, 3 or more episodes, or continuously) ranges from 0 to 28. Thus, higher scores indicate higher levels of anxiety(125). The Cronbach's alpha for the Anxiety Scale was 0.75 in the current sample. Hyperactive/Distraction Scale is a 4-item scale that assesses the frequency of four facets of distractibility and hyperactivity. That is impulsivity, ease of distraction, hyperactivity, and disorganization). The total sum of the frequency of each behavior (0 = not present to 4 = Exhibited daily in the last 3 days, 3 or more episodes or continuously) ranges from 0 to 16. Higher scores indicated higher levels of distractibility and hyperactivity(125). The Cronbach's alpha for the Hyperactive/Distraction scale was 0.77 in the current sample. The Depression Severity Scale comprises five items, capturing various depressive expressions of the individual, including sad or pained facial expressions, made negative statements, self-deprecation, expressions of guilt/shame, and hopelessness. Possible scores for each of the items are 0 ("Not present"), 1 ("Present but not exhibited in last 3 days"), 2 ("Exhibited on 1–2 of last 3 days"), and 3 ("Exhibited daily in last 3

days"). Higher scores indicated higher levels of depressive symptoms(127). The Cronbach's alpha for the Depression Severity scale was 0.83 in the current sample. The Cronbach's alphas for the three scales in this study sample were more than 0.7, indicating good internal consistencies.

5.2.3 Variables

Dependent Variable: The primary dependent variable was substance use within two years of follow-up. From the instruments, there were several ways that substance use was ascertained. For youth assessed with the ChYMH Adolescent Supplement, the most recent instance a youth reported using opiates, cannabis, cocaine, stimulants, inhalants, hallucinogens, alcohol, or intentional misuse of prescription or over-the-counter medication is coded if the person used the substance in the three days, seven days, 30 days, one year, and more than one year before assessment. For youth assessed with the ChYMH-S, the item on substance use asks if the person used alcohol, drugs or misused prescription or OTC within the 14 days before the assessment.

Independent Variables: The main independent variables for this study were marginalization indicators and Marginalization Indicator Sum. The indicators examined in this study represent different dimensions of marginalization relevant to youth. They were chosen based on the result of the previous study among this study population that identified seven common MI within the full ChYMH and CYMH-S. However, only five of the seven MI were significantly associated with substance among this study population. One MI, cognitive/intellectual disability, was negatively associated with substance use among youth, hence not included in this current study. The Marginalization Indicator Sum (MIS) was developed to examine the cumulative impact of four marginalization indicators associated with substance use: having no strong family relationship, having a parent with an addiction/substance use problem, being a victim of abuse and at risk of disrupted education. These marginalization indicators represent different dimensions of

marginalization relevant to youth, including social support, resources, victimization, and vulnerability (65,76,86,87,92,129). The MIS was scored by summing these indicators. Two versions of this variable were examined, the full sum ranging from 0 to 4 and a version of the MIS that includes 3 categories (MIS = 0, 1-2, 3 – 4). This category was based on a previous study that shows a similar association with substance use for those exposed to 1 - 2 MI compared to those that reported no MI [RR for MIS-1: 1.4; RR for MIS-2: 1.5] and those exposed to 3 – 5 MI compared to those that reported no MI [RR for MIS-3 to MIS-5: 2.0](65).

Covariates: Prior research examining factors associated with substance use among this sample considered the following in the models: age, sex, and severity of clinical symptoms. Age was categorized into two (12 – 13 and 14 – 16 years). Only male and female sex were included in this study. The severity of clinical symptoms (anxiety, depression, and hyperactivity) was measured using three scales embedded in the ChYMH and the ChYMH-S: Anxiety Scale, Distraction/Hyperactive Scale, and Depression Severity Index.

5.2.4 Analytic Approach

Descriptive analysis of the study population performed includes frequency and percentages for categorical data. Univariate analysis was performed for the continuous variable (time-to-substance use). The bivariate relationships between categorical variables were examined using chi-square analysis. This study used the Cox proportional hazards model to test how predictor variables predict an outcome variable that measures the time until an event occurs (185–189). Specifically, the proportional hazard model was used to explain the effect of marginalization on substance use survival among the study population while controlling for age, sex, and severity of clinical symptoms. The PHREG Procedure in the Statistical Analysis Software version 9.4 was used to assess the hazard ratio with a 95% confidence interval. This procedure performs regression

analysis of survival data based on the Cox proportional hazards model(185,187–189). Cox's semiparametric model explains the effect of explanatory variables on survival times(185,187,189).

In the proportional hazard model, Analysis of Maximum Likelihood Estimates displayed the model coefficients, tests of significance, and exponentiated coefficient, also known as hazard ratio(187,189). The hazard ratio with a 95% confidence interval was used to explain the effect of marginalization at baseline on future substance use (2-year follow-up). In this study, MI or MIS_CAT with parameter estimates of a p-value that is less than 0.1 are statistically significant predictors of future substance use.

Lastly, fit statistics are used for model comparison and selection. The model with lower -2logL, AIC, and SBC is better. The test of Global Null Hypothesis: \(\BETA=0: tests the hypothesis that all coefficients in the model are 0. It is an overall test of whether the model can predict changes in the hazard rate(187,190–192).

5.3 Results

5.3.1 Descriptive and clinical characteristics of the study sample

The sociodemographic and clinical profiles of youth assessed with the full ChYMH and ChYMH-S is in Table 5.1. The study population comprised 57.6% females and 42.4% males. Approximately 50% of youth were 12 – 13 years old, while the remaining half was 14 – 16 years old at baseline. More than half of the youth had a history of suicidal ideation/attempt (51%) and behavioral symptoms (57%).

Table 5.1. Descriptive statistics of the whole sample (N=19279)

Variables	**Frequency**	**Percentage**
Instrument		
Full ChYMH	3195	16.6
ChYMH-S	16084	83.4
Patient type		
Residential	174	0.9
Community	19105	99.1
Sex		
Male	8169	42.4
Female	11110	57.6
Age categories		
12 - 13	8169	49.8
14 - 16	9687	50.2
Severity of Clinical Symptoms		
Distraction and hyperactivity scale		
0 - None (Ref)	4178	21.7
1 - Low	10858	56.3
2 - Moderate	1442	7.5
3 - High	1292	6.7
4 - Very high	1509	7.8
Anxiety scale		
0 - None (Ref)	3744	19.4
1 - Low	5696	29.6
2 - Moderate	6435	33.4
3 - High	2811	14.6
4 - Very high	593	3.1
Depression severity scale		
0 - None (Ref)	901	4.7
1 - Low	9086	47.1
2 - Moderate	5080	26.3
3 - High	1959	10.2
4 - Very high	2253	11.7
Sleep Problem		
Yes	11382	59.0
No	7897	41.0
Self-injurious ideation or attempt		
Yes	9724	50.4
No	9555	49.6
Behaviour symptom		
Yes	10715	55.6

No	8564	44.4
Problematic sexual behaviour		
Yes	1042	5.4
No	18237	94.6

5.3.2 Pattern of marginalization among youth living with mental health conditions at baseline

Table 5.2 shows the pattern of marginalization among youth living with mental health conditions at baseline. More than half of the youth were at risk of disrupted education. About a third were victims of physical, sexual, or emotional abuse. Furthermore, about 72% of all the youth examined in this study had at least one MI at baseline.

Table 5.2. Pattern of Marginalization among all Youth at Baseline (N=19279)

Dimensions and Indicators of Marginalization	**Frequency**	**Percentage**
Victimization - Victim of abuse		
Yes	5564	28.9
No	13715	71.1
Social Support - No Strong family relationship		
Yes	2531	13.1
No	16748	86.9
Vulnerability - Parental addiction/substance abuse		
Yes	3220	16.7
No	16059	83.3
Resources - Risk of disrupted education		
Yes	10410	54.0
No	8869	46.0
Simple sum of Marginalization Indicators: MI-Sum (0 - 4)		
0	5408	28.0
1	8110	42.1
2	3939	20.4
3	1551	8.1
4	271	1.4
MI-Sum Categories (0 - 2)		
0: MI-Sum (0)	5408	28.0
1: MI-Sum (1 - 2)	12049	62.5
2: MI-Sum (3 – 4)	1822	9.5

5.3.3 Proportion of Youth that used Substances at Follow Up and Univariate Analysis of Time-to-Substance Use (N=19279)

Almost 2.1% of the total youth in this study cohort initiated substance use within the two-year follow-up period. Among those that used substances at follow-up, 41.3% were males, and 58.4% were females. About 66.8% of those that initiated substance use at follow-up were within the older age group (14 – 16 years old) at baseline, while 33.2% were 12 – 13 years old. Also, the bivariate analysis (See D1 in the Appendix) showed a significant association between the indicators of marginalization and substance use within a two-year follow-up.

Table 5.3. Results of the Cox proportional hazards model showing the risk of future substance use among youth that reported exposure to marginalization indicators at baseline controlling for age, sex, and severity of clinical symptoms

		Full Model		**Parsimonious Model**	
Variables	**Label**	**Hazard Ratio (95% CI)**	**P-Value**	**Hazard Ratio (95% CI)**	**P-Value**
Sum of Marginalization Indicators					
0: MI-Sum (0) - Reference					
1: MI-Sum (1 - 2)	1 vs 0	1.47 (1.11, 1.93)	0.001	1.49 (1.13, 1.95)	0.0007
2: MI-Sum (3 - 5)	2 vs 0	1.94 (1.36, 2.76)		1.96 (1.38, 2.78)	
Sex	Female vs Male	1.07 (0.86, 1.32)	0.54		
Age	14 - 16 vs 12-13	2.13 (1.73, 2.63)	<.0001	2.134 (1.74, 2.64)	<.0001
Behavioural symptoms	1 vs 0	1.80 (1.43, 2.28)	<.0001	1.81 (1.44, 2.28)	<.0001
Self-injurious attempt/ideation	1 vs 0	1.33 (1.07, 1.65)	0.01	1.35 (1.10, 1.65)	0.004
Problematic sexual behaviour	1 vs 0	1.20 (0.85, 1.70)	0.31		
Sleep problem	1 vs 0	1.19 (0.96, 1.42)	0.11		
Anxiety Symptom Scale	1 vs 0	0.91 (0.68, 1.23)	0.04		
	2 vs 0	0.77 (0.57, 1.05)			
	3 vs 0	0.61 (0.42, 0.89)			
	4 vs 0	0.49 (0.26, 0.93)			
Distraction and hyperactivity scale	1 vs 0	1.78 (1.27, 2.50)	0.001	1.75 (1.25, 2.44)	0.001
	2 vs 0	1.94 (1.23, 3.07)		1.89 (1.20, 2.95)	
	3 vs 0	2.45 (1.56, 3.86)		2.37 (1.52, 3.69)	
	4 vs 0	2.31 (1.46, 3.64)		2.21 (1.42, 3.43)	
Depression Severity Scale	1 vs 0	0.76 (0.44, 1.34)	0.47		
	2 vs 0	0.87 (0.48, 1.56)			
	3 vs 0	0.97 (0.52, 1.82)			
	4 vs 0	0.97 (0.51, 1.81)			

5.3.4 Predictors of future substance use among youth living with mental health conditions at baseline

The unadjusted hazard model in Table S2 in the supplementary files shows that all the individual indicators of marginalization predicted future substance use except having a parent with

SUD. However, when sex, age, and clinical variables were added to the predictive model, only victim of abuse was a significant predictor of future substance use (HR: 1.36 [1.10, 1.68]; p-value 0.01). When the non-significant adjusted variables were removed from the predictive model, being a victim of abuse remained a significant predictor of future substance use.

Table 5.3 above shows that after controlling for age, sex, and severity of clinical symptoms, the hazard ratio, that is, the probability of not reporting substance use within two-year follow-up among youth exposed to 1 - 2 MI compared to those that did not is approximately 1.5 (P-value=0.003). Among those exposed to 3 - 4 MI, the probability of reporting substance use at two-year follow-up compared to those with no MI was approximately 2.0 (P-value <.0001). And the overall P-value of 0.0003 shows that marginalization precedes substance use, and this association is statistically significant. When the non-significant covariates were removed from the final predictive model, the HR for the cumulative effect of marginalization remained stable.

5.4 Discussion

This study is the first longitudinal research to examine the cumulative impact of marginalization in predicting substance use among youth in mental health settings in Ontario, Canada. This study builds on previous cross-sectional research that identified a strong association between substance use and these indicators of marginalization(65), showing that exposure to three or more indicators of marginalization does increase the risk of future substance use. The cumulative impact of marginalization indicators is important because of the multidimensional nature of marginalization. For instance, youth without a history of disrupted education might be victims of abuse, lack supportive family relationships, and have a parent with addiction problems. Therefore, MIS is a better measure of the indicators of marginalization than individual indicators.

There may be a complex interplay among indicators of marginalization and social vulnerability, occurring at different levels of influence (individual, interpersonal, community/societal). The indicators of marginalization examined in this study and its relationship to youth substance use may be indicative of chronic stressors and complex trauma in early childhood. Complex trauma is the exposure to multiple or chronic and prolonged, developmentally adverse traumatic events, most often of interpersonal nature and early-life onset that occurs within the child's caregiving system(193). Complex trauma includes physical, emotional, and educational neglect and child maltreatment beginning in early childhood. For instance, an extensive literature has shown that victimization, (that is, exposure or the experience of trauma like physical, sexual, and emotional abuse and neglect, family violence, disaster, war, and other emotionally harmful experiences during childhood), has long-term consequences, including PTSD, attention deficit and hyperactive disorder (ADHD), depression and anxiety, personality disorders a profound effect of cognitive, social, and emotional competencies and an increased risk for chronic diseases and substance use or substance use disorder(35,50,193,194). These symptoms can persist into adolescence and young adulthood through parent-child conflict and transgenerational transmission of trauma in adulthood. The mechanism of this relationship is early childhood trauma, especially complex trauma. Chronic childhood trauma is associated with attachment impairments, behavioral control, interpersonal issues, limit-setting, establishing healthy boundaries, poor cognitive skills, and high-risk behaviors that can cause neurobiological changes that impact human development and cause significant changes in brain function(193,195). These changes in brain structures are responsible for cognitive and physical functioning. Therefore, exposure to complex trauma in childhood leads to increased symptom complexity and is associated with greater impairment in cognitions, physical awareness and dissociation affect regulation, interpersonal attachment, and

behavior control(50,193,195). Numerous studies have demonstrated a relationship between early childhood trauma and substance abuse/dependence(33,35,193,195). Individuals who have experienced trauma are more vulnerable to using alcohol and drugs to cope with stressful situations(33,35,196). Research shows that some individuals rely on techniques focused on soothing their emotional responses to stress. Trauma survivors often turn to substance use to "sedate or numb" the effects of trauma or self-medicate to mediate painful memories and feelings associated with adverse events and situations(33,35,193,195).

This study shows that parental and family factors, including lack of supportive family relationships and parental substance use, are significant predictors of substance use among this study population. Attachment theory provides some insights into how these factors relate to substance use. In particular, insecure interpersonal attachment due to adverse childhood experiences has been linked to substance use and substance use disorder later in life. Also, substance use disorder could negatively impact attachment security(35,51,197,198). Parents who abuse substances could also be dealing with the consequences of trauma, affecting the relationships they form with their children. The long-lasting relational effects of their trauma may impede the capacity of parents to nurture their children to provide a base for their children to form a secure attachment with them which may lead to intergenerational cycles of trauma(198).

Furthermore, although this study shows that parental substance use alone does not predict youth substance use, parental substance use could result in an adverse environment like domestic violence, dysfunctional family, lack of family cohesiveness, and other traumatic experiences that impact children. And children with a history of these adverse experiences who do not experience a sufficiently secure attachment base may develop insecure attachment patterns. Children with insecure attachments will face more difficulties regulating emotions and stress and forming and

maintaining relationships with others. Then they might engage in using psychotropic substances to "self-medicate" attachment needs, regulate emotions, cope with stress, and replace relationships(35,51,52). Research evidence has shown that epigenetic mechanisms could play a role in the intergenerational transmission of parental trauma to their children, resulting from the offspring's early environmental exposures or a preconception trauma in parents that may affect the germline and impact fetoplacental interactions. (199–201) Research has also shown substantial genetic influences on SUD linked to multiple neurotransmission pathways within the dopaminergic system and substance-specific genes(156,157). Further research could also examine if these mechanisms are linked.

Other theories that have hypothesized the relationship between parental and family relations and substance use include family system theory and social cognitive theory. The family systems theory is based on the notion that the family structure and behavior generate essential factors for individual development and functionality because of the opportunities for family members to be role models and sources of reinforcement for adolescent behavior(202). This theory recognizes that the disruption in normal family functioning may strengthen the negative influence of other systems such as peers, school, and community on youth behavior(202). For instance, a conflict between parent and youth may lead youth to engage with substance-using peers or adopt community values favorable toward substance use. The persistent disruptions in the family system may lead to substance use, and the ongoing use of substances may further exacerbate these family issues.

The concept of modeling in social cognitive theory provides context for parent substance use or substance use disorder as the cause of substance use among youth. The social cognitive theory is based on the premise that social behaviours like substance use are acquired through direct

conditioning by modeling others' (parent) behaviour(25,48,202). Offspring of substance-using parents are at higher risk of future substance use than offspring of parents who do not use substances. For instance, repeated exposure to high-status, substance-using role models are likely to influence the behaviours of adolescents; that is, it may give adolescents the perception that substance use is necessary if they want to be famous (64).

Youth may be at risk of disrupted education for many reasons, including traumatic or adverse childhood experiences like maltreatment, behavioural, psychiatric, and family social circumstances, or negative school experiences like bullying, stigma, discrimination, and social isolation(49,170,203). Therefore, youth at risk of disrupted education could use substances to cope with their trauma or form a strong bond with substance or substance-using peers. These show that the relationship between substance use and being at risk of disrupted education are complex and can be linked to multiple constructs, including family attachment, educational attachment, emotional regulation, sense of agency, beliefs, and constrained resources(50,170,195,202,203).

This study shows that while exposure to multiple and cumulative indicators of marginalization could lead to substance use among youth, they are all interconnected. The root cause of all these MI is the adverse early childhood experiences and unsecured parental or family attachment. This means that youth experiencing one indicator of marginalization are at risk of experiencing more than one based on the common root cause. Therefore, identifying one MI indicates prompt and immediate intervention or response to ameliorate the cumulative effect or experience.

Experiencing maltreatment and cumulative stressful life events are associated with future and early onset of substance use. Early life stressors can result in permanent neurohormonal and hypothalamic-pituitary-adrenal axis changes, morphological changes in the brain, and gene

expression changes in the mesolimbic dopamine reward pathway leading to the development of substance use or substance use disorder(106,156,195). However, many children who have experienced severe early life stress do not develop psychopathology, indicating that mediating factors such as gene-environment interactions and family and peer relationships are important to consider in this study(195,204). Furthermore, while insecure attachment is not a pathological condition, it has also been shown to be related to mental disorders. Therefore, while not all youth that experienced trauma in early childhood or with an insecured attachment will use substances, the knowledge of the association between the experience of early childhood victimization and attachment insecurity in early childhood substance use are important for recognizing protective factors, examining resiliency, and identifying empirically-based treatment modalities to help alleviate symptoms of trauma survivors.

5.5 Limitations

The duration of the study (2-year follow-up) could have influenced the prevalence of future substance use observed in this study. Future research could assess future substance use using an extended period beyond two years. Such studies may also want to examine time to substance use to determine if certain combinations of MI may lead to earlier onset of substance use. Furthermore, there is a selection bias since the ChYMH assessment was only completed on youth with mental health concerns. Therefore, the results of this study could not be generalized to all youth in the community. Furthermore, limited dimensions/indicators of marginalization were examined. Further studies could examine if peer influence, family income, race/ethnicity, gender identity, religion/religiousity, immigration status, geographical location predict substance use. For instance, previous studies have shown that having substance-using friends might lead to substance use among youth. This study also was not able to include other important factors that can influence

whether the exposure to indicators of marginalization leads to substance use, such as coping resources. This study could not link the ChYMH data to OHIP billing data or other health system data to adjust for resource intensity in the receipt of physician-based mental healthcare, emergency department visits, or use of other mental health services outside of Ontario.

5.6 Implications for Research and Practice

This study establishes that modifiable indicators of marginalization like victimization, lack of social support, and disrupted education contribute to substance use among youth. These findings among youth living with mental health conditions align with the common factors models for co-occurring substance use and mental health conditions and are supported by the attachment theory and substance use. The findings from this study have implications for future research, practice, and policy.

Further research could use a more rigorous methodology (e.g., matching) to check if more indicators of marginalization, including those identified in this study, predict substance use. Another research could examine the development of a substance use risk index that includes indicators of marginalization in order to help identify those at risk of future substance use. Such an index may be helpful as an outcome measure to examine the incidence of substance use among service providers and potentially measure the quality of care. Such an indicator could also help examine the effectiveness of early interventions to address MIs in preventing future substance use

Implications for clinical practice include enhancing the utilization of integrated assessment tools to consider marginalization indicators at first contact for early identification of children at risk of substance use and early intervention. This information can be used at the point of care and communicating with care partners. At the point of care, youth identified as at-risk could receive more selective prevention interventions to reduce the risk of substance use. For instance, family

and social integration collaborative action plans (CAPs) integrated into the interRAI ChYMH help to identify children (4-11 years old) that have problems with attachment, caregivers' distress, interpersonal conflict, parenting, social and peer relation, and guidelines to improve these problems. Therefore, clinicians could use these CAPs in an integrated collaboration with the youth, their parents, school, and the child welfare systems to curb the trajectory of substance use among at-risk youth. Furthermore, the care of youth that are already using substances could include integrated intensive therapeutic trauma-informed family-based care, including child welfare and parenting programs in addition to substance use treatment.

Information from ChYMH tools can also be communicated with affiliated child welfare, education, and other social service supports for the early identification of youth at risk of substance use. The information can also be useful for identifying opportunities for preventative interventions, such as in areas where there is a high proportion of youth at risk of substance use. Preventive intervention for youth at risk of substance use should be proactive, integrated, and available at multiple levels, e.g., clinical setting, school, family, and within the community. Prevention programs could be designed to target different levels of needs, that is, universal preventive interventions for youth in the general population, selective preventive interventions for youth not using substances but at risk of use, and indicated prevention programs for substance-using youth(134). For instance, a universal prevention program for all youth could include an expansion of school curricula to include subjects or courses related to social and emotional competencies, youth empowerment, identification of unhealthy relationships, and where to get help.

Family- or parent-oriented universal prevention programs could include parenting classes or programs on parenting skills to raise healthy children and enhance family cohesiveness. Organizations using the interRAI ChYMH have access to the interRAI parenting CAP that outlines

practices for helping parents to build capacity and competency in supporting their child (142). Selective prevention programs for parents could include focused group interventions to develop positive relationships and stability at home, including eduction and supports for healthy lifestyles, to break the intergenerational transmission of trauma and prevention of childhood maltreatment

Community-level prevention intervention could include mentoring programs and programs that empower youth and provides a safe space for them to develop a healthy connection with others and develop helpful life skills. Teachers' training on raising healthy children and recognizing children at risk would also contribute to the prevention of substance use among youth. Intervention at all levels should be designed to address broader determinants of health and factors contributing to the experience of adverse childhood trauma and experiences using a family approach.

With these individual and community prevention and intervention considerations in mind, it is crucial for policy makers to consider the mobilization of resources and legislation to ensure that integrated health information systems are available to support providers and system planners. These results indicate that the implementation and monitoring of promising practice and policies frameworks are needed to prevent substance use among youth, including integrated and trauma-informed care for concurrent disorders, a trauma-informed child welfare system, and a positive school experience.

5.7 Conclusion

This study establishes that combinations of indicators of marginalization like adverse childhood experiences, lack of supportive parental and family relationships, and negative school experiences precede substance use among youth. These findings may help identify youth for whom preventive measures for substance use are most appropriate. Based on the common risk factor model, these MI can also influence mental illness among youth. Therefore, interventions that seek to change

these MI may have multiple effects on substance use, mental illness, and other health outcomes predicted by the MI addressed. Further research could examine if prevention programs targeting these MI at individual, family, community, policy, and practice levels would prevent or reduce substance use among youth.

Chapter 6

Discussion, Implications, and Conclusion

6. 1 General Discussion

The burden and cost of youth substance use are enormous for youth and their families as well as the health system. There is a crisis with the health system demonstrated by the high utilization of mental health services among children and youth in Ontario accompanied by long wait times and a lack of integrated services for youth living with substance use and mental illness. Furthermore, there is a need for evidence-based and theoretically informed interventions for the prevention and care of young people at multiple levels. These services need to consider the complex circumstances that youth may face, including substance use. Concurrent substance use can be particularly problematic for youth with mental health concerns. It can interfere with treatment for mental health disorders, worsens outcomes and long-term prognosis, and increases the cost of care. Therefore, finding a way to identify and address risk factors for substance use is vital for ensuring long-term outcomes for youth.

In trying to better understand the vulnerabilities of youth with mental health concerns, this study has focused on social determinants of health through the lens of marginalization in order to better understand substance use and mental health conditions. While there has been a movement within Ontario's health system to implement best practices and policies to promote the integration of mental health and addiction services, the findings from this dissertation demonstrate the need to consider social determinants, such as indicators of marginalization, to target substance use prevention and treatment among youth. Targeting these indicators as modifiable risk factors associated with substance use may be helpful in the development of early intervention strategies

to reduce the incidence of substance use disorders, mental illness, and the utilization of high-intensity services, potentially improving the quality of health and wellbeing of youth.

This dissertation has made a number of contributions that will be important for addressing marginalization and substance use among youth with mental health concerns. First, chapter 3 provides evidence for the complex needs of youth who use substances in the community and residential clinical settings, including psychological factors, adverse experiences, bavioural factors, and social relationships. Across both community and residential settings, a subset of social factors were strongly associated with substance use, particularly educational disruptions, abuse, and parental substance use. These findings provide further evidence to support the biopsychosocial model of substance use among youth. More tangibly, these findings demonstrate the importance of having comprehensive assessment available within the health system to best support care and service planning by identifying the range of factors related to substance use among youth.

Social circumstances, including exposure to indicators of marginalization, have a significant impact on mental illness and substance use. However, previous research has either examined the relationship between social factors and mental illness or social factors and substance use among youth but rarely considers all three. Limited studies have examined the impact of social determinants on co-occurring mental and substance use problems among youth. The studies that have examined the relationship are limited by sample size and social dimensions examined (age, sex, and family income). Furthermore, limited research has examined these associations specifically among youths in different mental health care facilities across Ontario, Canada. The second part of this dissertation addresses some of these gaps by adding new knowledge about how the nature and severity of exposure to marginalization indicators are associated with substance use among youth living with mental health conditions. Perhaps not surprising, indicators of

marginalization were common among youth and were significantly associated with substance use while adjusting for clinical symptoms. In particular, indicators of victimization, educational disruption, and residential instability were strongly associated with substance use. Not only do these factors, including substance use, pose a concern for the mental health recovery of youth, but the exposure to such marginalization indicators could also lead to a risk of homelessness or criminal involvement into adulthood(92). As such, timely interventions are important for promoting the longer-term recovery of youth.

While study 2 (Chapter 4) demonstrated the breadth of marginalization experienced by youth with mental health concerns, there remained questions as to the direction of the relationship with substance use. The third study (Chapter 5) addressed these questions, finding that several key marginalization indicators when measured in combination, precede the onset of substance use among youth. What is interesting about these findings is that the experience of any one indicator may not, alone, be predictive of substance use. However, when one considers the cumulative impact of exposure to indicators of marginalization, the risk of substance use increases substantially. Therefore, early identification and prevention of substance use needs to consider the holistic context of youth's circumstances rather than focusing only on specific issues or concerns. As such, multi-pronged approaches to intervention may be most appropriate.

6.2 General Implications for Research, Practice, and Policy

6.2.1 Research

There are several opportunities for future research to build on the streams of research presented in this dissertation, focused on better understanding the contexts of substance use, the combinations of marginalization indicators that lead to earlier onset of substance use, methods for enhancing the utility of instruments like the interRAI ChYMH in identifying risk of substance use

as well as social vulnerability, as well as intervention studies that examine the effectiveness of interventions for marginalization. Furthermore, future research using qualitative methods will complement these quantitative studies to explore with youth, and their families or caregivers, reasons for substance use and factors that they feel could be leveraged to prevent future substance use. This knowledge is important for building care planning recommendations tailored to the youths' contexts and identifying specific triggers or circumstances for substance use.

Second, further research could further examine the combinations of marginalization indicators, including those identified in this study, that predict earlier onset of substances use as well as future outcomes resulting from substance use. These might include computer-assisted models such as machine learning to examine how different patterns of social vulnerability may lead to substance use or other adverse outcomes related to the combination of marginalization and symptom or functional status.

Third, there are opportunities to develop at least two new indices based on the interRAI ChYMH assessments. The findings from this dissertation provide the conceptual basis for the development of a marginalization index. While the current research did use sums of marginalization indicators, it may be that there are more rigorous approaches for measuring this construct, perhaps by examining whether certain indicators of marginalization, such as victimization or residential circumstances, should be weighted differently in how a marginalization index is scored as well as statistical cut-offs for predicting various outcomes of marginalization, such as homelessness. The index could also investigate other outcomes among youth like homelessness or quality of care received like rehospitalization. The development of a marginalization index that can support social care planning (e.g., develop marginalization CAP) and be used as an equity indicator for evaluating the quality of care (can stratify quality indicators

by marginalization scores to ensure all get good quality of care). This would also be helpful for care planning or referral for social care services (e.g., Family and Children Services).

The results from study three can also be used to develop a substance use risk scales to enhance better identification of risk early and enhance monitoring of substance use by sharing this information with primary care or other social services supporting a youth (e.g., education settings). Such an index can and should incorporate indicators of marginalization, as well as other risk factors identified in study one. As such, the substance use risk indicator may be able to measure both the propensity or risk of developing substance use as well as the severity of existing substance use.

Finally, the findings from this research identify important issues of social vulnerability that should be addressed within the mental health system. Therefore, another opportunity for future research is to examine if services implementing interventions to address these MIs could prevent future substance use or mental illness, as well as secondary substance use or substance use disorders.

6.2.2 Practice

The different patterns of substance use among youth in the community and residential settings shows that care providers could intensify their efforts to identify and treat substance use conditions (initiation or disorder) among youth with less severe symptoms at first contact in all settings. Furthermore, based on the differences identified in the residential and community settings, treatments in the community setting could focus more on early identification, intervention, and monitoring. The focus of treatment in the residential setting may be more on intensive therapy and skills building and harm reduction. Also, comprehensive mental health assessment, including substance use assessment, should be completed for all youths accessing

outpatient or residential settings at first contact. Substance use should also be considered within mental health treatment. Failure to treat mental health conditions that co-occur with substance use conditions and vice versa due to fragmented services would increase the burden on youth seeking treatment, leading to intensive treatment needs and premature termination, resulting in poor outcomes.

Given the widespread use of interRAI ChYMH in Ontario and elsewhere, there is a need to enhance the care planning application of the interRAI ChYMH assessment instruments. While a range of CAPs exist for supporting the use of the ChYMH in care planning, study 2 of this dissertation provides evidence supporting the need to develop a Marginalization CAP that can be embedded in ChYMH. Such a CAP can alert teams to the social vulnerabilities experienced by youth and provide guidelines for addressing these vulnerabilities in the short- and the longer term.

The findings from this dissertation also underscore the importance of s early identification through screening using a comprehensive, integrated assessment that includes the evaluation of indicators of marginalization. Since the interRAI ChYMH screener has limited items related to the measure of marginalization, it would be helpful to add more indicators of marginalization that are relevant to children and youth, potentially as a supplemental screener. Furthermore, since full ChYMH provides a more comprehensive assessment, it should be used more regularly to capture more comprehensive data on the needs of youth. The broad use of the interRAI ChYMH assessment instrument provides an opportunity to examine broader indicators of marginalization and examine changes in relation to substance use and other multiple outcomes over time.

Preventive intervention for youth at risk of substance use should be proactive, integrated, and available at multiple levels, e.g., clinical setting, school, family, and community. Prevention programs could target different levels of needs, universal preventive interventions for youth in the

general population, selective preventive interventions for youth not using substances but at risk of use, and indicated prevention programs for substance-using youth(134). Therefore, sharing aggregate interRAI ChYMH data with child welfare, school, and other public system records may support the implementation of early identification and prevention programs for youth at risk of substance use. In addition, the data can also be used to evaluate the effectiveness of such interventions in preventing future substance use and substance use disorder among youth.

6.2.3 Policy

Broadly, the findings from this study can be used to develop reports for informing policy development and evaluating changes to policies implemented within and across health systems. The development of a provincial evaluation or reporting framework that captures all relevant social determinants, including key indicators of marginalization and youth at risk of substance use, would be helpful for monitoring and evaluating the public health system. In addition, the improvement of policies related to inequality, adverse early childhood experiences, food insecurity, racism, and other social determinants of mental health would be helpful to address this issue upstream before mental illness, or substance use occurs. Relevant sectors like health, education and children, community and social services could invest in more programs that improve child welfare, family social circumstances, and a healthy community. Finally, this study's findings may support the mobilization of resources and legislation to ensure the implementation and monitoring of the existing modeled and promising policies and practice guidelines like integrated and trauma-informed care for concurrent disorders, a trauma-informed child welfare system, and a positive school experience.

6.3 General Conclusion

This research underscores the importance of considering an integrated assessment in understanding and developing a care plan for substance use and mental health conditions. The result of this research establishes that the province-wide utilization of an integrated assessment tool like the interRAI ChYMH instrument is helpful to understand the psychosocial risk factors for youth substance use and the importance of using the social determinant lens in developing a care plan for youth with substance use and mental health issues in different care settings. Furthermore, the establishment of the theoretical underpinning of how exposure to modifiable key indicators of marginalization contributes to the incidence of substance use among youth through the attachment theory and common risk factor model provides the hypothesis that addressing these MI can prevent youth substance use and influence other multiple outcomes. Therefore, this research is evidence that we can prevent substance use and its consequences among youth from developing in the first place by focusing on risk assessment for early identification of those at risk and proactively developing integrated selective intervention for those at different levels of risk and indicated prevention interventions to reduce harm among substance-using youth. Policy level interventions to reduce substance use at the population level could address the broader social determinants of mental health at multiple levels. Lastly, the results of this research have implied that the implementation and evaluation of modeled or promising prevention programs/interventions and broader dissemination would have a substantial impact on the prevalence of substance use and related consequences.

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Appendix A

Table A1. Equity stratifiers and their definition (Source CIHI, 2018)

Equity stratifiers	Definition
Age	_
Sex	An individual's biological sex: male, female or other
Gender identity	An individual's sense of self as, for example, male, female or transgender
Sexual orientation	An individual's romantic or physical attraction to a specific sex or gender
Aboriginal identity	The self-identification of an individual as First Nations, Inuit or Métis
Ethnic/cultural group	Ethnic/cultural groups based on an individual's ancestry, with categories such as Canadian, German, Ukrainian, South Asian and Portuguese
Population group	Population groups (also referred to as racial/cultural groups) are used to identify visible minorities as defined in the Employment Equity Act. This stratifier commonly includes categories such as white, Chinese, Arab, Latin American and black
Immigration status	Length of time an individual has lived in Canada, including whether he or she is a refugee, immigrant or Canadian-born
Language	The language(s) that an individual feels most comfortable speaking or reading
Country of birth	_
Geographic location	An individual's home address, or a broader geographical region (e.g., neighbourhood, city, province, rural/urban)
Household composition	An individual's living arrangement, including categories such as living alone, couple or single parent
Marital status	Whether an individual report being single, married, separated, divorced, widowed or living common-law
Housing	The housing situation of an individual, which could include housing tenure (own home, rent from a private or social landlord, homeless) or inadequate housing (e.g., overcrowded, damp)
Education	The number of years of formal education (elementary, secondary, university, college or other post-secondary institution) completed or the highest level of education obtained by an individual
Employment status	Refers to whether a person was employed (full time or part time), unemployed or not in the labour force
Occupation	An individual's occupational category (e.g., transit vehicle drivers, retail sales persons, pharmacists) or industrial category (e.g., construction, educational services, arts/entertainment)

Income	An individual's personal or household income, which may be used to derive measures of poverty, neighbourhood-level income or financial strain
Wealth	An individual's household characteristics/amenities and possessions
Health insurance	The extent of an individual's insurance coverage for prescription drugs, dental care or other health services
Disability	Refers to whether an individual has a long-term or recurring physical, mental, sensory, psychiatric or learning impairment and is considered to be at a disadvantage. Disability may be captured by functional status, activities of daily living score or specific disability category (e.g., physical disability, learning disability).

Table B1. Characteristics of ChYMH and ChYMH-S Samples

		ChYMH-Screener (N = 38976)		ChYMH (N = 9142)	
Characteristics	Level	Freq	%	Freq	%
Patient type	Community	38,972	99.99	8446	92.4
	Residential	4	0.01	696	7.6
Sex	Male	15,099	38.4	4068	44.5
	Female	23,877	61.3	5074	55.5
Age group	12–14	11,022	28.3	2779	30.4
	15–16	14,941	38.3	3510	38.4
	17–18	13,013	33.4	2853	31.2
Risk of disrupted education	Yes	23,280	60	4717	52.7
	No	15,145	39	4027	45
	Not applicable	392	1	212	2.4
No Strong and supportive relationship with family	Yes	6727	17.3	2053	22.5
	No	32,249	82.7	7089	77.5
Parent/caregiver has mental health issue	Yes	13,536	34.7	3963	43.3
	No	25,440	65.3	5179	56.7
Parental addiction/substance use	Yes	7691	19.7	2125	23.2
	No	31,285	80.3	7017	76.8
Highest number of alcohol drinks in the last (14–30 days)	None	34,723	89.1	8059	88.2
	1	1092	2.8	277	3
	2–4	1729	4.4	476	5.2
	≥5	1432	3.7	330	3.6
Intentional misuse of prescription or OTC medication	Yes	1197	3.1	502	5.5
	No	37,779	96.9	8640	94.5

Use of illicit drugs (in the last 14 -30 days)	Yes	6568	16.9	1711	18.7
	No	32,408	83.1	7431	81.3
Use of any substance in the last 14–30 days	Yes	8583	22	2263	24.8
	No	30,393	78	6879	75.2
Behaviour symptom	Yes	20,654	53	5939	65
	No	18,322	47	3203	35
Self-injurious ideation or attempt	Yes	22,548	57.9	5515	60.3
	No	16,428	42.1	367	39.8
Problematic sexual behaviour	Yes	2332	6	425	4.7
	No	36,644	94	8717	95.3
Victim of abuse	Yes	13,875	35.6	3785	41.4
	No	25,101	64.4	5357	58.6
Distraction and hyperactivity scale	0-None	8061	20.7	1571	17.2
	1-Low	23,262	59.7	5204	56.9
	2-Moderate	3010	7.7	770	8.4
	3-High	2329	6	772	8.4
	4-Very high	2314	6	825	9
Anxiety scale	0-None	6729	17.3	1576	17.2
	1-Low	11,138	28.6	2315	25.3
	2-Moderate	13,498	34.6	2981	32.6
	3-High	6178	15.9	1766	19.3
	4-Very high	1433	3.7	504	5.5
Depression severity Index	0-None	1467	3.8	494	5.4
	1-Low	16,739	43	3751	41
	2-Moderate	10,490	26.9	2361	25.8
	3-High	4374	11.2	1049	11.5
	4-Very high	5906	15.1	1487	16.3
Sleep problem	Yes	24,797	63.6	5486	60
	No	14,179	36.4	3656	40
Cognitive problem	Yes	5908	15.2	2672	29.2
	No	33,068	84.8	6470	70.8
Last contact with CMH agency in the last year	No contact	13,301	34.1	1763	19.3
	≥31	8634	22.1	2416	26.5
	≤30	17,041	43.7	4953	54.2

Table C1. Components and Items of RAI-MH Marginalization Index and their corresponding variables in ChYMH

Components	Items (Marg Index) for RAI-MH	Items (ChYMH in-patient)
Victimization	Sexual, physical and emotional abuse	Victim of sexual, physical and emotional abuse
		Witness domestic violence,
	Abused family	Life stressors for caregiver
	Fear another person	Fearful of another person (
		Bullying
	Victim of crime	Victim of crime
		Suicidality
Social Support	Dysfunctional family	
	Severed relationship	Unsettled relationship
	No confidant	Confidant
	Overwhelmed family	Caregivers distress
Isolation	Lived alone	Has at least one friend with whom visits / plays /
	No contact within last month	socializes regularly
		Numbers of family members in household,
		Discharge support,
	No support for discharge	Relationship with family
		Relationship with friends/peers
		Has at least one friend
		Social inclusion by peers
Resources	Up to grade 11 education	Education
	Unemployed	Notable talent
		Good school performance
		School engagement
Deprivation	Residential instability	Residential stability over last
	Trade offs	2 years
		Finances
		Current payment source
		Foster care
Identity		Gender, ethnicity, disability, Immigration status

Table C2. Description and coding of the Marginalization Indicators in ChYMH

Components	Description	Coding of the MI for the analysis
Victim of abuse	Victim of sexual assault or abuse or Victim of physical assault or abuse or Victim of emotional abuse 0. Never 1. More than 1 year ago 2. 31 days-1 year ago 3. 8-30 days ago 4. 4-7 days ago 5. In last 3 days	Victim of sexual assault or abuse or Victim of physical assault or abuse or Victim of emotional abuse (1): 1 Victim of sexual assault or abuse and Victim of physical assault or abuse and Victim of emotional abuse (0): 0
Victim of crime	Victim of crime 0. Never 1. More than 1 year ago 2. 31 days-1 year ago 3. 8-30 days ago 4. 4-7 days ago 5. In last 3 days	Never: 0 ≥ 1: 1
Victim of bullying	Victim of bullying 0. Never 1. More than 1 year ago 2. 31 days-1 year ago 3. 8-30 days ago 4. 4-7 days ago 5. In last 3 days	Never: 0 ≥ 1: 1
Risk of disrupted education	Risk of Disrupted Education in Last 90 Days – due to increase in lateness or absenteeism or poor productivity or disruptiveness at school or conflict with school staff or expresses intent to quit school 0. No 1. Yes 8. Not applicable (homeschooled)	No or Not applicable: 0 Yes: 1

No friend:	Has at least one friend with whom visits/plays/socializes regularly 0. No 1. Yes	No: 1 Yes: 0
Caregiver Distress	Parent/primary caregiver expresses feelings of distress, anger, or depression 0. No 1. Yes 8. Unknown or not applicable	No or unknown: 0 Yes: 1
Lack of Strong and supportive relationship with family	Strong and supportive relationship with family No: 0 Yes: 1	No: 1 Yes: 0
Residential instability	Residential Instability Over Last 2 Years 0. No 1. Yes	No: 0 Yes: 1
History of foster placement	History of Foster Family Placement 0. None 1. 1 foster family 2. Multiple foster families	None: 0 ≥ 1: 1
Trade off	Finances (economic trade-offs) 0. No 1. Yes	No: 0 Yes: 1
Life Events - Parental addiction or substance abuse	0. Never 1. More than 1 year ago 2. 31 days-1 year ago 3. 8-30 days ago 4. 4-7 days ago 5. In last 3 days	Never (0): 0 Lifetime occurrence (1 – 5) : 1
Family Member(s) or Other Primary Caregiver(s) Has (Have) Current Developmental, or Mental Health Issues - Parent(s)/primary caregiver(s)	No: 0 Yes: 1	No: 0 Yes: 1

Cognitive/Intellectual disability	Cognitive Skills for Daily Decision-Making 0. Independent 1. Modified independence 2. Minimally independent 3. Moderately dependent 4. Severely dependent 5. No discernible consciousness, coma	None: 0 ≥ 1: 1

Table C3. Pattern of Indicators of marginalization among Youth assessed with Full ChYMH

		Total		M (N=4068)		F (N=5074)	
Indicators of Marginalization	Level	f	%	Freq	%	Freq	%
Social support-Caregiver distress							
	No	5542	60.6	2311	56.8	3231	63.7
	Yes	3419	37.4	1687	41.5	1732	34.1
	Unknown/NA	181	2	70	1.7	111	2.2
Social support - No strong family relationship							
	No	7089	77.5	3245	79.8	3844	75.8
	Yes	2053	22.5	823	20.2	1230	24
Isolation - No Friend							
	No	6988	76.4	2883	70.9	4105	80.9
	Yes	2154	23.6	1185	29.1	969	19.1
Deprivation - Residential instability							
	No	8210	89.8	3628	89.2	4582	90.3
	Yes	931	10.2	439	10.8	492	9.7
Deprivation - History of foster placement							
	No	7915	86.6	3454	84.9	4461	87.9
	Yes	1227	13.4	614	15.1	613	12.1
Deprivation-Trade off							
	No	8746	95.7	3881	95.4	4865	95.9
	Yes	396	4.3	187	4.6	209	4.1
Victimization - Victim of abuse							
	No	5357	58.6	2607	64.1	2750	54.2
	Yes	3785	41.4	1461	35.9	2324	45.8
Victimization - Victim of crime							

	No	8744	95.7	3859	94.9	4885	96.3
	Yes	398	4.3	209	5.1	189	3.7
Resources - Risk of disrupted education*							
	No	4027	45	1548	38.9	2479	49.8
	Yes	4717	52.7	2315	58.2	2402	48.2
	Not applicable	212	2.3	112	2.8	100	2
Vulnerability - Parental addiction/substance abuse							
	No	7017	76.8	3167	77.8	3850	75.9
	Yes	2125	23.2	901	22.1	1224	24.1
Vulnerability - Parent with MH issue							
	No	5179	56.7	2396	58.9	2783	54.9
	Yes	3963	43.3	1672	41.1	2291	45.1
Vulnerability - Disability							
	No	6470	70.8	2492	61.3	3978	78.4
	Yes	2672	29.2	1572	38.7	1096	21.6

Table C4. Descriptive statistics of the simple sum version of Marginalization Indicator

		Total		
Marginalization Indicator Sum	Frequency	Percent	Mean	3
0	792	8.8	Median	3
1	1436	16	Mode	3
2	1649	18.4	SD	2
3	1667	18.6	Variance	4
4	1332	14.9	Range	8
5	960	10.7	Q1	2
6	541	6	Q3	4
7	311	3.5	IQR	2
8+	267	3	P-value	<.0001

Table C5. Descriptive statistics of the simple sum version of Marginalization Indicator by gender

	Male				Female			
Marginalization Indicator Sum	Freq	%	Descriptive statistics for the MI among males		Freq	%	Descriptive statistics for the MI among females	
			Mean	3			Mean	3
0	277	7.0	Median	3	515	10.3	Median	3
1	591	14.9	Mode	3	845	17	Mode	2
2	713	17.9	SD	2	936	18.8	SD	2
3	751	18.9	Variance	4	916	18.4	Variance	4
4	637	16	Range	8	695	14	Range	8
5	449	11.3	Q1	2	511	10.3	Q1	1
6	257	6.5	Q3	5	284	5.7	Q3	4
7	166	4.2	IQR	3	145	2.9	IQR	3
8+	133	3.3	P-value	<.0001	134	2.7	P-value	<.0001

Table D1. Association between marginalization and substance use among those with follow-up assessments (Total sample with follow-up assessment N=4274)

Variable	N	n # that use substance	% Row substance use	Bivariate OR 95% CI	X^2	P-value
Victim of abuse						
Yes	1298	169	13	1.71 (1.39, 2.10)	26.91	<.0001
No	2976	243	8.2			
No strong family relationship						
Yes	574	77	13.4	1.55 (1.19, 2.02)	11	0.004
No	3700	335	9.1			
Parental addiction or substance abuse						
Yes	742	91	12.3	1.43 (1.12, 1.83)	9.38	0.009
No	3532	321	9.1			
Risk of disrupted education						
Yes	2248	261	11.6	1.70 (1.38, 2.10)	28.95	<.0001
No	2026	151	7.5			
Simple sum of Marginalization Indicators: MI-Sum (0 -4)						
0 - Reference	1186	66	5.6		62.37	<.0001
1	1786	168	9.4	1.78 (1.33, 2.39)		
2	881	111	12.6	2.48 (1.81. 3.40)		
3	370	60	16.2	3.44 (2.39, 4.96)		
4	51	7	13.7	3.17 (1.44, 6.97)		
MI-Sum Categories (0 - 2)						

0: MI-Sum (0) - Reference	1186	66	5.6		52.72	<.0001
1: MI-Sum (1 - 2)	2667	279	10.5	2.01 (1.52, 2.64)		
2: MI-Sum (3 - 4)	421	67	15.9	3.41 (2.39, 4.86)		

Appendix B

Table S1. Proportion of youth that experienced substance use during 2-year follow-up by MISum

Severity of Marginalization (MI-Sum Categories)	Total number of Youth	Number of Youth who used substance	Number of Youth Censored	Percent Censored
0: MI-Sum (0) - Reference	5408	66	5342	98.8
1: MI-Sum (1)	8110	168	7942	97.9
2: MI-Sum (2)	3939	111	3828	97.2
3: MI-Sum (3)	1551	60	1491	96.1
4: MI-Sum (4)	271	7	264	97.4
Total	19279	412	18867	97.9

Table S2. The risk of future substance use among youth that reported the experience of marginalization at baseline (Unadjusted Hazard Ratio)

Variables	Label	Hazard Ratio (95% CI)	P-Value
Victim of abuse	Yes vs No	1.58 (1.28, 1.95)	<.0001
Risk of disrupted education	Yes vs No	1.42 (1.16, 1.74)	0.0006
No strong family relationship	Yes vs No	1.36 (1.06, 1.75)	0.02
Parental addiction or substance abuse	Yes vs No	1.15 (0.90, 1.47)	0.28

Table S3. The risk of future substance use among youth that reported the experience of marginalization at baseline controlling for significant covariates

Variables	Label	Hazard Ratio (95% CI)	P-Value
Victim of abuse	Yes vs No	1.53 (1.06, 1.62)	<.01
Risk of disrupted education	Yes vs No	1.16 (0.94, 1.42)	0.16
No strong family relationship	Yes vs No	1.23 (0.96, 1.58)	0.10
Parental addiction or substance abuse	Yes vs No	1.12 (0.88, 1.43)	0.36
Age	(14-16) vs (12-13)	2.13 (1.73, 2.63)	<.0001
Behaviour symptoms	Yes vs No	1.81 (1.44, 2.28)	<.0001
Self-injurious ideation/attempt	Yes vs No	1.33 (1.08, 1.63)	0.007
Distraction and hyperactivity scale			
	1 vs 0	1.77 (1.26, 2.47)	0.001
	2 vs 0	1.91 (1.22, 2.99)	
	3 vs 0	2.38 (1.53, 3.71)	
	4 vs 0	2.25 (1.45, 3.49)	

Table S4. Fit statistics for model comparison

Summary of events and censored values

Total	Event	Censored	Percent censored
19278	412	18866	97.86

Model fit	Full Model		Parsimonious Model	
Criterion	Without covariates	With covariates	Without covariates	With covariates
2LOGL	8121.345	7942.752	8121.345	7957. 057
AIC	8121.345	7982.752	8121.345	7957. 057
SBC	8121.345	8063.172	8121.345	8011.246

Testing Global Null Hypothesis: BETA=0

	Full Model			Parsimonious Model		
Test	Chi-Square	DF	Pr> ChiSq	Chi-Square	DF	Pr> ChiSq
Likelihood ratio	178.5928	20	<.0001	164.2879	9	<.0001
Score	170.6421	20	<.0001	156.3282	9	<.0001

Wald	162.5587	20	<.0001	148.3909	9	<.0001
Type 3 Tests						
Effect	DF	Wald Chi-Square	Pr>Chisq	DF	Wald Chi-Square	Pr>Chisq
Sex	1	0.3693	0.54			
Age	1	49.6917	<.0001	1	50.9666	<.0001
Behavioural symptoms	1	24.3737	<.0001	1	25.4367	<.0001
Self-injurious attempt/ideation	1	6.6125	0.01	1	8.3431	0.004
Problematic sexual behaviour	1	1.0406	0.31			
Sleep problem	1	2.4819	0.11			
Anxiety Severity scale	4	9.8094	0.04			
Hyperactivity and Distractibility scale	4	17.9369	0.001	4	17.7358	0.001
Depression Severity scale	4	3.5304	0.47			
Sum of Marginalization Indicators	2	13.4600	0.001	2	14.4244	0.0007

Table S5. Dimensions and Indicators of Marginalization in interRAI

Dimensions of Marginalization	Indicators of Marginalization	
	ChYMH	ChYMH-S
Social support	Caregiver distress, No strong family relationship	No strong family relationship
Deprivation	Residential instability, History of foster placement, Trade off	History of foster placement
Victimization	Victim of abuse, victim of crime	Victim of abuse
Resources	Risk of disrupted education	Risk of disrupted education
Vulnerability	Parent addition/substance use, parent with mental health issue, disability	Parent addition/substance use, parent with mental health issue, disability
Isolation	No friend	