Mental Illness Among Canadian Immigrant Students: Reports from The Canadian Community Health Survey (CCHS)

by

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Declaration of Committee

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Abstract

Background: The main cohort of Canadian-born students entering postsecondary education has decreased over the last decade due to Canada's low birth rate [1] while Canada's international student population has grown six-fold over the past 20 years [2]. This shifting demographics might impact Canadian institutions of higher education as more immigrant students pursue their education in Canada [3]. At the same time, the prevalence of mental illness among postsecondary institutions has been skyrocketing [4]. There is limited Canadian research on the mental illness of students, particularly that of immigrant students. This study bridges the gap using data from Canadian Community Health Survey (CCHS).

Objective: The objective of this study is to estimate the prevalence of self-reported mental illness (SRMI) among Canadian immigrant students as compared to their Canadian-born counterparts, and to identify risk factors of SRMI focusing on mood- and anxiety- disorders.

Results: Overall prevalence of SRMI among students was 16% (18% and 7% for Canadian-born- and immigrant- students, respectively). However, Canadian-born students have reported more than double SRMI than that of immigrant students including that of self-reported mood- and anxiety- disorder. Overall, older, female, single, and economically less fortunate students were the most likely to have SRMI. Stressful life, smoking, and drinking alcohol were associated with increased odds of having SRMI, mainly for Canadian-born students. A weaker sense of belonging to their local community was also associated with a significant increase in the odds of having SRMI while consulting mental health professionals had a significant protective effect against having SRMI.

Conclusion: SRMI was more prevalent among Canadian-born- compared to immigrant-students. Socio-economic characteristics and health behaviours, including the sense of belonging to the local community have significantly influenced the odds of having SRMI while consulting mental health professionals has shown a significant protective effect against having SRMI.

Recommendation: Promoting a culture of wellness that prioritizes healthy habits, forging a sound funding and work-study program that reduces students' financial burden, and improving access to mental health counselling services might produce a better mental health outcome.

Keywords: Mental illness; Mental health; Canadian immigrant students; Canadian community health survey; Students mental health; Students mental illness

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List of Acronyms

CCHS	Canadian Community Health Survey
CCTB	Canadian Child Tax Benefit
DALYs	Disability Adjusted Life Years
HIE	Healthy Immigrant Effect
HR	Health Region
IRCC	Immigration, Refugee and Citizenship Canada
LAC	Library and Archives Canada
LFS	Labour Force Survey
MI	Mental Illness
OCD	Obsessive Compulsive Disorder
PPS	Probability Proportional to Size
PHAC	Public Health Agency of Canada
SES	Socio Economic Status
SFU	Simon Fraser University
SRAD	Self-reported Anxiety Disorder
SRMD	Self-reported Mood Disorder
SRMI	Self-reported Mental Illness
US	United States of America
WHO	World Health Organization
YLDs	Years Lived with Disabilities

Chapter 1. Introduction

Any given year will yield approximately 1 in 5 Canadians that experience a mental illness requiring professional care [5-8], which mostly affects young people between 15 to 24 years of age [9]. Postsecondary students, in particular, are more prone to develop a mental illness that may affect their ability to think, feel and perform daily functions [4]. For most of them, the onset of mental illness precedes their 25th birthday mostly resulting from a substantial delay in treatment [10], and it usually gets better one time and worsens the other time throughout their life [5]. Normally, the age at the beginning of their postsecondary education is a highly susceptible time for the onset of mental illness [10, 11] because they are in a developmental stage where the brain is highly sensitive to risk exposures generally encountered by post-secondary students, including psychosocial stressors, recreational drugs, alcohol binging, and sleep disruption [12].

Despite the burden of disability mental illness creates [7, 13], most students who need care do not receive mental health services [8, 14-16]. Left untreated or inadequately treated, mental illness can lead to progression to more complex disorders, school dropout, addiction, and self-harm [17, 18]. As students walk into post-secondary education they enter the riskiest period for the emergence of mental illness, maladaptive coping, and academic failure [19]. This period also represents a window of opportunity for prevention and timely intervention.

During the last decade, the cohort of Canadian-born students entering post-secondary education has remarkably dropped owing to Canada's declining birth rate [1]. This has been mirrored in the fact that Canadian colleges and universities have been depending on recruiting more international students to sustain themselves financially [1]. Canada is now the third destination worldwide for international students [1], which has grown six-fold over the past 20 years and tripled over the last decade [2] perhaps due to the comprehensive study-work-immigrate package that Canada offers international students [20]. The changing demographics indicated that Canadian post-secondary institutions will be impacted as more prospective immigrant students pursue their education in Canada [3].

Studies have highlighted the link between migration and mental health stressors [21] pinpointing a critical need for mental health services and related programs for refugee and

immigrant youth. Studies have suggested a further scholarly inquiry into mental health disparities in post-secondary education experiences observed by immigrant student populations as compared to other student populations [22, 23]. However, little is known about the mental illness of Canadian immigrant students. Of particular concern are mood- and anxiety- disorders, which are the two most common mental illnesses in Canada.

Accordingly, this study aims to gain a better understanding of the variations in the prevalence of self-reported mental illness (SRMI) and its determinants among Canadian immigrant students as compared to their Canadian-born counterparts. We hypothesized a significant difference in the prevalence of self-reported mental illness among immigrant students as compared to their Canadian-born colleagues. Towards this end, we have used the data from the recent cycle (2017-2018) of the Canadian Community Health Survey (CCHS), which is a pan Canadian survey of Canadians.

Chapter 2. Literature Review

This chapter discusses available literature on mental illness with specific emphasis on the mental illness of immigrant students in the Canadian context. It is organized in such a way that it clarifies the areas of prior research on the study we are undertaking. It starts with defining mental illness as contrasted to mental health. Then it shows some highlights on the global and local burden of mental illness, mental illness among immigrants and students, and risk factors associated with mental illness. Lastly, it shows the conceptual framework for this study.

In this thesis, we focused on mood- and anxiety- disorders, the most common mental illness in Canada, which present unique challenges for the student population, especially immigrant students.

2.1. Defining mental illness

The World Health Organization (WHO) constitution defines health as a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity. It defines mental health as the ability to think, learn, and understand one's emotions and the reactions of others; a state of well-being in which an individual realizes his or her own abilities, can cope with the normal stresses of life, can work productively and can make a contribution to his or her community [24]. To wit, mental health is a state of balance, both within and with the environment – physical, psychological, social, cultural, spiritual and other interrelated factors participate in producing this balance [24]. Another study has also defined mental health as a combination of emotional (emotional well-being refers to the realization of well-being), social (social well-being refers to the effective functioning of a person in the community) and psychological well-being (psychological well-being refers to effective individual functioning) [25].

Keyes, on the other hand, defined mental health on a continuum model, stretching mental health and mental illness on opposite ends [26]. According to him, one should assess the symptoms of mental health such as emotional, psychological, and social well-being, and symptoms of mental illness at the same time to gain a thorough sense of the individual's full mental health [27]. and this would help classify individuals into 3 reasonable states of mental health, i.e. languishing, moderate mental health and flourishing [26-29].

Accordingly, lower levels or complete mental illness symptoms would indicate and high levels of mental health would indicate complete mental health, while lower levels or complete absence of well-being symptoms coupled with high levels of ill-being symptoms would indicate mental illness [27].

Mental illness comprises a range of disorders that affect mood, thinking and behaviour including depression, anxiety disorders and schizophrenia, as well as substance use disorders and gambling problems. It can weaken functioning, or cause distress with varying symptoms from mild to severe [30]. In essence, it potentially impacts every aspect of an individual's life, including relationships, education, work, and community involvement - individual-level effects that can potentially impact the overall economy [31-33]. A range of mental illnesses exists in Canada and worldwide that can have a tremendous negative impact on an individual's life, however, mood and anxiety disorders hold the lion's share [34].

According to the Public Health Agency of Canada (PHAC), mood disorders are characterized by the lowering or elevation of a person's mood and include major depressive disorder, bipolar disorder, dysthymic disorder, and perinatal/postpartum depression [35]. Anxiety disorders, on the other hand, are characterized by excessive and constant feelings of nervousness, anxiety and even fear which includes generalized anxiety disorder, phobias, and post-traumatic stress disorder, among others [35]. Mood and anxiety disorders are different; however, both can occur concurrently [35]. Either of these disorders can significantly impact a person's life, ranging from just an episode to chronic disorders [36], which makes them a significant public health challenge in Canada [35].

This study focuses on these disorders in such a way that it covers students living with mood disorders only, anxiety disorders only, or both mood- and anxiety- disorders.

2.2. Mood and anxiety disorder

2.2.1. Mood disorders

Mood disorders affect the way an individual feels and may involve depressive or manic episodes [37]. People undergoing depression can feel worthless, helpless, hopeless, become uninterested in regular activities, experience change in appetite, sleeplessness,

reduced energy, lose focus, and/or become indecisive. On the other hand, individuals experiencing a manic episode can have an excessively high or elated mood, unreasonable optimism, poor judgment, racing thoughts, decreased sleep, extremely short attention span and rapid shifts to rage or sadness [35].

Mood disorders can be categorized into 4 categories: major depressive disorder; bipolar disorder; dysthymic disorder; and perinatal/postpartum depression. While mood disorders commonly start manifesting during adolescence or young adulthood, they affect individuals of all ages and more frequently affects women than men except for bipolar disorder, which affects women and men equally [35].

2.2.2. Anxiety disorders

People who have an anxiety disorder may experience episodes of excessive and persistent feelings of apprehension, worry and even fear that may cause the individual affected to avoid situations or develop compulsive rituals that help to reduce these symptoms [37]. These disorders are distinguished by "intense and prolonged feelings of fear and distress that occur out of proportion to the actual threat or danger" where "the feelings of fear and distress interfere with normal daily functioning" [36]. Anxiety disorders include generalized anxiety disorder, social phobia or social anxiety disorder, specific phobias, post-traumatic stress disorder, obsessive-compulsive disorder, panic disorder and agoraphobia [36]. Women are more affected by these disorders than men, and symptoms usually develop during childhood, adolescence or early adulthood [36].

2.2.3. Mood and anxiety disorders: Canadian context

According to the 2016 report of the PHAC, approximately 1 in 10 (3.5 million) Canadians used health services annually for mood and anxiety disorders, and higher rates were observed among adolescent and adult females, middle-aged and older adults and those with other chronic conditions, particularly asthma and chronic obstructive pulmonary disease [36]. Approximately 3 million Canadians (11.6%) older than 18 years of age have mood and/or anxiety disorder, and for more than a quarter of them (27%) their life has been affected “quite a bit” or “extremely” in the past 12 months by their disorder, not to mention that basic activities and the ability to work were challenging for many [35]. While 50% of those who were working or have worked since diagnosis, have modified their job

(i.e., change in the number of hours worked, type of work, or how work tasks are carried out), 35% have stopped working altogether because of their mood and/or anxiety disorder(s) [35].

The majority (77%) have consulted a health professional about their disorder(s) in the previous 12 months. Of all the people with mood and/or anxiety disorder(s), only a few (20%) received counselling services to manage their disorders. Adapting good sleeping habits and getting informed about their disorder(s) are commonly practiced coping strategies compared to exercising, meditating and developing a care plan [35].

2.3. Why study mental illness? The burden of mental illness in a Canadian context

Mental illness today is a global burden causing significant morbidity and mortality [38]. This is mirrored in the findings published by the PHAC in 2015 showing that mental disorders are among those to blame first for causing the highest non-fatal burden of disease [39] with depressive- and anxiety- disorders being the third and ninth leading contributors to years lived with disability (YLDs) — a measure of nonfatal burden. Mental illness is a prevalent and highly debilitating disorder [40]. It is the major cause of disability worldwide as of 2020, transcending all physical illnesses [41]. About 3/4th of those diagnosed with mental illness henceforth will show the symptoms before they turn 25, and half of them before they turn 14 [42]. Any random year will yield 1 in 5 Canadians with a mental illness before they turn 40 half of the Canadians have or already had a mental illness [43]. Mental illness and substance use disorders were the primary contributors to the years lived with disability (YLDs) above all disease groups, covering 10.4% of the global burden of disease [44, 45]. In the face of changing demographics and extended life expectancy, the long-term burden of mental disorders is projected to rise [46].

Currently, mental illness accounts for a third of disability-adjusted-life-years (DALYs) globally [47, 48] affecting more than 1 billion people in 2016 [38]. In two decades from 1990 to 2010, DALYs caused by mental illness increased by 41% (182 million DALYs to 258 million DALYs) [49]. While depressive-, anxiety-, drug use-, and alcohol-use disorders cause about 2/3rd of the DALYs among mental and addictive disorders [38], depressive disorders cause most DALYs for both sexes, followed by anxiety disorders in women, leaving drug-use disorders and alcohol-use disorders to take the second and third places, respectively, in men [38]. Mental illness can deduct 10 to 20 years from a person's life

expectancy and people with mental illness have more odds of dying prematurely than the general population [50].

Apart from being a social burden, mental illness entails an economic burden as well. Mental illness has a paramount effect on the world's economy, costing about $2.5 trillion per annum; the amount is expected to surge to $6 trillion per annum by 2030, surpassing that of heart disease and exceeding cancer, diabetes and respiratory diseases combined [51]. In 2006 mental illness costed the Canadian economy 51.6 billion dollars in disability claims, loss of productivity, and health care costs [52]. Roughly 30% of disability claims are caused by mental illness, costing Canadians annually anywhere in the range of 15- to 33- billion dollars [53]. The odds of being employed are lower for people with mental illness [54] with unemployment rates as high as 90% [55]. At least 500,000 employed Canadians are unable to work in any given week because of mental illness including about 355,000 disability cases [56].

2.4. Mental illness among immigrants

Mental illness among immigrants remains a pressing issue worldwide [57]. Migrating to another country itself entails some level of stress as people strive to adjust to a new environment and culture [58, 59]. Since the immigration and settlement process is by nature stressful, the well-being of immigrants is questionable, especially when migration is coupled with other risk factors such as unemployment, separation from family, discrimination and prejudice, language barriers and lack of social support [60]. These hardships and difficulties associated with the immigration process can consequently make them highly vulnerable to mental illness [61-63].

Given that the experience of migration and resettlement in a new country is associated with mental illness, some studies in Europe have found that immigrants are at greater risk of mental illness than non-migrants [64-67], yet other studies conducted in the United States have found immigrants to be less likely to experience mental illness as compared to the US-born [68-77]. Likewise, studies conducted in Canada have shown that at their time of arrival in Canada immigrants are generally in better health than their Canadian-born counterparts - what is commonly referred to as the Healthy Immigrant Effect (HIE) [78, 79]. However, the initial health advantage is not guaranteed for the long-term and tends to diminish over time, perhaps as a result of difficulties in adjusting to a new environment, stress and/or adoption of risky health behaviours [78-80]. As in general

health, the initial mental health advantage also vanishes over the years as they live in the host country [81]. A study in Canada shows that with an increase in their dwelling time in Canada, there is a report of a decline in their mental health and increased feelings of sadness, depression, isolation, and loneliness, especially for women [82, 83].

The decline in immigrants' mental health status over time might be explained by the lack of social support upon arrival and during settlement [84]. However, some immigrant groups develop a mental illness at a higher rate than others, indicating the need for assessing vital associations with age, gender, ethnicity, racialization, socioeconomic status, and geography [85]. Understanding the reasons underlying these disparities in health declines is an important research goal and a steppingstone to taking action to mitigate the resulting health inequalities.

2.5. Mental illness among students

The mental illness affecting postsecondary students spans the globe [86, 87], and it is of significant interest in public health as a result of high rates of mental illness and suicidal thoughts in postsecondary institutions [88]. Studies indicated that postsecondary students have higher odds of suffering mental illness than the general population in several high-income countries [89, 90], with a third of students reporting a common mental illness over the past 12 months [88, 91]. This was reflected in a study conducted in Canada where 30% of students had a mental illness, which was a significantly higher percentage than adults in the general population [92]. Another study also found a sharp increase in the prevalence of mental illness among postsecondary students where depression and anxiety were 6 to 7 times higher among graduate students than in the general population [93].

Mental illness can have a complex and detrimental impact on adjusting to university life [94, 95], which extends to hampering academic achievement and results in harmful health outcomes such as suicide [96, 97]. The beginning of university life brings about new challenges like leaving home, adjusting to campus life, growing academic stress, exposure to substance use, and financial hardship [10, 98]. This is also a time when the preexistent mental illness is also aggravated or new symptoms are appended in response to the new life pressures [97, 99, 100]. These problems are echoed in Canada, where equivalent mental stressors impact mental health besides their financial, academic, and physical wellbeing [101, 102].

Similarly, a study conducted by the World Health Organization (WHO) with data collected from 21 countries pointed out that on average, 20.3% of college students across the countries had a mental illness, where mood- and anxiety- disorders were the most reported by the students [88]. Mental illness has a huge impact on academic performance [95, 103]; students with mental illness have double the odds of dropping out without finishing their studies [104, 105]. Similarly, 15% to 23% of college students with mental illness indicated that they confer a negative academic impact [106]. Depression, suicidal thoughts and behaviours are associated with a poorer grade point average [97, 107, 108].

Of the Canadian postsecondary students surveyed in 2018, self-reported mental illness disability was the most common and reported by 18% of the students [109]. In another study among Canadian post-secondary students, 63.3% felt hopeless, 88.2% felt overwhelmed, 87.6% felt exhausted, 76.2% felt very sad, and 68.9% felt extremely anxious [110]. The above studies have demonstrated the substantial mental illness among postsecondary students and the need to address them with various mental health support services on campuses.

Even though an extensive range of Canadian colleges and universities provide mental health services, those provided vary considerably in the scope and extent of their support and counselling services [111]. Moreover, many students haven't properly understood the mental health services on campus [111, 112]. The average waiting time to receive campus mental health services in Canada is 19.3 weeks [113], as such, more resources are needed to meet the unfilled needs of student requests [114]. The most common barrier to mental health services is that of cost, however, other barriers such as knowledge of the availability of the service itself in addition to excessive waiting times were also mentioned [115]. It is evident by now that there are barriers that prevent students from accessing and using mental health services, indicating that many Canadian post-secondary students lack the support they need.

2.6. Risk Factors of Mental Illness, including mood and anxiety disorders

The causal mechanism of the social determinants of mental illness points out a recurring model for mental illness: at first, socioeconomic hardships increase the risk for mental illness; conversely, people experiencing mental illness drift into poverty during their

lifetime out of increased health-care expenditure, reduced economic productivity due to disability, and stigma and discrimination arising from these disorders [49].

For the general population, a range of risk factors for mental illness has been identified, including those for mood- and anxiety- disorders. Just like physical health, mental health is determined by demographic factors such as age, sex, and ethnicity; socioeconomic statuses such as low income, unemployment, income inequality, low education, and low social support; neighbourhood factors such as inadequate housing, over-crowding, neighbourhood violence; environmental factors such as urbanization, natural disasters, war, conflict, climate change; lifestyle factors such as personal smoking habits, exposure to second-hand smoke, and social circles [49, 116-121]. On top of the factors listed above, some migration-related factors like language fluency, knowledge of the health care system, family stability, intergenerational conflict, availability of access to appropriate care and services, acceptance of foreign credentials, discrimination, racism and poverty were proved to be associated with mental illness among immigrants and refugees [122-124].

As with the general population, student mental illness has been associated with a range of sociodemographic factors, including lower socioeconomic status (SES), and being a member of an ethnic minority [125, 126]. Female students have higher odds of internalizing disorders (such as mood, anxiety and eating disorders) [96, 127, 128], while male students have higher odds of externalizing disorders [5, 129].

Approximately 70% of mental illness commences during childhood or adolescence [130]. Youth between the ages of 15 to 24 have more odds of experiencing mental illness than any other age group [131]. Men have higher rates of addiction than women, while women have higher rates of mood and anxiety disorders [131]. People in the lowest income strata have 3 to 4 times the odds of experiencing mental illness than those in the highest income strata [132] while 23% to 67% of homeless people report experiencing a mental illness [133].

2.7. Knowledge gap and significance of the study

While the above studies have discussed mental illness among students [8, 88, 90, 96, 100, 102, 108, 111, 125, 126, 134-149] and immigrants [21, 57, 60, 64, 65, 73, 76, 78, 79,

150-164] in general, none of these studies have examined immigrant students specifically. In this study, we will shed some light on the subject matter by using data from Canadian Community Health Survey, focusing on mood- and anxiety disorders.

The result of this study can also help to identify and document mental illness among immigrant students that can be used to advocate for change to improve access to mental health services for immigrant students. It can also help academic institutions that want to devise mental illness coping strategies for immigrant students and improve mental health infrastructure support on campuses and accessibility to campus mental health resources.

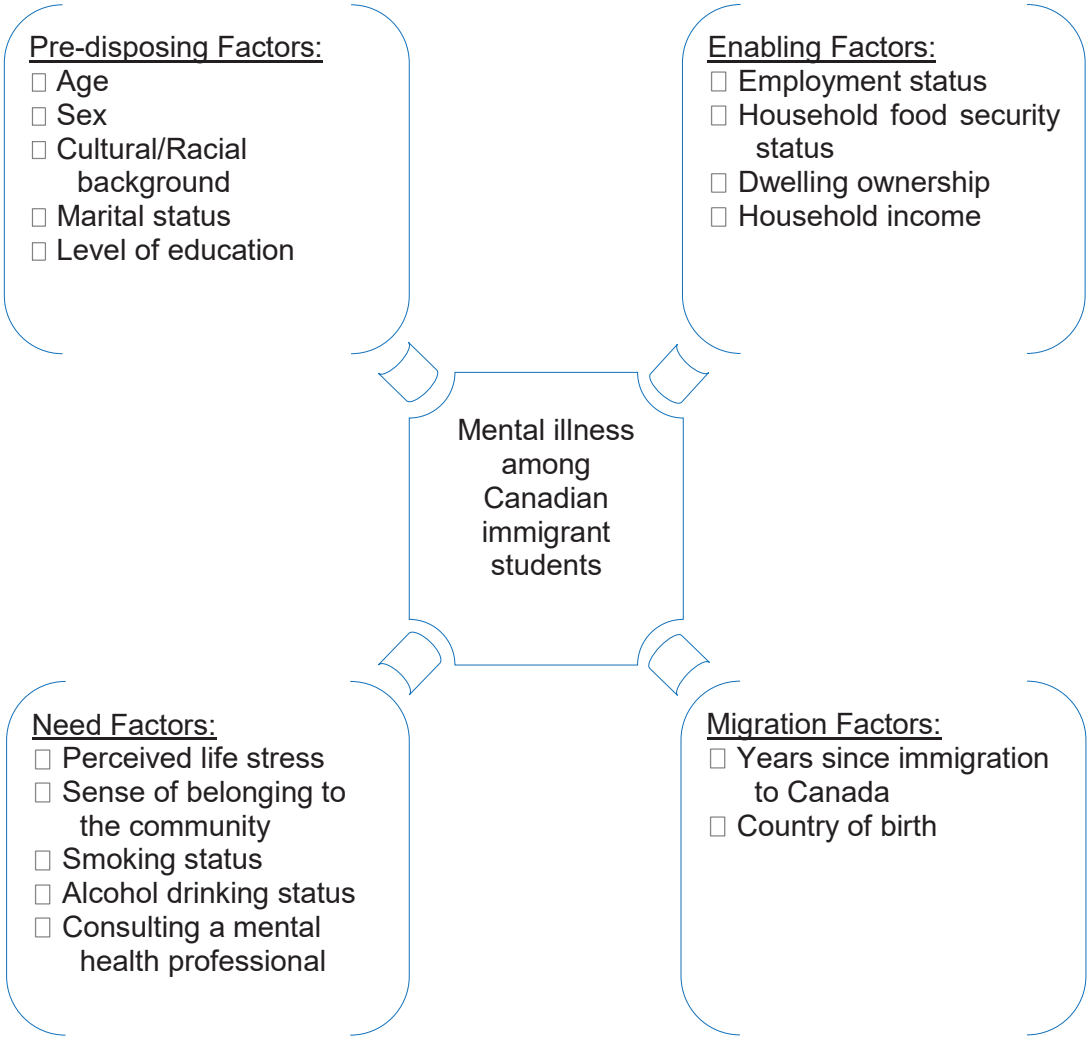
2.8. Conceptual Framework

Based on the analysis of literature reviews, various factors associated with mental illness among refugee and immigrant youth have been identified. Andersen's behavioural model of health service use [165] and subsequent modifications of the model by Graham et al. [166] were used to organize the contextual variables in the analysis. Andersen and Newman [165] divided contextual variables into predisposing (biological and sociodemographic), enabling (family and community resources), and perceived need factors (health beliefs and psychosocial factors).

As such, the predisposing factors include age, gender, cultural or racial background, marital status, and the highest level of education. The enabling factors include employment status, household food security status, dwelling ownership, and household income. Lastly, perceived need factors include perceived life stress, sense of belonging to their local community, smoking status, alcohol drinking status, and consulting a mental health professional. Graham et al. [166] stressed the inclusion of variables of social connectedness and variables specific to the study population within the Andersen Model. Feeling a sense of belonging to a community is highly correlated with physical and mental health [167, 168]. In addition to the factors listed in the above model, migration-related factors such as years since immigration to Canada and country of birth were also included.

These factors were organized into an array of associations with mental illness among immigrant students into pre-disposing-, enabling-, need-, and migration factors.

Figure 1: Conceptual Framework



Chapter 3. Objectives

The objective of this study is to gain a better understanding of mental illness among immigrant students older than 15 years of age as compared to non-immigrant students in Canada using data from the Canadian Community Health Survey, which is a publicly available cross-sectional dataset of 130,000 Canadians. We focus on mood- and anxiety disorders, which are the two most common mental illnesses in Canada.

Objective 1: To estimate the prevalence of a self-reported mental illness (SRMI) among immigrant students, compared to Canadian-born students.

Objective 2: To identify factors associated with a self-reported mental illness (SRMI) among Canadian immigrant students compared to Canadian-born students.

Objective 3: To repeat objectives 1 and 2 for a self-reported mood disorder (SRMD) and self-reported anxiety disorder (SRAD).

Chapter 4. Methods

4.1. Study design and setting

4.1.1. Description

For this study, we used the data from the Canadian Community Health Survey (CCHS), which is a cross-sectional survey that gathers information on health status, health care utilization and health determinants for a representative sample of about 130,000 subjects drawn from the Canadian population. The data is designed to provide reliable estimates at the health region level, by using information from a large number of participants every 2 years [169]. There are several CCHS cycles, however, for this MSc thesis, we have used the 2017-2018 cycle (the most recent) of this data.

4.1.2. Instrument design

The CCHS questionnaire is developed in partnership with experts from various organizations, including Statistics Canada, government and provincial departments and/or academic units. The questions are designed with a major emphasis on programming the logical sequence to enable computer-assisted interviewing (CAI). The interview questions are tested by using individual cognitive interviews to identify any errors and ensure that the appropriate wording is in place. Similarly, the computer application for data collection is extensively tested internally each time adjustments to the survey questions are made [169].

4.1.3. CCHS data collection

This study uses a cross-sectional survey design. The population 12 years of age and older, living in the ten provinces and the three territories of Canada are covered by the CCHS. Persons living on reserves and other aboriginal settlements in the provinces, full-time members of the Canadian Armed Forces, the institutionalized population, children aged 12 to 17 living in foster care, and persons living in the Région du Nunavik and Région des Terres-Cries-de-la-Baie-James health regions in Quebec are excluded from the survey. Overall, these exclusions represent less than 3% of the Canadian population aged 12

years and older. In the North, the CCHS frame covers 94% and 93% of the target population in combined Yukon and Northwest Territories, and Nunavut, respectively [169].

A sample of 130,000 respondents, comprised of 120,000 respondents covering the population aged 18 and over and 10,000 respondents covering the population aged 12 to 17, is used to provide a reliable estimate at the health region (HR) level. To ensure an appropriate distribution of the sample across HRs and provinces, a multi-stage sample allocation technique is utilized. To this end, the sample for each age group (18 years and older, 12 to 17 years) is first divided among the provinces according to the size of their respective populations using a power allocation of 0.75. The sample of each province is then divided among its HRs with a power allocation of 0.35 according to the size of the population in each HR [170].

Two different frames are used to select the CCHS sample, namely an Area frame and the Canadian Child Tax Benefit (CCTB) frame. The Area frame is used to select a sample of residences that includes the population aged 18 and older. In this frame, all members of the household are listed and various selection probabilities based on age and household composition are used to select an individual aged 18 or older. The CCTB frame is used for individuals aged 12 to 17 years. A child is then pre-selected to complete the survey. The Area Frame is primarily intended for the Labour Force Survey (LFS). As a result, when selecting the CCHS residential sample, the LFS sampling plan must be taken into account. The LFS plan is a complex two-stage stratified design with clusters in each stratum. In the LFS, clusters are first selected using a sampling procedure in which probability is proportional to size (PPS), and then the final sample is drawn by systematically selecting the residences in the clusters. The LFS clusters in each HR are pooled for the CCHS. Then, in each HR, a sample of clusters and systematic residencies is chosen. The approach maximizes the overlap between clusters selected in both surveys and guarantees that the same residence is selected only once [170].

Based on the address, an HR is allocated per child in the target population for the CCTB frame. The CCTB frame is then stratified by HR, followed by the selection of a simple random sample (SRS) of children aged 12 to 17 [169].

4.1.4. Data sources

As indicated above, we used the most recent cycle for this study. Data were collected using computer-assisted personal and telephone interview software. Cases from the area frame are collected using a combination of both modes, while CCTB cases are collected exclusively by telephone interview [170].

To overcome language as a barrier to conducting interviews, each of Statistics Canada's Regional Offices hired interviewers who were fluent in several languages. Respondents were given the option of conducting the interview in either English or French at the beginning, and cases were passed on to an interviewer with the requisite language skills to complete the interview whenever necessary. It took an average of 50 minutes to complete the survey [170].

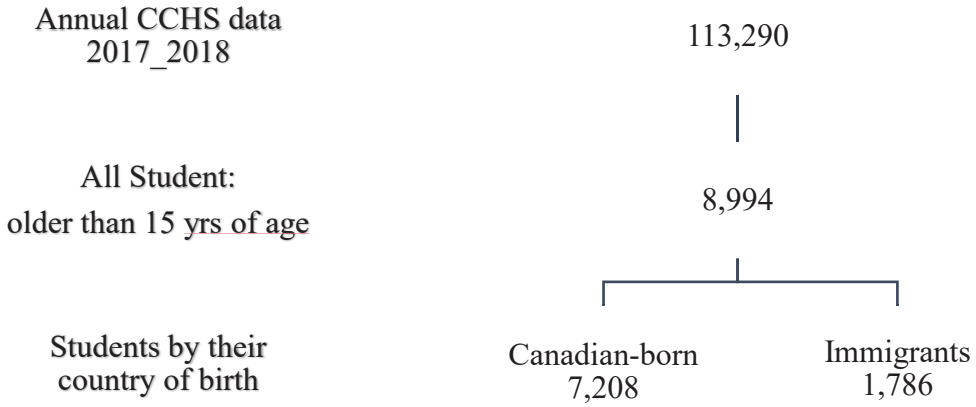
The data collected during the 2017-2018 CCHS was linked to the respondents' personal tax records as well as the tax records of all household members. The primary variables for the linkage are household information (address, postal code, and telephone number), respondent information (social insurance number, surname, name, date of birth/age, sex), and information on additional household members (surname, name, age, sex, and relationship to respondent) [170].

4.1.5. Study Population for the MSc thesis

This study looked at a specific study population to analyze the estimated prevalence of self-reported mental illness among Canadian immigrant students as compared to their Canadian-born counterparts. Henceforth, a subset dataset was created from the Canadian Community Health Survey (CCHS) of the latest cycle of 2017-2018, targeting only the student population. The student population was filtered using the student status identifier flag (MACG020). This data comprises immigrant and Canadian-born student populations (n=13,410) selected based on how they responded to the CCHS annual surveys and agreed to link and share their information. “Canadian-born students” refers to respondents who reported having been born in Canada (n=11,258), while “immigrant students” refers to the CCHS respondents who reported having been born outside Canada with a country of birth identifier variable – SDCDVIMM (n=2,152). Note that the immigrant populations vary in when they arrived, where they came from and why they came to Canada.

After filtering the student population using the student identifier flag (MACG020), we found out that for the question “Are you enrolled as a full-time student, or both full-time and part-time student, or only part-time student?” a value of 1 was automatically given for any respondent under 15 years of age, which means people within 12 to 15 years of age were automatically assigned into student category. We, therefore, excluded all the respondents under 15 years of age to avoid potential bias that can arise from this automatic assignment of student status. This left us with a total of 8,994 student respondents out of which the Canadian-born students made up about 80% (7,208), while the rest 20% (1,786) were immigrant students [Fig.2].

Figure 2: Study Population



4.1.6. Handling missing data

After visualizing the data, we found out that the variables ‘time since immigration to Canada’ has some missing data. However, after sub-setting the data to ‘Canadian-born students’ and ‘immigrant students’ we didn’t see any serious missing data problems for immigrant students within the dataset. Therefore, we used this variable only for immigrant students since it doesn’t apply to Canadian-born students. The visualization of the data was performed accordingly to represent the overall-, only Canadian-born- and immigrant-students population, respectively (Appendix 1, fig. 3, fig. 4, and fig. 5).

4.2. Outcome and Covariates

4.2.1. Primary outcome variable

The primary outcome of this study is self-reported mental illness (SRMI). In this study, having a mental illness means the respondents reported having a self-reported mood disorder (SRMD) including depression, bipolar, mania or dysthymia; and/or a self-reported anxiety disorder (SRAD) including phobia, obsessive-compulsive disorder, or panic. A dichotomous primary dependent variable SRMI was created to indicate whether students had mental illness targeting only the student population from CCHS 2017-2018 cycle. Respondents who had mood disorders only (those who answered 'yes' to the question 'do you have a mood disorder such as depression, bipolar disorder, mania or dysthymia?'), anxiety disorders only (those who answered 'yes' to the question 'do you have an anxiety disorder such as a phobia, obsessive-compulsive disorder or a panic disorder?'), or both mood and anxiety disorders (those who answered 'yes' to both questions) were identified as having SRMI.

4.2.2. Covariate Variables

Andersen's behavioural model of health service use [165] and subsequent modifications of the model by Graham et al. [166] were used to organize the contextual variables in the analysis. Andersen and Newman [165] divided contextual variables into predisposing (biological and sociodemographic), enabling (family and community resources), and perceived need factors (health beliefs and psychosocial factors).

The following predisposing factors such as sex (male, female), age (15 to 24, 25-34, 35-44, 45 and older), cultural or racial background (white, non-white including aboriginal and other visible minorities), marital status (married or common-law, widowed or divorced or separated, single), and the highest level of education attained by the respondent (secondary or less, post-secondary certificate diploma or university degree) were included in the regression model (Table 1).

The enabling factors such as employment status – worked at job/business in the last 12 months (Yes, No), household food security status (food secure, food insecure), dwelling ownership (owned by a member of the household, rented) and annual household income

(No income or less than 40,000; 40,000-79,999; more than 80,000) were included in the model (Table 1).

Moreover, perceived behavioural and health need factors such as, perceived life stress (stressful, not stressful), smoking status (yes, no), alcohol drinking status (yes, no), and consulted a mental health professional in the last 12 months (yes, no) were included as perceived need factors. Additionally, a sense of belonging to the local community (strong, weak), years since immigration to Canada (≤ 9 years, 10 to 121 years), and country of birth (Canada, other) were included in the model (Table 1).

4.3. Statistical Analysis

Descriptive characteristics of the study population and the prevalence of having a self-reported mental illness (SRMI), self-reported mood disorder (SRMD) and self-reported anxiety disorder (SRAD) are presented for both Canadian-born and immigrant students (table 2). The association between SRMI, SRMD and SRAD, and explanatory variables were determined using an odds ratio with a 95% confidence interval at a 5% significance level. Logistic regressions were used to examine the odds of having SRMI, SRMD and SRAD for immigrant students as compared to their Canadian-born counterparts. As such, we first run a multiple logistic regression model for all students together to see the larger picture of having SRMI (table 3). Then we run multiple logistic regression separately for Canadian-born students and immigrant students to make it more suitable for comparison side by side. Accordingly, we first run an unadjusted- and adjusted logistic regression model of SRMI for overall students (table 3), then a logistic regression model of SRMI for Canadian-born- and immigrant- students side by side (table 4), and we did the same for SRMD (table 5) and SRAD (table 6).

Now, prior to the estimation of the model parameters, it was crucial to look into the problem of multicollinearity – association among the potential candidate variables. To this end, the variance inflation factor (VIF) was used to test the degree of multicollinearity among categorical and binary variables (table 7 and table 8). The values of VIF for variables were found to be small (i.e., VIF values less than 5). Based on the VIF result, the data was found to have no problem of multicollinearity.

Mutable and informative variables were included in the model according to their importance depending on the literature review and Andersen model theory. Significance

was achieved with a p-value ≤ 0.05. All analyses were performed using R software, version 4.0.5 (2021-03-31).

Table 1: Definition of variables specified in the logistic regression models.

Variables	Meaning of value/outcome	Type of variable
Age	Age of respondents in years: 0 if 15 to 24 yrs., 1 if 25 to 34 yrs., 2 if 35 to 44 yrs., 3 if 45 yrs. and older	Categorical
Sex	Sex of respondents: 0 if Female and 1 If male	Dichotomous
Marital status	Marital status of respondents: 0 if Single, 1 if Married & Common-law, 2 if Widowed/Divorced/Separated	Categorical
Cultural / racial background	Cultural/Racial background of respondents: 0 if white, 1 if non-white (Aboriginal or Other Visible Minority)	Dichotomous
Highest level of education	Level of education of respondents: 0 if secondary or less, 1 if post-secondary	Dichotomous
Country of birth	Country of birth of the students - Regrouped 1 if Canada, 2 if other than Canada	Dichotomous
Time in Canada	Length of time immigrants lived in Canada (only for immigrant students): 0 if they lived 0 to 9 years, 1 if more than 10 years	Dichotomous
Household food security status	Food security status of respondents: 0 if food secure (food secure), 1 if food insecure (moderately food insecure or severely food insecure)	Dichotomous
Dwelling ownership	Dwelling situation of respondents: 0 if they lived in a dwelling owned by a household member, 1 if they lived in a rented dwelling	Dichotomous
Employment-Worked at job/business - 12 months	Employment status of respondents: 0 if worked at job/business in the last 12 months, 1 if they didn't.	Dichotomous
Total household income	The annual household income of the respondents categorized: 0 if no income or less than $40,000, 1 if $40,000 to $79,999, and 2 if $80,000 or more	Categorical
Perceived life stress	The amount of perceived stress in the respondent's life:	Dichotomous

Variables	Meaning of value/outcome	Type of variable
	0 if not stressful at all or not very stressful, 1 if a bit stressful, quite a bit stressful or extremely stressful	
Sense of belonging to the local community	Respondent's sense of belonging to your local community: 0 if very strong or somewhat strong, 1 if somewhat weak or very weak	Dichotomous
Mental Illness	Whether the respondent had mental illness as defined in 'Having either mood disorder (depression, bipolar, mania, dysthymia); or anxiety disorder (phobia, OCD, panic); or both: 0 if they don't (Healthy), 1 if they do (ill)	Dichotomous
Has a mood disorder (depression, bipolar, mania, dysthymia)	Whether the respondent had a mood disorder (depression, bipolar, mania, dysthymia): 0 if No, 1 if Yes	Dichotomous
Has an anxiety disorder (phobia, OCD, panic)	Whether the respondent had an anxiety disorder (phobia, OCD, panic): 0 if No, 1 if Yes	Dichotomous
Smoking –Regrouped	Whether respondent smoked: 0 if 'Never' or 'Rarely', 1 if 'Yes', 'Sometimes' or 'Most of the time' or 'All of the time'	Dichotomous
Alcohol use	Whether respondent drinks alcohol: 0 if yes, 1 if No	Dichotomous
Consulted mental health professional 12 mo	Whether respondent consulted mental health professional in the last 12 months: 1 if Yes, 0 if No	Dichotomous

Chapter 5. Results

5.1. Descriptive statistics

Table 2 summarizes the characteristics of 8,994 student respondents where Canadian-born students take the lion's share (about 80%); while the rest 20% were immigrant students. Looking into pre-disposing factors, most of the respondents were young students between 15 and 24 years of age (73%), followed by 25 years to 34 years (15%). Male students made up a little over half of the students (54%). The majority (82%) of the students were singles. White students accounted for about 87% of the Canadian-born students, and 19% of immigrant students. Post-secondary students accounted for 27% of Canadian-born- and 45% of immigrant students- students, while the rest of the students have attended secondary or less.

As to the need factors, most of the students (88%) were food secure. While most of the Canadian-born students (75%) lived in a dwelling owned by a member of the household, the same is true for only about half (48%) of immigrant students. Most students were employed (70%), and more than half of them were in the lowest income category (no income or earned less than $40,000 per year (table 2).

Regarding their perceived behavioural and health need factors, the majority of the students (68%) found life, in general, to be stressful, and only a few of them (25%) had a strong sense of belonging to their local community. Overall, about 16% of students reported having a self-reported mental illness in general. Relatively more students (12%) have reported having self-reported anxiety disorder compared to self-reported mood disorder (9%). However, Canadian-born students have reported more than double that of immigrant students when it comes to self-reported mental illness, as well as self-reported mood- and anxiety- disorder. Most students drank alcohol (76%) while few smoked (12%). About 32% of the students, in general, have consulted mental health professionals in the last 12 months, however, only 16% of the students have reported having SRMI (Table 2).

Table 2: **Descriptive statistics for n=8,994 students (7,208 Canadian born & 1,786 immigrant students) in Canada from the Canadian Community Health Survey (CCHS).**

Variables	Country of Birth		
	Canadian-born (%)	Immigrants (%)	Total (%)
Age			
Age between 15 and 24	5,561 (77%)	1,005 (56%)	6,566 (73%)
Age between 25 and 34	958 (13%)	407 (23%)	1,365 (15%)
Age between 35 and 44	385 (6%)	225 (13%)	610 (7%)
Age 45 and older	304 (4%)	149 (8%)	453 (5%)
Total	7,208 (100%)	1,786 (100%)	8,994 (100%)
Sex			
Male	3,915 (54%)	948 (53%)	4,863 (54%)
Female	3,293 (46%)	838 (47%)	4,131 (46%)
Total	7,208 (100%)	1,786 (100%)	8,994 (100%)
Marital status			
Single	6,082 (85%)	1,229 (69%)	7,311 (82%)
Married & Common-law	932 (13%)	484 (27%)	1,416 (16%)
Widowed/Divorced/Separated	172 (2%)	70 (4%)	242 (3%)
Total	7,186 (100%)	1,783 (100%)	8,969 (100%)
Cultural / racial background			
White	5,665 (87%)	336 (19%)	6,001 (72%)
Non-white (including Aboriginal or other visible minorities)	852 (13%)	1,431 (81%)	2,283 (28%)
Total	6,517 (100%)	1,767 (100%)	8,284 (100%)
Highest level of education			
Secondary or less	5,219 (73%)	964 (55%)	6,183 (69%)
Post-secondary certificate, diploma, or university degree	1,950 (27%)	802 (45%)	2,752 (31%)
Total	7,169 (100%)	1,766 (100%)	8,935 (100%)
Household food security status			
Food secure	6,298 (89%)	1,526 (87%)	7,824 (88%)
Food insecure	788 (11%)	231 (13%)	1,019 (12%)
Total	7,086 (100%)	1,757 (100%)	8,843 (100%)
Dwelling ownership			
Owned by member of household	5,344 (75%)	844 (48%)	6,188 (69%)
Rented	1,814 (25%)	932 (52%)	2,746 (31%)
Total	7,158 (100%)	1,776 (100%)	8,934 (100%)
Employment-Worked at job/business - 12 months			
Yes	5,284 (73%)	1,041 (59%)	6,325 (70%)
No	1,909 (27%)	738 (41%)	2,647 (30%)

Variables	Country of Birth		
	Canadian-born (%)	Immigrants (%)	Total (%)
Total	7,193 (100%)	1,779 (100%)	8,972 (100%)
Total household income			
No income or less than $40,000	4,354 (61%)	638 (36%)	4,992 (56%)
$40,000 to $79,999	1,255 (17%)	706 (40%)	1,961 (22%)
$80,000 or more	1,563 (22%)	433 (24%)	1,996 (22%)
Total	7,172 (100%)	1,777 (100%)	8,949 (100%)
Time in Canada			
Time since immigration 0 - 9 years	-	663 (53%)	663 (53%)
Time since immigration 10 - 121 yrs.	-	587 (47%)	587 (47%)
Total	-	1,250 (100%)	1,250 (100%)
Perceived life stress			
Stressful	4,892 (68%)	1,173 (66%)	6,065 (68%)
Not Stressful	2,303 (32%)	607 (34%)	2,910 (32%)
Total	7,195 (100%)	1,780 (100%)	8,975 (100%)
Sense of belonging to the local community			
Weak	4,906 (75%)	1,215 (74%)	6,121 (300%)
Strong	1,620 (25%)	417 (26%)	2,037 (25%)
Total	6,526 (100%)	1,632 (100%)	8,158 (325%)
Has Self-reported mental illness (SRMI)			
Yes	1,272 (18%)	124 (7%)	1,396 (16%)
No	5,916 (82%)	1,655 (93%)	7,571 (84%)
Total	7,188 (100%)	1,779 (100%)	8,967 (100%)
Has self-reported mood disorder (SRMD) (depression, bipolar, mania, dysthymia)			
Yes	719 (10%)	77 (4%)	796 (9%)
No	6,473 (90%)	1,703 (96%)	8,176 (91%)
Total	7,192 (100%)	1,780 (100%)	8,972 (100%)
Has self-reported anxiety disorder (SRAD) (phobia, OCD, panic)			
Yes	1,010 (14%)	85 (5%)	1,095 (12%)
No	6,183 (86%)	1,697 (95%)	7,880 (88%)
Total	7,193 (100%)	1,782 (100%)	8,975 (100%)
Smoking			
Yes	866 (12%)	174 (10%)	1,040 (12%)
No	6,338 (88%)	1,612 (90%)	7,950 (88%)

Variables	Country of Birth		
	Canadian-born (%)	Immigrants (%)	Total (%)
Total	7,204 (100%)	1,786 (100%)	8,990 (100%)
Alcohol use			
Yes	5,627 (78%)	1,168 (66%)	6,795 (76%)
No	1,577 (22%)	615 (34%)	2,192 (24%)
Total	7,204 (100%)	1,783 (100%)	8,987 (100%)
Consulted mental health professional 12 mo			
Yes	2,405 (33%)	448 (25%)	2,853 (32%)
No	4,803 (67%)	1,338 (75%)	6,141 (68%)
Total	7,208 (100%)	1,786 (100%)	8,994 (100%)

5.2. Univariate and Multivariate analysis of self-reported mental illness (SRMI) among overall students

In multivariate analysis, as summarized in table 3, we wanted to assess the self-reported mental illness among students in general before diving into Canadian-born- and immigrant- students for comparison. The adjusted model depicts the odds ratios of the variable in question adjusted for the rest of the variables in the table. We analyzed it in an organized fashion according to our conceptual framework as follows:

Kicking it off with pre-disposing factors, older students tend to have higher odds of SRMI compared to younger ones, especially after adjusting for covariates. Students in the age group of 35 to 44 years, and those above 45 years of age have significantly higher odds of having SRMI (OR=1.62 [95% CI=1.78, 2.22], OR=1.74 [95%CI=1.18, 2.52] respectively) compared to those who were between 15 and 24 years of age. Male students shown to have significantly lower odds of having SRMI both in unadjusted (OR=0.46 [95% CI=0.41, 0.52]) and adjusted models (OR=0.45 [95% CI=0.40, 0.53]). Single students appear to be more affected whereas those who were married or in a common-law relationship have shown significantly lower odds of having SRMI consistently in both unadjusted- (OR=0.82 [95% CI=0.69, 0.97]) and adjusted- (OR=0.74 [95% CI=0.58, 0.94]) models. Post-secondary students have been shown to have lower SRMI compared to those with secondary or less levels of education, and the odds became strongly significant after adjusting for covariates (OR=0.73 [95% CI=0.60, 0.89]). Students born outside Canada have reported significantly lower odds of having SRMI in both unadjusted- (OR=0.35 [95%

CI=0.29, 0.42]) and adjusted- (OR=0.51 [95% CI=0.40, 0.66]) models compared to those who were born in Canada (table 3).

Looking at enabling factors, we found out that food insecure, unemployed and students within lower income categories had significantly higher odds of having SRMI ((OR=1.60= [95% CI=1.30, 1.96), OR=1.19 [95% CI=1.00, 1.40]) and (OR=1.30 [95% CI=1.09, 1.55]) respectively).

Likewise, when we look at behavioural and health need factors, students who were perceived to have stressful life had about 3 times the odds of having SRMI (OR=3.04 [95% CI=2.51, 3.71) compared to those who do not. Similarly, students who had a weak sense of belonging to their local community compared to those with a strong sense of belonging. In the same vein, those who smoked, and who drank alcohol had higher odds of having SRMI compared to those who displayed opposite behaviours. However, those who consulted mental health professionals in the last 12 months were found to have lower odds of having SRMI (OR=0.72 [95% CI=0.62, 0.84]) compared to those who did not (Table 3).

Table 3: Crude and adjusted odds ratios of self-reported mental illness (SRMI), controlled for selected pre-disposing-, enabling-, health need- and immigration-related- factors for overall students.

	SRMI among students overall (n=8,994)	
Variables	**COR [95% CI]**	**AOR [95%CI]**
Age		
Age between 15 and 24	1.00	1.00
Age between 25 and 34	1.15 [0.98, 1.34].	1.21 [0.95, 1.53]
Age between 35 and 44	1.19 [0.95, 1.48]	1.62 [1.78, 2.22]**
Age 45 and older	1.14 [0.89, 1.47]	1.74 [1.18, 2.52]**
Sex		
Male	0.46 [0.41, 0.52]***	0.45 [0.40, 0.53]***
Female	1.00	1.00
Marital status		
Single	1.00	1.00
Married & Common-law	0.82 [0.69, 0.97]*	0.74 [0.58, 0.94]*
Widowed/Divorced/ Separated	1.38 [1.00, 1.89]*	0.79 [0.51, 1.20]
Cultural / racial background		
White	1.00	1.00
Non-white (Aboriginal or Other Visible Minority)	0.41 [0.35, 0.48]***	0.58 [0.46, 0.73]***

Variables	SRMI among students overall (n=8,994)	
	COR [95% CI]	AOR [95%CI]
Highest level of education		
Secondary or less	1.00	1.00
Post-secondary certificate/diploma/degree	0.90 [0.79, 1.02].	0.73 [0.60, 0.89]**
Country of birth		
Canadian-born	1.00	1.00
Others	0.35 [0.29, 0.42]***	0.51 [0.40, 0.66]***
Household food security		
Food secure	1.00	1.00
Food insecure	2.01 [1.72, 2.35]***	1.60 [1.30, 1.96]***
Dwelling ownership		
Owned by member of household	1.00	1.00
Rented	1.34 [1.19, 1.51]***	1.11 [0.93, 1.32]
Employment-Worked at job/business - 12 mo		
Yes	1.00	1.00
No	1.05 [0.93, 1.19]	1.19 [1.00, 1.40]*
Total household income		
$0 to $39,999	1.37 [1.19, 1.58]***	1.26 [1.02, 1.55]*
$40,000 to $79,999	1.29 [1.12, 1.49]***	1.30 [1.09, 1.55]**
> $80,000	1.00	1.00
Perceived life stress		
Not stressful	1.00	1.00
Stressful	5.79 [4.18, 8.27]***	3.04 [2.51, 3.71]***
Sense of belonging to local community		
Weak	1.59 [1.41, 1.80]***	1.36 [1.17, 1.57]***
Strong	1.00	1.00
Smoking		
No	1.00	1.00
Yes	2.44 [2.10, 2.83]***	1.92 [1.59, 1.57]***
Alcohol use		
No	1.00	1.00

Variables	SRMI among students overall (n=8,994)	
	COR [95% CI]	AOR [95%CI]
Yes	1.71 [1.48, 1.99]***	1.63 [1.32, 2.03]***
Consulted mental health professional 12 mo		
Yes	0.80 [0.70, 0.90]***	0.72 [0.62, 0.84]***
No	1.00	1.00

COR=Crude Odds Ration; AOR=Adjusted Odds Ratio; Significance codes: '***', 0.001 '**', 0.01 '*', 0.05 '.', 0.10

5.3. Multivariate Comparison of self-reported mental illness (SRMI) between Canadian-born and immigrant students.

Table 4 summarizes the comparison of odds of having SRMI among immigrant students as compared to Canadian-born students. The adjusted model portrays the odds ratios of the variable in question adjusted for the rest of the variables in the table. We organized it in accordance with our conceptual framework as pre-disposing-, enabling-, health needs-, and immigration-related- factors.

Starting off with pre-disposing factors, the odds of having SRMI for Canadian-born students have significantly increased as they entered age groups older than 25 years of age, compared to those between 15 and 24 years of age, however, age didn't show any significant association with SRMI for immigrant students. Male students had consistently lower odds of having SRMI compared to female students in unadjusted and adjusted models among both Canadian-born and immigrant students ((AOR= 0.45 [95% CI=0.58, 0.97]) and (AOR= 0.51 [95% CI=0.29, 0.86]), respectively). Being married or living in a common-law relationship was shown to be associated with having lower odds of SRMI in both Canadian-born and immigrant students, even if the association wasn't significant among immigrant students. Canadian-born students from a non-white racial background including Aboriginal and other visible minorities had significantly lower odds of having SRMI compared to white students in both unadjusted (COR= 0.61 [95% CI=0.49, 0.76]) and adjusted (AOR= 63 [95% CI=0.49, 0.81]) models. Similarly, immigrants from non-white racial background had significantly lower odds of having SRMI in unadjusted model

(COR= 0.45 [95% CI=0.30, 0.67]) even if the association wasn't significant after adjusting for covariates (AOR= 0.69 [95% CI=0.39, 1.24]). Similar to the findings in table 3, post-secondary students were shown to have lover SRMI in adjusted models, however, the association wasn't significant for immigrant students (table 4).

Exploring the enabling factors, Canadian-born students facing household food insecurity had higher odds of having SRMI; however, food security didn't have a significant effect among immigrant students. Dwelling ownership didn't have a significant association with having SRMI both among Canadian-born and immigrant students. Canadian-born students in the lowest- (no income, or under $40,000 per year) income categories had higher odds of having SRMI compared to those in the higher income category (more than $80,000 per year). Similarly, unemployed Canadian-born students had higher odds of having SRMI compared to those who were employed in both unadjusted (COR=1.22 [95% CI=1.07, 1.40) and adjusted (AOR=1.27 [95% CI=1.06, 1.52) models. However, we didn't see any statistically significant association between income categories and unemployment with having SRMI among immigrant students. Time since immigration tends to increase the odds of having SRMI, even if it is not statistically significant after adjusting for covariates (table 4).

Likewise, when we look at behavioural and health need factors, perceived life stress, weaker sense of belonging to their local community, smoking and drinking alcohol have significantly increased the odds of having SRMI for Canadian-born students in both unadjusted and adjusted models. These factors were also associated with an increased odds of having SRMI for immigrant students, however, only a weaker sense of belonging to their local community was associated with a significantly increased odds of having SRMI in the adjusted model. Consulting mental health professionals was associated with a reduction in the odds of having SRMI for both Canadian-born and immigrant students, even if the association wasn't statistically significant for immigrant students after adjusting for covariates (table 4).

Table 4: **Crude and adjusted odds ratios of self-reported Mental Illness (SRMI) controlled for selected pre-disposing-, enabling-, health need- and immigration-related- factors of immigrant students compared to Canadian-born students.**

	Canadian Born Students		Immigrant Students	
Variables	**Crude OR [95% CI]**	**Adjusted OR [95%CI]**	**Crude OR [95%CI]**	**Adjusted OR [95%CI]**
Age				
Age between 15 and 24	1.00	1.00	1.00	1.00
Age between 25 and 34	1.32 [1.11, 1.57]**	1.24 [0.95, 1.60]	1.17 [0.75, 1.80]	0.94 [0.42, 2.07]
Age between 35 and 44	1.53 [1.19, 1.95]***	1.69 [1.19, 2.40]**	1.12 [0.63, 1.90]	0.84 [0.32, 2.12]
Age 45 and older	1.49 [1.12, 1.96]**	2.11 [1.39, 3.17]***	0.68 [0.28, 1.40]	0.51 [0.15, 1.57]
Sex				
Male	0.45 [0.40, 0.51]***	0.45 [0.38, 0.53]***	0.53 [0.36, 0.78]**	0.51 [0.29, 0.86]*
Female	1.00	1.00	1.00	1.00
Marital status				
Single	1.00	1.00	1.00	1.00
Married & Common-law	1.00 [0.83, 1.19]	0.75 [0.58, 0.97]*	0.72 [0.45, 1.11]	0.95 [0.45, 1.95]
Widowed/Divorced/ Separated	1.52 [1.05, 2.14]*	0.69 [0.42, 1.10]	1.62 [0.70, 3.31]	1.28 [0.40, 3.75]
Cultural / racial background				
White	1.00	1.00	1.00	1.00
Non-white (Aboriginal or Other Visible Minority)	0.61 [0.49, 0.76]***	0.63 [0.49, 0.81]***	0.45 [0.30, 0.67]***	0.69 [0.39, 1.24]
Highest level of education				
Secondary or less	1.00	1.00	1.00	1.00
Post-secondary certificate/diploma/degree	1.01 [0.88, 1.15]	0.72 [0.58, 0.88]**	1.00 [0.69, 1.44]	0.86 [0.44, 1.64]
Household food security				

Variables	Canadian Born Students		Immigrant Students	
	Crude OR [95% CI]	Adjusted OR [95%CI]	Crude OR [95%CI]	Adjusted OR [95%CI]
Food secure	1.00	1.00	1.00	1.00
Food insecure	2.24 [1.89, 2.64]***	1.70 [1.36, 2.13]***	1.24 [0.72, 2.02]	1.21 [0.59, 2.32]
Dwelling ownership				
Owned by member of household	1.00	1.00	1.00	1.00
Rented	1.73 [1.52, 1.97]***	1.18 [0.98, 1.42].	1.00 [0.70, 1.45]	0.94 [0.53, 1.65]
Employment-Worked at job/business - 12 mo				
Yes	1.00	1.00	1.00	1.00
No	1.22 [1.07, 1.40]**	1.27 [1.06, 1.52]*	0.74 [0.50, 1.08]	0.72 [0.41, 1.26]
Total household income				
$0 to $39,999	1.77 [1.51, 2.06]***	1.23 [0.98, 1.54].	1.21 [0.80, 1.82]	1.57 [0.83, 2.97]
$40,000 to $79,999	1.48 [1.28, 1.72]***	1.33 [1.10, 1.60]**	0.73 [0.42, 1.22]	1.00 [0.50, 1.96]
> $80,000	1.00	1.00	1.00	1.00
Time in Canada				
0 - 9 years	-		1.00	1.00
> 10 years	-	-	1.72 [1.10, 2.71]*	1.52 [0.90, 2.59]
Perceived life stress				
Not stressful	1.00	1.00	1.00	1.00
Stressful	3.83 [3.23, 4.57]***	3.29 [2.67, 4.08]***	2.83 [1.78, 4.75]***	1.64 [0.91, 3.15]
Sense of belonging to the local community				
Weak	1.54 [1.35, 1.76]***	1.24 [1.06, 1.46]**	2.45 [1.68, 3.57]***	2.07 [1.26, 3.38]**
Strong	1.00	1.00	1.00	1.00
Smoking				
No	1.00	1.00	1.00	1.00
Yes	2.43 [2.07, 2.85]***	1.94 [1.58, 2.37]***	2.13 [1.28, 3.42]**	1.65 [0.76, 3.33]

Variables	Canadian Born Students		Immigrant Students	
	Crude OR [95% CI]	Adjusted OR [95%CI]	Crude OR [95%CI]	Adjusted OR [95%CI]
Alcohol use				
No	1.00	1.00	1.00	1.00
Yes	1.53 [1.31, 1.80]***	1.66 [1.31, 2.10]***	1.97 [1.29, 3.10]**	1.46 [0.80, 2.80]
Consulted mental health professional 12 mo				
Yes	0.72 [0.63, 0.82]***	0.71 [0.60, 0.83]***	1.18 [0.78, 1.76]	0.78 [0.43, 1.37].
No	1.00	1.00	1.00	1.00

COR=Crude Odds Ration; AOR=Adjusted Odds Ratio; Significance codes: '***', 0.001 '**', 0.01 '*', 0.05 '.', 0.10

5.4. Multivariate Comparison of self-reported mood disorder (SRMD) between Canadian-born and immigrant students.

Table 5 summarizes the univariate and multivariate logistic regression for a self-reported mood disorder (SRMD) for immigrant students as compared to Canadian-born students.

Beginning with the pre-disposing factors, the odds of having SRMD for Canadian-born students have significantly increased with age as they entered older age groups, compared to younger age group (15 and 24 years of age), however, the age category didn't have a significant association with having SRMD for immigrant students. Similar to the SRMI outcome, male students had consistently lower odds of having SRMD compared to female students in unadjusted and adjusted models among both Canadian-born and immigrant students; however, this association was not significant for immigrant students after adjusting for covariates. Both Canadian-born and immigrant students who were married or living in a common-law, and those who were widowed, divorced, or separated have been shown to have lower odds of SRMD, even if it was not statistically significant among immigrant students. Similarly, those who were from non-white backgrounds including Aboriginal and other visible minorities, and those who were in post-secondary education had lower odds of having SRMD. But again, this reduction was not statistically significant among immigrant students (Table 5).

Exploring the enabling factors, household food insecurity, and being in a lower income category have significantly increased the odds of having SRMD for Canadian-born students. These factors have affected immigrant students similarly, however, the association was not statistically significant. Students' employment status and dwelling ownership didn't have a statistically significant effect on having SRMD for both Canadian-born and immigrant students. However, time since immigration tends to be associated with increased odds of having SRMD, even if it is not statistically significant after adjusting for covariates (Table 5).

Likewise, when we look at behavioural and health need factors, Canadian-born students who had a stressful life had by far significantly higher odds of having SRMD in both unadjusted- (COR=4.17 [95% CI=3.30, 5.32]) and adjusted- (AOR=3.10 [95% CI=2.35, 4.15]) models. Perceived life stress has had a similar effect on the SRMD of immigrant students, however, the effect was not statistically significant. On the other hand, students

who had a weaker sense of belonging to their local community have consistently shown to have significantly increased the odds of having SRMD among both Canadian-born-((COR=2.01 [95% CI=1.71, 2.37]), AOR=1.70 [95% CI=1.40, 2.06])) and immigrant-((COR=2.35 [95% CI=1.47, 3.75]), AOR=2.24 [95% CI=1.20, 4.20])) students in unadjusted and adjusted models. Similarly, smoking and alcohol use have significantly increased the odds of SRMD ((AOR=2.03 [95% CI=1.59, 2.57]) and AOR=1.89 [95% CI=1.39, 2.63]), respectively) for Canadian-born students. These factors had a similar effect on immigrant students, however, the increment in odds of having SRMD was not statistically significant. To end, consulting mental health professional has significantly reduced the odds of SRMD for Canadian-born students (AOR=0.41 [95% CI=0.33, 0.51]); it had a similar effect for immigrant students even if the reduction in odds of having SRMD was not statistically significant (AOR=0.53 [95% CI=0.23, 1.13]) (Table 5).

Table 5: **Crude and adjusted odds ratios of self-reported mood disorder (SRMD), controlled for selected pre-disposing, enabling, need and migration-related characteristics of immigrant students compared with the Canadian-born students.**

	Canadian Born Students		Immigrant Students	
Variables	**COR [95% CI]**	**AOR [95%CI]**	**COR [95%CI]**	**AOR [95%CI]**
Age				
Age between 15 and 24	1.00	1.00	1.00	1.00
Age between 25 and 34	1.65 [1.33, 2.02]***	1.53 [1.13, 2.08]**	1.35 [0.77, 2.29]	1.10 [0.40, 2.91]
Age between 35 and 44	2.17 [1.63, 2.87]***	2.46 [1.63, 3.68]***	1.40 [0.69, 2.63]	1.28 [0.40, 3.91]
Age 45 and older	2.05 [1.48, 2.80]***	2.93 [1.80, 4.72]***	0.86 [0.29, 2.02]	0.79 [0.17, 3.05]
Sex				
Male	0.41 [0.35, 0.49]***	0.42 [0.34, 0.51]***	0.46 [0.28, 0.75]**	0.57 [0.29, 1.10]
Female	1.00	1.00	1.00	1.00
Marital status				
Single	1.00	1.00	1.00	1.00
Married & Common-law	1.17 [0.93, 1.45]	0.70 [0.51, 0.95]*	0.66 [0.36, 1.14]	0.68 [0.27, 1.65]
Widowed/Divorced/ Separated	1.82 [1.18, 2.71]**	0.53 [0.30, 0.91]*	1.60 [0.55, 3.77]	0.73 [0.15, 2.84]
Cultural / racial background				
White	1.00	-	1.00	1.00
Non-white (Aboriginal or Other Visible Minority)	0.72 [0.54, 0.94]*	0.73 [0.53, 0.99]*	0.51 [0.31, 0.87]**	0.92 [0.45, 2.04]
Highest level of education				
Secondary or less	1.00	1.00	1.00	1.00
Post-secondary certificate/diploma/degree	1.24 [1.05, 1.49]*	0.76 [0.58, 0.97]*	1.14 [0.72, 1.81]	0.94 [0.41, 2.14]

Variables	Canadian Born Students		Immigrant Students	
	COR [95% CI]	AOR [95%CI]	COR [95%CI]	AOR [95%CI]
Household food security				
Food secure	1.00	1.00	1.00	1.00
Food insecure	2.40 [1.96, 2.92]***	1.61 [1.23, 2.09]***	1.28 [0.65, 2.32]	1.16 [0.46, 2.60]
Dwelling ownership				
Owned by member of household	1.00	1.00	1.00	1.00
Rented	1.89 [1.60, 2.22]***	1.09 [0.87, 1.38]	1.10 [0.69, 1.74]	1.16 [0.58, 2.35]
Employment-Worked at job / business - 12 mo				
Yes	1.00	1.00	1.00	1.00
No	1.12 [0.95, 1.33]	1.22 [1.00, 1.53].	0.67 [0.40, 1.08]	0.72 [0.34, 1.47]
Total household income				
$0 to $39,999	2.23 [1.84, 2.69]***	1.60 [1.21, 2.10]***	1.40 [0.84, 2.37]	1.74 [0.77, 3.99]
$40,000 to $79,999	1.68 [1.39, 2.03]***	1.59 [1.26, 2.01]***	0.82 [0.41, 1.58]	1.40 [0.59, 3.27]
> $80,000	1.00	1.00	1.00	1.000
Time in Canada				
0 - 9 years			1.00	1.00
> 10 years	-	-	2.13 [1.20, 3.90]*	1.93 [0.99, 3.90].
Perceived life stress				
Not stressful	1.00	1.00	1.00	1.00
Stressful	4.17 [3.30, 5.32]***	3.10 [2.35, 4.15]***	3.25 [1.77, 6.54]***	1.65 [0.78, 3.95]
Sense of belonging to local community				
Weak	2.01 [1.71, 2.37]***	1.70 [1.40, 2.06]***	2.35 [1.47, 3.75]***	2.24 [1.20, 4.20]*
Strong	1.00	1.00	1.00	1.00

Variables	Canadian Born Students		Immigrant Students	
	COR [95% CI]	AOR [95%CI]	COR [95%CI]	AOR [95%CI]
Smoking				
No	1.00	1.00	1.00	1.00
Yes	2.83 [2.35, 3.41]***	2.03 [1.59, 2.57]***	2.57 [1.40, 4.45]**	1.76 [0.67, 4.12]
Alcohol use				
No	1.00	1.00	1.00	1.00
Yes	2.16 [1.73, 2.74]***	1.89 [1.39, 2.63]***	2.44 [1.40, 4.57]	1.70 [0.78, 4.07]
Consulted mental health professional 12 mo				
Yes	0.51 [0.43, 0.62]***	0.41 [0.33, 0.51]***	1.05 [0.61, 1.73]	0.53 [0.23, 1.13]
No	1.00	1.00	1.00	1.00

COR=Crude Odds Ration; AOR=Adjusted Odds Ratio; Significance codes: '***', 0.001 '**', 0.01 '*', 0.05 '.', 0.10

5.5. Multivariate Comparison of a self-reported anxiety disorder (SRAD) between Canadian-born and immigrant students.

Table 6 summarizes the estimated odds ratios of having SRAD in the unadjusted and adjusted model for immigrant students as compared to Canadian-born students.

Kicking it off with the predisposing factors, age categories, unlike SRMI and SRMD, didn't have a statistically significant effect on SRAD both for Canadian-born and immigrant students. However, like SRMI and SRMD, male students had consistently lower odd of having SRAD compared to female students among both Canadian-born- and immigrant-students ((AOR=0.40 [95% CI=0.34, 0.48]) and AOR=0.39 [95% CI=0.20, 0.76]) respectively), compared to female students. Both Canadian-born and immigrant students who were either married or living in a common-law relationship, and those who were widowed, divorced, or separated were shown to have lower odds of SRAD, even if this reduction was not statistically significant for both student categories. Similarly, those who were from non-white backgrounds including Aboriginal and other visible minorities, and those who were in post-secondary education had lower odds of having SRAD, but again, this reduction was not statistically significant among immigrant students (Table 6).

When we look at the enabling factors, Canadian-born students who were food insecure, unemployed and in the lower- and middle-income categories had consistently higher odds of having SRAD in both unadjusted and adjusted models. However, these factors didn't have any statistically significant effect on the odds of having SRAD for immigrant students. Time since immigration tends to increase the odds of having SRAD, even if this finding is not statistically significant.

Likewise, when we look at behavioural and health need factors, Canadian-born students who had a stressful life have by far a significantly higher odds of having SRAD in both unadjusted- (COR=4.02 [95% CI=3.31, 4.92]) and adjusted- (AOR=3.54 [95% CI=2.79, 4.56]) models. We saw a similar effect with immigrant students (COR=2.69 [95% CI=1.55, 5.02]) except that the effect was not statistically significant after adjusting for covariates (AOR=1.51 [95% CI=0.75, 3.30]). On the other hand, a weak sense of belonging to students' local community has increased the odds of having SRAD for both student categories, however, this increment was not statistically significant after adjusting for covariates. Smoking has increased the odds of having SRAD by about 2-fold for both

Canadian-born and immigrant students. Drinking alcohol was also associated with an increased risk of having SRAD, however, this association was not statistically significant for immigrant students. Last but not least, consulting mental health professionals has reduced the odds of SRAD for Canadian-born students (AOR=0.79 [95% CI=0.66, 0.95]). It also had a similar effect on immigrant students even if the reduction in odds of having SRAD was not statistically significant (AOR=0.76 [95% CI=0.36, 1.49]) (Table 6).

Table 6: **Crude and adjusted odds ratios of a self-reported anxiety disorder (SRAD), controlled for selected pre-disposing, enabling, need and migration-related characteristics of immigrant students compared with the Canadian-born students.**

	Canadian Born Students		Immigrant Students	
Variables	**COR [95% CI]**	**AOR [95%CI]**	**COR [95%CI]**	**AOR [95%CI]**
Age				
Age between 15 and 24	1.00	1.00	1.00	1.000
Age between 25 and 34	1.12 [0.92, 1.35]	1.01 [0.75, 1.35]	1.11 [0.65, 1.84]	1.42 [0.55, 3.57]
Age between 35 and 44	1.14 [0.85, 1.51]	1.18 [0.79, 1.76]	1.00 [0.49, 1.88]	0.98 [0.29, 3.03]
Age 45 and older	0.95 [0.67, 1.33]	1.35 [0.82, 2.18]	0.40 [0.65, 1.84]	0.42 [0.08, 1.79]
Sex				
Male	0.42 [0.36, 0.49]***	0.40 [0.34, 0.48]***	0.51 [0.32, 0.81]**	0.39 [0.20, 0.76]**
Female	1.00	1.00	1.00	1.000
Marital status				
Single	1.00	1.00	1.00	1.000
Married & Common-law	0.82 [0.66, 1.00].	0.77 [0.57, 1.03].	0.74 [0.42, 1.23]	0.91 [0.38, 2.18]
Widowed/Divorced/ Separated	1.11 [0.72, 1.66]	0.74 [0.42, 1.27]	1.79 [0.67, 3.99]	1.60 [0.42, 5.45]
Cultural / racial background				
White	1.00	1.00	1.00	1.00
Non-white (Aboriginal or Other Visible Minority)	0.64 [0.50, 0.81]***	0.65 [0.48, 0.85]**	0.43 [0.27, 0.69]***	0.57 [0.30, 1.14]

Variables	Canadian Born Students		Immigrant Students	
	COR [95% CI]	AOR [95%CI]	COR [95%CI]	AOR [95%CI]
Highest level of education				
Secondary or less	1.00	1.00	1.00	1.000
Post-secondary certificate/diploma/degree	0.86 [0.73, 1.00].	0.74 [0.58, 0.93]**	0.83 [0.53, 1.29]	0.71 [0.33, 1.54]
Household food security				
Food secure	1.00	1.00	1.00	1.000
Food insecure	2.23 [1.86, 2.66]***	1.75 [1.37, 2.22]***	1.35 [0.72, 2.36]	1.42 [0.62, 3.02]
Dwelling ownership				
Owned by member of household	1.00	1.00	1.00	1.000
Rented	1.59 [1.38, 1.84]***	1.15 [0.93, 1.41]	0.93 [0.60, 1.43]	0.61 [0.30, 1.21]
Employment-Worked at job / business - 12 mo				
Yes	1.00	1.00	1.00	1.000
No	1.29 [1.11, 1.49]***	1.31 [1.07, 1.59]**	0.72 [0.45, 1.14]	0.57 [0.27, 1.12]
Total household income				
$0 to $39,999	1.60 [1.35, 1.89]***	1.17 [0.91, 1.51]	1.17 [0.73, 1.89]	1.71 [0.82, 3.57]
$40,000 to $79,999	1.43 [1.21, 1.67]***	1.28 [1.04, 1.58]*	0.54 [0.27, 1.04].	0.66 [0.25, 1.56]
> $80,000	1.00	1.00	1.00	1.000
Time in Canada				
0 - 9 years			1.00	1.000
> 10 years	-	-	1.71 [1.00, 2.97].	1.50 [0.81, 2.83].

Variables	Canadian Born Students		Immigrant Students	
	COR [95% CI]	AOR [95%CI]	COR [95%CI]	AOR [95%CI]
Perceived life stress				
Not stressful	1.00	1.00	1.00	1.00
Stressful	4.02 [3.31, 4.92]***	3.54 [2.79, 4.56]***	2.69 [1.55, 5.02]***	1.51 [0.75, 3.30]
Sense of belonging to the local community				
Weak	1.34 [1.16, 1.56]***	1.11 [0.93, 1.33]	2.02 [1.29, 3.15]**	1.73 [0.95, 3.12].
Strong	1.000	1.00	1.00	1.000
Smoking				
No	1.000	1.00	1.00	1.000
Yes	2.31 [1.94, 2.74]***	1.94 [1.55, 2.42]***	2.07 [1.12, 3.61]*	2.26 [1.00, 3.12]*
Alcohol use				
No	1.000	1.00	1.00	1.000
Yes	1.25 [1.06, 1.49]**	1.44 [1.12, 1.85]**	1.53 [0.95, 2.57].	1.12[0.56, 3.37]
Consulted mental health professional 12 mo				
No	1.00	1.00	1.00	1.00
Yes	0.74 [0.64, 0.86]***	0.79 [0.66, 0.95]*	1.04 [0.62, 1.69]	0.76 [0.36, 1.49]

COR=Crude Odds Ration; AOR=Adjusted Odds Ratio; Significance codes: '***', 0.001 '**', 0.01 '*', 0.05 '.', 0.10

Chapter 6. Discussion

Our exploratory analysis shows that Canadian-born students took the lion's share (80%) of the total student population. Overall, the student population was dominated by singles and young adults between 15 to 24 years of age in both student categories. While Canadian-born students were predominantly from white racial/cultural backgrounds who have completed high school or less, immigrant students were mostly non-white where almost half of them were in post-secondary education. Most of the overall students were food secure, however, while most Canadian-born students lived in a dwelling owned by a member of their family, more than half of immigrant students lived in a rented dwelling. When it comes to employment, the majority of the students were employed, but then, most of them are in lower income category making either no income at all or making less than 40,000 per year (Table 2). Yet again, the majority of overall students were living a stressful life with a weak sense of belonging to their local community. About 16% of overall students reported having a self-reported mental illness in general. This percentage is much lower compared to a similar study conducted on the general population where a higher percentage (about 72%) of Canadian respondents have reported having SRMI [67].

We carefully examined the association of predisposing, enabling, and health need factors as well as migration-related factors with the odds of having SRMI (including SRMD and SRAD). Starting with predisposing factors, older, female, single and white students tend to have higher odds of SRMI. As to enabling factors, overall, less fortunate (food insecure, unemployed and those who had no income or earned less than $40,000 per year) students had higher odds of having SRMI. Similarly, when we look at behavioural and health-related factors, students who were stressed, had a weak sense of belonging to their local community, have smocked, drank alcohol, and did not consult mental health professionals in the last 12 months had higher odds of having SRMI. Overall, however, when we see whether the country of birth is associated with SRMI for overall students, we found out that students born in Canada had about twice the odds of having self-reported mental illness compared to those born outside Canada. This is consistent with the finding of a similar study conducted on the general population in Canada, where immigrants were significantly less likely to have high self-reported mental illness in general compared to their Canadian-born counterparts [163]. This finding is similar to the studies conducted in

the US on the general population that found immigrants to be less likely to experience mental illness as compared to the US-born population [68-77]. However, it was contrary to the findings of other studies conducted in Europe that found immigrants to be at greater risk of mental illness compared to non-migrants [64-67]. This has intrigued the curiosity to run the logistic regression analysis separately for Canadian-born and immigrant students to see if there are differences among the student groups (immigrants vs Canadian-born).

Kicking it off with predisposing factors, older ages seem to be associated with significantly increased odds of having SRMI and SRMD for Canadian-born students. However, it didn't show any significant association with SRMI and SRMD for immigrant students. A study on the general population shows a similar association of age with mental illness that older adults are more likely to experience mental illness compared to the younger age group [74]. For SRAD, we didn't see a significant association with age for both Canadian-born- and immigrant- students. Examining the association of sex, male students were shown to have significantly reduced the odds of having SRMI (including SRMD and SRAD) for both Canadian-born and immigrant students (except for SRMD which loses its significance in the adjusted model for immigrant students). Other studies have also found that female students have higher odds of having mental illnesses including mood, anxiety and eating disorders [96, 127, 128]. However, this may result from better recognition of mental illness and help-seeking behaviour among female students. Research suggests females disclose mental health concerns more readily than males, which might correspond to the sex differences observed in trends over time [75, 76]. Likewise, white students tend to consistently have higher odds of having SRMI (true for SRMD and SRAD as well) compared to non-white students. This is contrary to a study conducted in the USA that shows an increased mental illness including depression, anxiety, suicidal ideation, and one or more mental illness among non-white students [171]. Canadian-born students in post-secondary education are shown to have consistently and significantly lower odds of having SRMI (true for SRMD and SRAD as well) compared to those in secondary school or less. The same is true for immigrant students even if the association was not significant. This is similar to the finding of a previous study that mental illness among post-secondary students was lower compared to non-students [47], however, there is also another study that concluded graduate students were more than 6 times as likely to experience mental illness compared to the general population [77].

Proceeding to enabling factors, food insecurity, unemployment, and lower or no household income were significantly associated with an increased odds of having SRMI (including SRMD and SRAD) for Canadian-born students, however, it didn't show significant association for immigrant students. Similar to this finding, a study conducted on socioeconomic inequality and mental illness shows that socioeconomically disadvantaged children and adolescents were 2 to 3 times more likely to develop mental illness [78].

Further, when we look at behavioural and health need factors, Canadian-born students who were stressed, smoked, drank alcohol and did not consult mental health professionals in the last 12 months had significantly higher odds of having SRMI (including SRMD and SRAD). These factors had shown a similar association with having higher odds of SRMI for immigrant students as well, even if it wasn't statistically significant. A similar study on mental health shows that smokers and frequent drinkers had a higher prevalence of mental illness compared to those who did not [79]. Similarly, having a weak sense of belonging to the local community was associated with having higher odds of SRMI for both Canadian-born- and immigrant- students. This corresponds to the finding of a similar study where a strong sense of belonging to the local community had a better mental health outcome [67].

Over and above, looking at the time since immigration to Canada, established immigrants (who lived in Canada for more than 10 years) seem to have higher odds of having SRMI compared to those who lived in Canada for less than 10 years, even if the association wasn't statistically significant. A related study on the general population shows that established immigrants who lived in Canada for more than 10 years have a higher risk of developing mental illness than recent immigrants who live in Canada for less than 10 years [67]. This could be the result of the healthy immigrant effect that was previously discussed in this study [81, 172]. Studies on the general population have pinpointed this decline in mental health advantage over time could result from difficulties in adjusting to a new environment, stress and/or adoption of risky health behaviours [78-80], as well as increased feelings of sadness, depression, isolation, loneliness, and lack of social support, especially for women [82-84].

6.1. Conclusion

In conclusion, the prevalence of SRMI among the overall student population was 16%. We have seen a significant difference in the prevalence of SRMI (including SRMD and

SRAD) between Canadian-born and immigrant students. To begin with, the prevalence of SRMI is higher among Canadian-born students as compared to immigrant students (18% and 7%, respectively). The same prevalence trend applies for SRMD (10% vs 4%) and SRAD (14% vs. 5%) among Canadian-born- and immigrant- students, respectively. Older, female, single, and economically less fortunate students were the most affected when it comes to SRMI. These factors affected both student categories similarly, however, the effect was consistently significant among Canadian-born students whereas it didn't have a consistently significant effect on immigrant students. Behavioural and health need factors such as life stress, smoking, and drinking have increased the odds of having SRMI (including SRMD and SRAD), however, the effect was consistently significant for Canadian-born students whereas it wasn't statistically significant for immigrant students in the adjusted model. Weaker connection to their local community has significantly increased the odds of having SRMI. Health-seeking behaviour (consulting mental health professionals) has also shown to have a significant protective effect against SRMI.

6.2. Recommendation

Institutions of higher education (schools, colleges, and universities) should consider more targeted support for students that are most affected by MI, e.g. female-, and economically disadvantaged- students. A study conducted in Canada shows that a rise in mental illness paralleled a rise in poorly perceived mental health consultations among female students [47]. A sound funding, grants and work-study program also need to be forged to reduce students' financial burden.

Promoting a culture of wellness that prioritizes healthy habits for students has also been shown to help with their mental illness [173]. This enables students to interact with their colleagues, friends, relatives, blog creation or similar activities that help them calm down. It also encourages students to analyze their situation and find solutions for it. Additionally, they should also allocate additional resources to avail accessible mental health services such as consultation and counselling services with mental health professionals.

6.3. Strengths and limitations of the study

Strength:

We were able to examine mental illness among Canadian students in a more comprehensive way by their immigration status because of the relatively rich, high-quality data (CCHS) with large sample size. We were able to run multiple logistic regression in all cases, adjusting for covariates without having a problem of multicollinearity with very small variance inflation factors.

Limitations:

This study gives a bird's eye view of SRMI among Canadian students along with the differences among the immigrant and non-immigrant groups. However, a study on the general population conducted in Canada in 2018 has shown significant interprovincial differences in the prevalence of MI [174]. Our future work could look at the provincial differences and other details that might help a closer look at the subject matter to forge a targeted intervention to reverse the outcome.

One possible limitation of this study is that there could be too many predictor variables included in the immigrant students' analysis because of its smaller sample size. In the future we will consider a more detailed examination of the choice of predictor variables in our multivariate models, and whether there might be differences in the immigrant group as compared to the Canadian-born group. Our sample has also reduced in size through the inclusion process, especially for immigrant students. This can reduce the statistical power; however, the remaining sample is large enough to compensate for these shortcomings.

Moreover, we cannot infer causality due to due to the nature of the data (cross-sectional survey). For instance, alcohol and tobacco use could cause mental illness, or instead may be mental illness could cause alcohol and tobacco use due to self-medication. Another limitation of the survey is that outcome variables are self-reported responses and were subjective which might be influenced by factors such as stigma, and non-random measurement errors such as memory recall bias. Additionally, the cultural difference may explain the reason why there is lower SRMI among immigrant students. This could be the result of under-reporting of true mental illness among immigrant students which can introduce a form of measurement error of SRMI among this group. After the immigrants have been in Canada for a longer time, then the cultural difference goes away, and immigrants might have started reporting MI more accurately. Therefore it could be that there is both a healthy immigrant effect and measurement error that is happening at the

same time. Hence, the lower odds of SRMI among immigrant students may be due to both healthy immigrant effect and measurement error due to cultural differences.

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Appendix A. Figures for missing data diagnosis (Fig: 3, 4, 5)

Figure 3: Missing data diagnostics for overall Canadian students' dataset

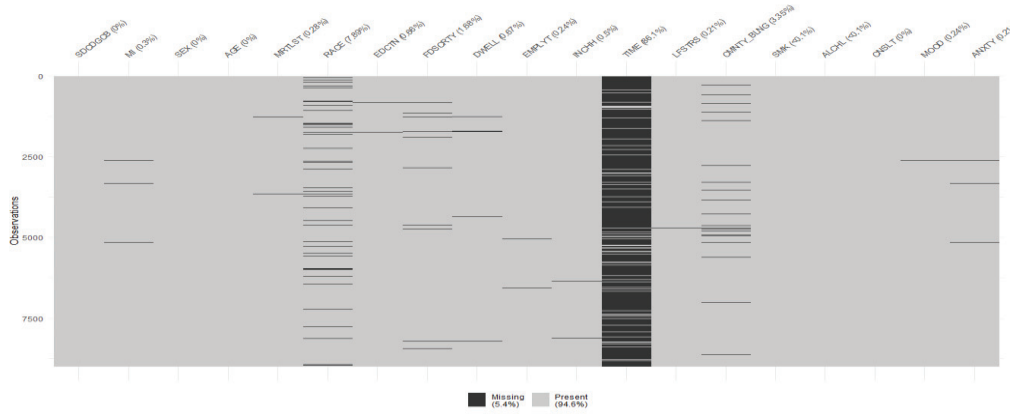

Figure 4: Missing data diagnostics for only Canadian-born students' dataset

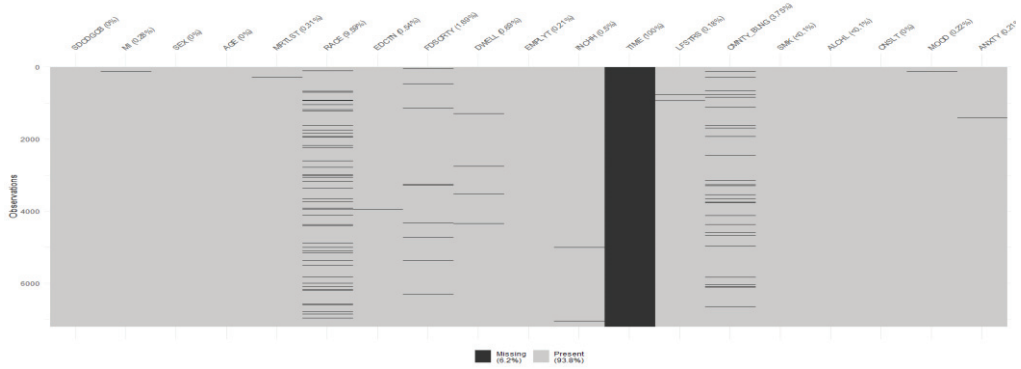

Figure 5: Missing data diagnostics for only immigrant students' dataset

Appendix B. *V*ariance inflation factors (VIF) of the explanatory variables used in logistic regression analysis models (Table 7 and 8)

Table 7: Variance inflation factors (VIF) of the explanatory variables used in logistic regression analysis models for self-reported Mental Illness.

Variables	Canadian Born	Immigrants	All students
Age between 25 and 34	1.660707	2.037606	1.690217
Age between 35 and 44	1.607727	2.108479	1.668300
Age 45 and older	1.743042	1.832469	1.732600
Male Sex	1.033832	1.093507	1.035020
Married & Common-law	1.659330	1.837819	1.667442
Widowed/Divorced/Separated	1.464171	1.515525	1.446489
Non-White racial/cultural background	1.053447	1.147233	1.505521
Born outside Canada	-	-	1.519231
Post-secondary certificate/diploma/degree	1.765883	1.890428	1.774183
Food insecure	1.169050	1.120248	1.150546
Rented Dwelling	1.415875	1.407684	1.458408
Not worked at job/business	1.132158	1.151093	1.144842
No income or less than $40,000	1.588945	1.729865	1.680500
$40,000 to $79,999 income	1.226249	1.352741	1.249782
More than 10 years in Canada	-	1.189363	-
Not stressful life	1.038602	1.062000	1.035783
Weak sense of belonging to the local community	1.071385	1.072766	1.063663
Yes smoking	1.058910	1.099501	1.058074
No alcohol	1.189591	1.220881	1.183375
Yes, consulted MH professional	1.054517	1.109343	1.057688

Table 8: Variance inflation factors (VIF) of the explanatory variables used in logistic regression analysis for Mood Disorder and Anxiety Disorder.

	VIF for Mood Disorder		VIF for Anxiety Disorder	
Variables	**Canadian Born**	**Immigrants**	**Canadian Born**	**Immigrants**
Age between 25 and 34	1.665432	1.944758	1.618293	2.187294
Age between 35 and 44	1.666507	2.042758	1.548466	2.148659
Age 45 and older	1.756962	1.802468	1.680028	1.684089
Male Sez	1.035445	1.093293	1.031848	1.099318
Married & Common-law	1.602191	1.651469	1.615715	1.806806
Widowed/Divorced/Separated	1.451733	1.396817	1.464020	1.590065
Non-White race	1.052671	1.125906	1.055395	1.171028
Post-secondary certificate/diploma/degree	1.753770	1.898020	1.711568	1.889761
Food insecure	1.183137	1.136857	1.184627	1.147037
Rented Dwelling	1.423183	1.388562	1.431331	1.442475
Not worked at job/business	1.115534	1.155286	1.138688	1.155813
No income or less than $40,000	1.673167	1.822950	1.605651	1.677355
$40,000 to $79,999 income	1.273039	1.472077	1.229303	1.212285
More than 10 years in Canada	-	1.186344	-	1.167909
Not stressful life	1.034930	1.061676	1.037655	1.074779
Weak sense of belonging to the local community	1.069791	1.072816	1.071519	1.083980
Yes smoking	1.059107	1.114093	1.070137	1.131443
No alcohol	1.163717	1.206682	1.201907	1.261851
Yes, consulted MH professional	1.054818	1.096324	1.052079	1.128900