INFLUENZA VACCINE PREVALENCE AND FACTORS ASSOCIATED WITH INFLUENZA VACCINATION AMONG CANADIAN ADULTS WITH MENTAL ILLNESS: AN EXPLORATION OF THE CCHS DATA

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Abstract

Individuals with mental illness are at high-risk for influenza (flu) and reduced receipt of preventive services i.e., flu vaccination. Yet, literature is limited on flu vaccination among this population. This study identifies flu vaccine rates and explores factors associated with having a flu vaccine among adults with mood/anxiety disorders living in 4 Canadian provinces. Data from the 2017-2018 Canadian Community Health Survey were analyzed. Of the mental illness sample, 65.1% received a flu vaccine in their lifetime. Of those, 55.9% received it less than 1 year ago. Those more likely to receive a lifetime flu vaccine are 60 years +, females, have higher education and household incomes, chronic comorbidities, non-smokers, non-sedentary behaviours, had relationships, primary care access, and lived in Alberta health regions. Findings highlight that Canadians with mental illness may need support to receive annual flu vaccines, and health interventions should target these specific factors to promote flu vaccination.

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List of Abbreviations

AB	Alberta
BC	British Columbia
BCCDC	British Columbia Center for Disease Control
BMI	Body Mass Index
CAMH	Centre for Addiction and Mental Health
CCHS	Canadian Community Health Survey
CMHA	Canadian Mental Health Association
CVD	Cardiovascular disease
CDC	Centres for Disease Control and Prevention
CMC	Chronic medical condition
COPD	Chronic obstructive pulmonary disease
CINAHL	Cumulative Index to Nursing and Allied Health Literature
HBM	Health belief model
HPM	Health promotion model
JCVI	Joint Committee on Vaccination and Immunisation
MHCA	Mental Health Commission of Canada
MAR	Missing at random
MCAR	Missing completely at random
MICE	Multiple Imputation Chained Equations
NACI	National Advisory Committee on Immunization
NFL	Newfoundland and Labrador
PEI	Prince Edward Island

PHAC	Public Health Agency of Canada
SES	Socioeconomic status
SPSS	Statistical Package for Social Sciences
SDG	Sustainable development goals
DSM-5	The Diagnostic and Statistical Manual of Mental Disorders
TPB	Theory of planned behaviour
UK	United Kingdom
UNCRPD	United Nations Convention on the Rights of Persons with Disabilities
US	United States
WHO	World Health Organization

CHAPTER ONE: INTRODUCTION & BACKGROUND

Seasonal influenza, also known as the "flu" is an infectious disease of the respiratory system (BC Center for Disease Control [BCCDC], n.d.). In Canada, seasonal influenza is among the top ten causes of death, creating a burden on the healthcare system, and leading to considerable morbidity and mortality among the Canadian population (Government of Canada, 2020b; Young et al., 2020). Each year, up to 20% of the Canadian population is infected with influenza, contributing to 12,200 hospitalizations, while claiming the lives of 3,500 people (Farmanara et al., 2018; Government of Canada, 2020b; Young, K., et al., 2020). Worldwide, approximately one billion people are infected with influenza, and annually 290,000 to 650,000 people die from flu-related complications (World Health Organization [WHO], n.d.a]. Thus, influenza is a significant public health concern, nationally and globally.

Certain groups with higher risk of developing influenza-related complications such as heart conditions, pneumonia, bronchitis, and respiratory failure are especially encouraged to vaccinate (BCCDC, n.d.; Government of Canada, 2020b). Groups considered high-risk by the National Advisory Committee on Immunization (NACI) in Canada include seniors 65 years old and older; children; pregnant women; individuals with compromised immune systems, and chronic medical conditions (CMC) such as cardiovascular disease, diabetes mellitus, asthma, chronic obstructive pulmonary disease (COPD), obesity, liver disease, kidney disease, and cancer (BCCDC, n.d.; Government of Canada, 2020b). However, individuals with mental illness are not considered a high-risk group for influenza and influenza-related complications despite possessing numerous risk factors and barriers that increase their risk for influenza and susceptibility to flu complications (Borthwick et al., 2021; Government of Canada, 2020b; Lord et al., 2010; Lorenz et al., 2013; Miles et al., 2020).

While individuals with mental illness are a vulnerable population, there may be insufficient understanding and awareness about the relationship between mental illness, the flu and preventive health (Lawrence, D., et al., 2020). As well, issues with societal stigma, discrimination, healthcare disparities and reduced mental health spending may have resulted in a lack of prioritizing this at-risk group to receive essential preventive services such as the flu vaccine (Centre for Addiction and Mental Health [CAMH], 2016, 2022; Lawrence, D., et al., 2020; Young, S., et al., 2015). Therefore, this study expands that understanding by highlighting the risks, addressing the gaps, and reiterating the importance of flu vaccination among this group. While influenza is preventable, it is a serious and acute illness with devastating consequences for high risk and vulnerable populations such as those with mental illness with and without comorbidities (Centers for Disease Control and Prevention [CDC], n.d.a).

People with mental illness are a vulnerable group enduring immense challenges within society (Canadian Mental Health Association [CMHA], n.d.; Happell et al., 2012; Lawrence & Kisely, 2010; Mental Health Commission of Canada [MHCC], 2016; WHO, n.d.c). Biological and lifestyle factors, as well as socioeconomic and systemic barriers including poverty, stigma, and reduced access to primary healthcare play a key role in their health disparities and poor health outcomes compared to the general population (CMHA, n.d.; Lawrence, D., & Kisely, 2010; Lorenz et al., 2013; Miles et al., 2020; WHO, n.d.c). All are factors that contribute to higher risk for diseases and lower rates of preventive care services including influenza and influenza vaccines. The influenza vaccine, a proven method of reducing respiratory illness, complications and mortality is of great benefit to vulnerable populations (CMHA, n.d.; Lawrence, D., & Kisely, 2010; Lorenz et al., 2013; Miles et al., 2020; WHO, n.d.c). Therefore, people with mental illness should be recognized as a high-risk group in need of encouragement and support to receive vaccines for this potentially life-threatening disease (Borthwick et al., 2021; Lord et al., 2010; Lorenz et al., 2013; Miles et al., 2020).

Now, amid a global pandemic, the topic of vaccination has garnered increased attention. Around the world, mass COVID-19 vaccination programs are underway to combat high rates of hospitalizations, morbidity, and mortality, particularly among high-risk groups (Government of UK, 2021; Mazereel et al., 2021; Warren et al., 2020). As such, several reports urged governments to provide early access to COVID-19 vaccines for people with mental illness, to consider them a high-risk group (Government of UK, 2021; Mazereel et al., 2021; Warren et al., 2020). Recent studies have found potential associations between mental disorders and the risk for COVID-19, an infectious respiratory disease (Government of UK, 2021; Mazereel et al., 2021; Warren et al., 2020). In December 2020, an independent report was released in the United Kingdom (UK) by the Joint Committee on Vaccination and Immunisation (JCVI) to advise on priority groups, and establish a framework to facilitate national policy development and strategies on COVID-19 vaccination (Government of UK, 2021). Within their ethical guidelines, people with severe mental illness were officially recognized as a high-risk group (Government of UK, 2021). This will hopefully send a clear message to other governments that people with mental illness are a vulnerable population in need of special attention when it comes to vaccination.

Moreover, a recent launch by Equally Well UK (2020) developed flu vaccination guides for people with severe mental illness, their healthcare professionals and mental health teams. These guides aim to support and inform, to remind of the potential vaccine eligibility and its importance among this population (Equally Well UK, 2020). Equally Well UK (2020), an initiative supported by many National Health Services (NHS) organizations and medical associations, recognizes that the flu vaccine is a life-saving service for people with severe mental illness, a service that can improve physical health and reduce the gap in life expectancy. Thus, amid a global pandemic and a dual risk, receiving the flu vaccine is especially crucial for people with mental illness (Equally Well UK, 2020; Government of UK, 2021; Mazereel et al., 2021; Warren et al., 2020). It can not only avoid the flu and its devastating consequences on health, but to reduce hospitalizations and the burden on our healthcare system and the economy (Government of Canada, 2020b; Government of UK, 2021; Mazereel et al., 2021; Warren et al., 2020).

There have been numerous attempts to identify vaccination rates and explain predictors of flu vaccine uptake among the general population and various high-risk groups. However, only a few attempts have been made among the mental health population. More knowledge is needed as influenza vaccination is a particularly important topic among individuals with mental illness. Reports of shorter life expectancy and poor health, as well as increased comorbidities, smoking, homelessness, and institutionalization not only place this population in a high-risk group for influenza infection but also negatively impact their preventive care utilization such as vaccination (Borthwick et al., 2021; Lorenz et al., 2013; Miles et al., 2020; Young, S., et al., 2015). Greater insight into factors that influence vaccination behaviours and decisions will allow health care providers to better understand the importance of vaccination, develop appropriate health promotion interventions and reduce the burden of influenza among the mental health population (Borthwick et al., 2021; Lorenz et al., 2013). Therefore, it is of great importance to identify flu vaccination rates and explain the factors that influence the uptake of flu vaccines among this vulnerable group within the Canadian context.

The following chapter provides background information about influenza and influenza vaccination among people with mental illness, including the risk factors and the challenges faced by our mental health population, a marginalized yet resilient group. While there are serious barriers among this population to vaccination against influenza, there are also probable solutions that must be considered and implemented to promote vaccination and overcome these obstacles.

Background

Mental illness is a significant health concern, experienced by people of all age groups, cultures, incomes, and education levels (Government of Canada, 2017; WHO, n.d.c). Not only is mental illness a global and a national health crisis but the incidence and prevalence continue to rise. Around the world, 450 million people are suffering from mental illnesses such as mood and anxiety disorders, disorders that impair one's emotional state, contribute to significant distress, and the ability to adequately function (CMHA, n.d.). In Canada, during a lifetime, 12.6% of Canadians over 15 years of age will experience a type of mood disorder such as major depression and bipolar disorder, and 8.7% of individuals "will experience generalized anxiety disorder" (CMHA, 2013a; Public Health Agency of Canada [PHAC], 2016, p. 6). Thus, mood disorders and anxiety disorders, the most common types of mental illnesses in Canada are the primary focus of this study (PHAC, 2016).

Overall, nationally, approximately one in five Canadians will experience a mental illness issue or illness in any given year and nearly 50% of the Canadian population has experienced or will experience mental illness by the age of 40 (CAMH, n.d., 2022). It is estimated that more Canadians (16%) were accessing and seeking help from their healthcare professionals about mental health issues in 2019 compared to 14% of Canadians in 2015 (Statistics Canada, 2020c). As well, potentially due to the pandemic more adults are screening positive for depression and anxiety symptoms, and pre-existing mental illness symptoms may be intensifying (Statistics

Canada, 2021a). Thus, a rise in mental illness potentially signifies a rise in poor physical health and physical illness, and an increase in their morbidity and mortality rates (CMHA, n.d.; PHAC, 2019). Including a potential rise and burden from communicable respiratory diseases such as influenza (CMHA, n.d.; PHAC, 2019).

The impact of mental illness on physical health is immense, and people with mental illness experience higher prevalence of physical comorbidities compared to the general population (Lord et al., 2010). For instance, research demonstrates that people with mental illness such as major depression experience “three times the number of chronic medical conditions” compared to those without major depression (Druss et al., 2008, p. 4). In Canada, adults utilizing psychiatric healthcare services experience higher occurrences of medical conditions and illnesses such as COPD, asthma, diabetes, hypertension, and cardiovascular disease compared to Canadians seeking healthcare services for non-psychiatric conditions (PHAC, 2016). In terms of common mental illnesses, Canadians with anxiety and mood disorders are approximately one and a half times more likely to develop asthma, and up to 1.3 times more likely to develop ischemic heart disease, hypertension, and diabetes compared to the general population (PHAC, 2016). It is evident that people with mental illness suffer greatly from medical conditions and illnesses that increase their risk of developing serious influenza complications (CDC, n.d.a; CMHA, n.d.; Lawrence & Kisely, 2010; Lorenz et al., 2013; Miles et al., 2020; PHAC, 2016).

However, this is not unique to Canada. In the United Kingdom, individuals seeking mental health services experience a higher prevalence of COPD, asthma, obesity, heart failure, stroke, and coronary heart disease (Government of UK, 2018). Furthermore, they are 4.7 times more likely to die from respiratory disease, 3.3 times more likely to die from cardiovascular disease, twice as likely from cancer and five times more likely from liver disease (Government of UK, 2018). In New Zealand, people with mental illness are afflicted in similar ways with higher occurrences of hyperlipidemia, kidney disorders, and obesity (Wheeler, 2014). Further, a systematic review by De Hert et al. (2011) noted that pneumonia and acute respiratory failure, both serious complications of influenza remain prominent among patients with severe mental illness. Overall, this data highlights stark physical health inequalities for people with mental illness compared to the general population (Government of UK, 2018). Ultimately, the medical comorbidities compromise the health and well-being of individuals with mental illness and increase their risk of influenza (Equally Well UK, 2020; Government of UK, 2018; Lorenz et al., 2013; Miles et al., 2020;). If infected with influenza, the chances of developing severe complications or experiencing an exacerbation of existing physical and mental illness grow, potentially leading to further suffering, disease burden, and widening mortality rates for this vulnerable population (Equally Well UK, 2020; Government of UK, 2018; Lorenz et al., 2013; Miles et al., 2020).

The mortality rates for people with mental illness are two to three times greater compared to the general population, with an overall reduced life expectancy of up to 25 years (Mazereel et al., 2021; Miles et al, 2020; WHO, 2018b). This is largely stemming from structural and systemic factors, interwoven with higher prevalence of physical illness, unhealthy behaviours, and symptoms of the mental illness itself (CMHA, n.d.; Lawrence & Kisely, 2010; Lorenz et al., 2013; Miles et al., 2020; WHO, 2018b).

The risk of influenza increases when individuals exhibit unhealthy behaviours that negatively impact their health status such as physical inactivity, poor nutrition, smoking and substance misuse (CDC, n.d.a; Lorenz et al., 2013; Miles et al., 2020). These risk behaviours are common among people with mental illness (CMHA, n.d.; Government of UK, 2018; Lorenz et al., 2013; Miles et al., 2020; Wheeler, 2014; WHO, 2018b). For instance, the rates of smoking are two to three times greater for people with mental illness, and the obesity rates are one and a half times higher compared to those without mental illness (Lawrence, D., & Kisely, 2010; Lorenz et al., 2013; Mazereel et al., 2021). Smoking is a major risk factor for developing serious infections and illnesses including influenza (Lorenz et al., 2013). Moreover, the adverse effects on health and in turn higher risk of influenza may relate to the mental illness itself (Borthwick et al., 2021; Druss et al., 2008; Lorenz et al., 2013; PHAC, 2016). Symptoms of mental illness include cognitive impairment, low risk awareness, reduced self-efficacy, lack of motivation, and chronic stress from hormonal and neurotransmitter imbalance (Druss et al., 2008; Lorenz et al., 2013; PHAC, 2016). Such symptoms may jeopardize physical health, as well as interfere with one's ability or willingness to recognize and seek medical attention when experiencing an illness, such as influenza (Druss et al., 2008; Lorenz et al., 2013; Miles et al., 2020; PHAC, 2016). Symptoms of the mental illness can pose barriers for people to process, understand, or adhere to information regarding influenza prevention and treatment (Druss et al., 2008; Lorenz et al., 2013; Miles et al., 2020; PHAC, 2016). As well, the negative effects of psychotropic medications, medications that people with mental illness commonly take, increase one's chances of influenza and its related complications (Miles et al., 2020; Seminog & Goldacre, 2013). Weight gain, obesity and metabolic syndrome are common side effects of psychotropic medications, side effects that weaken the immune system and its ability to fight infection, effects that also raise the risks of diabetes, stroke, and heart disease (CMHA, n.d.; Druss et al., 2001; Lorenz et al., 2013; Miles et al., 2020; PHAC, 2016; WHO, 2018b).

Individuals with mental illness suffer significantly from violations of human rights, societal stigma, and discrimination (Lawrence, D., & Kisely, 2010; WHO, n.d.c). These systemic factors have contributed to loneliness and social exclusion; reduced access to emergency, social and healthcare services, suboptimal physical health monitoring; and limited education and employment opportunities (Lawrence, D., & Kisely, 2010; Mazereel et al.; Miles et al., 2020; Tosh et al., 2014; WHO, n.d.c). They hinder the ability of people with mental illness to access or receive the proper diagnosis, management, and treatment for mental health issues and physical illnesses (Lawrence, D., & Kisely, 2010; Mazereel et al.; Miles et al., 2020; WHO, n.d.c). In addition, the rates of homelessness, poverty and institutionalization are overwhelmingly higher among people with mental illness (CMHA, n.d.; Lorenz et al., 2013; Miles et al., 2020; WHO, n.d.c).

Research is showing that individuals with major depression are two times more likely to live below the poverty line compared to people without major depression, and in Toronto, Canada, 38% of the homeless population also experience significant mental health issues (Druss et al., 2008; Young, S., et al., 2015). These individuals are often afflicted immensely from respiratory illnesses and infections due to greater occurrences of inadequate nutrition, smoking, lung disease, overcrowded living conditions including inability to physically distance or perform safe hygiene, and inadequate access to healthcare (CMHA, n.d.; Lorenz et al., 2013; Miles et al., 2020; Seminog & Goldacre, 2013; Young, S., et al., 2015). Overall, the individual and systemic factors increase the likelihood for people with mental illness to acquire, spread, and die from communicable respiratory illnesses, including influenza (Borthwick et al., 2021; Happell et al., 2012; Lorenz et al., 2013; Miles et al., 2020; Seminog & Goldacre, 2013; Young, S., et al., 2015).

Higher prevalence of chronic medical illnesses intertwined with unhealthy behaviours, socioeconomic disadvantages, stigma, and lack of healthcare parity are potentially placing individuals with mental illness at a similar or even greater risk level of influenza and influenza-related complications to that in groups considered high risk by the national influenza advisory committee (Borthwick et al., 2021; Government of Canada, 2020b; Lorenz et al., 2013; Miles et al., 2020; PHAC, 2016; Seminog & Goldacre, 2013).

Mental Illness and Influenza Vaccine Rate

The influenza (flu) vaccine is a cost-effective measure that reduces the chances of developing and spreading the infection to others (BCCDC, n.d.; Government of Canada, 2020b). It functions to minimize transmission rates and disease severity, thereby, protecting individuals and communities at large (Government of Canada, 2020b). In Canada, seasonal influenza vaccines are recommended for all individuals and high-risk groups by the NACI, typically between the months of October and December annually to remain continually protected as the virus is frequently changing (Farmanara et al., 2018; Government of Canada, 2020b). However, several studies suggest that people with mental illness may experience reduced rates of preventive care services including seasonal influenza vaccines, that are contributing to higher morbidity and mortality rates (Borba et al., 2012; Borthwick et al., 2021; Bradford et al., 2014; Druss et al., 2008; Happel et al., 2012; Lord et al., 2010; Lorenz et al., 2013; Miles et al, 2020; Xiong et al., 2015; Young, S., et al., 2015). This is of concern, as people with mental illness are a vulnerable group with serious risk factors and comorbidities that threaten their health and raise the risk of physical illness including influenza.

However, while in several studies potential discrepancies and significant reductions in flu vaccine rates were highlighted among people with mental illness such as those with major depression, in several studies it has also been reported that either little differences or greater flu vaccination rates exist for people with mental illness compared to those without mental illness (Lord et al., 2010; Lawrence, T., et al., 2020; Yarborough et al., 2018). Thus, obtaining influenza vaccination rates among this group is imperative as research is currently mixed, and not in the forefront within the Canadian context.

Influenza Vaccine Uptake and Associated Factors

According to previous research, various factors are shown to be associated with the uptake of influenza vaccine. These factors include sociodemographic characteristics such as age, gender, race, marital status, education, income, and health insurance; health behaviours such as smoking, physical activity, and nutrition; as well as health status such as body mass index (BMI), perceived physical health, and presence of chronic conditions (T. Lawrence et al., 2020; Schmid et al., 2017; Takayama et al., 2012; Yeung et al., 2016). Psychological variables such as knowledge, attitudes, and beliefs (KAB) about influenza and influenza vaccines, reduced self-efficacy, low risk perception, low social pressure and low perceived benefits to vaccination have been recognized as major barriers to receiving influenza vaccines (Schmid et al., 2017). Other important factors such as previous experiences with getting influenza and receiving influenza vaccines are strongly linked with higher uptake of flu vaccines (Schmid et al., 2017; Yeung, K., et al., 2016;). Interestingly, mental disorders such as depression and anxiety were identified as factors that positively influenced influenza vaccination rates among an elderly population with chronic illness in primary care (T. Lawrence et al., 2020).

Within the broader context, factors such as healthcare system utilization and interaction, recommendations from healthcare providers and family members to vaccinate, as well as healthcare organization size and location were identified as significant determinants of influenza vaccine uptake (Lawrence, T., et al., 2020; Schmid et al., 2017; Yeung et al., 2016; Young, K., et al., 2020). However, most of the factors identified in research were explored among the general population or “high-risk” groups such as the elderly, children, people with chronic medical conditions and healthcare workers (Farmanara et al., 2018; Lawrence, T., et al., 2020; Lorenz et al., 2013; Lu et al., 2019; Schmid et al., 2017; Yeung et al., 2016). Extant research on flu vaccination among individuals with mental illnesses is currently understudied. Therefore, exploring factors that influence people with mental illness in Canada to vaccinate against the flu will offer insight into important facilitators and barriers to receiving flu vaccines from a Canadian and a mental health perspective. This knowledge will enable policy makers and healthcare stakeholders to develop programs directly targeting this vulnerable population, to promote the uptake of flu vaccines. Additionally, identifying flu vaccination rates and understanding the influencing factors may facilitate an exploration into whether current vaccination programs, policy changes, and resources aimed to increase flu vaccination coverage in Canada are headed in the right direction and whether people with mental illness are benefiting from them.

Research Objective

The main objective of this study was to fill an important gap within literature, the lack of knowledge and research on influenza vaccination among individuals with mental illness in Canada. The study addressed this gap by identifying flu vaccination rates among Canadian adults with mental illness and then examining specific factors that are associated with the uptake of flu vaccines among this population. For the purposes of this study, adults are those at least 18 years and older. In addition, as detailed in chapter two, Pender’s Health Promotion Model (HPM), a comprehensive nursing model developed to predict health related behaviours was used as a theoretical framework in this study, to guide the research process, and to discover pertinent factors that could influence the uptake of flu vaccine, a health promoting behavior (Pender, 2011).

Research Purpose and Questions

The primary purpose of this study was to explore the factors associated with influenza vaccination receipt among Canadian adults with mood disorders and anxiety disorders. From this research statement, two research questions emerged:

1. What are the influenza vaccination rates among Canadian adults with mood disorders and anxiety disorders compared to individuals without mental illness?
2. What factors based on the HPM (i.e., personal characteristics and experiences, behavior specific cognitions and affect, as well as interpersonal and situational influences) are associated with influenza vaccination receipt among Canadian adults with mood disorders and anxiety disorders?

The anticipated outcomes of this study were to empirically inform vaccine use for individuals with mental illness. To raise awareness among the mental health population, healthcare professionals, provincial and federal governments about their high risk of influenza and influenza related complications, and the importance of flu vaccine. To develop innovative programs that promote and increase the uptake of flu vaccine, and subsequently contribute to reducing the health disparities among people with mental illness. Above all, this study was aiming to advocate, and disseminate knowledge that will lead to positive change for people with mental illness.

Project Significance

At present, flu vaccination rates among people with mental illness in Canada are unknown. Identifying their vaccination rates may uncover potential discrepancies in influenza vaccine for this vulnerable population susceptible to severe flu complications. Conversely, the data could demonstrate how unique Canada might be in relation to this essential preventive care service for mental health compared to other nations. Nevertheless, in Canada, people with mental illness are not considered “high risk” for influenza and its related complications (Government of Canada, 2020b). This may subsequently result in under vaccination, lack of awareness and dismissal of its importance for this population by their healthcare providers, communities, and governments (Government of Canada, 2020b; Lorenz et al., 2013; Miles et al., 2020).

The Canadian adult population has been experiencing plateauing influenza vaccination rates for years, even during the COVID-19 pandemic (CanAge, 2022; Government of Canada, 2020b; Farmanara et al., 2018). During the 2018-2019 and 2019-2020 flu seasons, the coverage rates among all adults remained at 42%, with similar rates in previous years (Government of Canada, 2020b). This is despite having a universally available vaccination coverage in most provinces and territories except for British Columbia (pre- pandemic), Quebec, and New Brunswick (pre-pandemic), and with the majority of governments also funding the vaccine for “high risk” groups, excluding those with mental illness (Farmanara et al., 2018; Immunize Canada, 2019; PHAC, 2021). In terms of high-risk groups, during the 2019-2020 flu season, vaccination coverage was higher among seniors at 70%, and adults with chronic medical conditions (CMC) at 44%. Evidently, Canada has yet to achieve its national flu vaccination coverage goal of 80% (Government of Canada, 2020b). Even during the 2020-2021 flu season, coverage rates for seniors remained at 70% and for adults (18-64) with CMC the rates were 41% (CanAge, 2022). If healthy individuals and high-risk groups such as seniors and adults with chronic medical conditions are experiencing difficulties in achieving this national goal, one could imagine the difficulties people with mental illness may be experiencing, a vulnerable population with its own unique and complex health needs.

This study, however, went beyond merely a descriptive analysis. It attempted to identify vaccination rates among people with mental illness and examine how vaccine rates may be influenced by other factors. Thus far, only a few studies have explored factors associated with flu vaccine uptake among people with mental illness. The focus is primarily directed towards examining other groups such as the general adult population, children, seniors, pregnant women, hard to reach populations and people with chronic medical illnesses (Farmanara et al., 2018; Lu et al., 2019; Yeung et al., 2016; Schmid et al., 2017). However, people with mental illness are a population with their own risks and vulnerabilities. Therefore, most of the common factors identified in research did not apply to those with mental illness. Studies that have explored factors among people with mental disorders are scarce and vary widely across healthcare systems, mental health programs and populations (Borthwick et al., 2021; T. Lawrence et al., 2020; Lorenz et al., 2013). Thus, the findings are not generalizable to the Canadian adult population with mental illness. Significantly, in Canada there are no known studies that have examined associations with flu vaccine uptake among adults with mental disorders, revealing an important gap.

Exploring factors that influence people with mental illness to vaccinate against the flu allow us to better understand the mechanisms behind this, and empirically inform the healthcare sector and policy makers, both nationally and internationally. This understanding will allow policy makers and healthcare professionals to evaluate and develop future interventions that incorporate the unique needs of this vulnerable population, and that target individual and systemic factors. Such interventions could effectively promote flu vaccination (and more recent

COVID-19 vaccination) and raise awareness about its fundamental importance among people with mental illness. Overall, these are pivotal advances toward alleviating the burden and suffering caused by influenza. These advances would be steps toward improving the quality of life and health outcomes of people with mental illness and ensuring that no disparities exist in this essential preventive care service. Arguably, this is an ethical responsibility of our governments and healthcare systems.

To hold governments and healthcare systems accountable, the United Nations Convention on the Rights of Persons with Disabilities (UNCRPD) was established to ensure that internationally, governments are protecting and advocating for the rights of their disabled populations (United Nations, n.d.a). Within this international agreement, people with mental health conditions are recognized as people with disabilities. People with disabilities have faced serious obstacles and threats within society (United Nations, n.d.a). Therefore, the UN convention set out essential standards for societies to promote the basic human rights of people with disabilities, including the right to dignity, respect, justice, inclusion, and equality (United Nations, n.d.a). Another important right under the UN convention is the right to health. This includes the right to access to the same timely and quality healthcare as everyone else, while having the unique needs of people with disabilities properly met (Equality and Human Rights Commission, 2017; United Nations, n.d.a). Overall, it is the right of people with mental illness to "enjoy the best possible health" (Equality and Human Rights Commission, 2017, p. 44). Therefore, governments and healthcare professionals have a tremendous responsibility to not leave people with mental illness behind, to recognize their high risk, and consider their needs throughout every step of planning and developing interventions that will impact their health, and this includes flu vaccination (Lawrence, D., & Kisely, 2010; Lord et al., 2010; Lorenz et al., 2013; Warren et al., 2020; WHO, n.d.c). According to the WHO (2021) vaccination is a major component of "primary health care and an indisputable human right" (para. 3).

Similarly, the Sustainable Development Goals (SDG) adopted by the United Nations in 2015 were developed as a "call for action," to achieve "peace and prosperity for people and the planet, now and into the future" (United Nations, n.d.b, para. 1). One SDG has targeted the importance of mental health and addressing the needs of people with mental disorders (WHO, 2018b). It includes urging all nations to view people with mental illness as citizens deserving of respect, equal opportunities, and empowerment (WHO, 2018b). Within this goal, calls are made to improve the health services for people with mental illness, to bridge the gap between mental disorders and physical illnesses that contribute to their premature mortality rates (WHO, 2018b). Ultimately, promoting influenza vaccination among people with mental illness is a step toward bridging that divide.

Within research, several authors have affirmed the importance of ethical responsibility and protection of human rights for people with mental illness (Lawrence, D., & Kisely, 2010; Warren et al., 2020). For instance, Fleishbacker argued that healthcare parity is a basic human right and people with mental illness are entitled to it, just as everyone else (as cited in Lawrence, D., & Kisely, 2010). Lawrence, D., and Kisely (2010) further argued that people with mental illness should be entitled to even greater use of healthcare services to match their needs, which are higher level and more complex. Thus, while addressing potential discrepancies in flu vaccine uptake between the general population and people with mental illness is of great importance, promoting higher use of flu vaccine for this population, a population that experiences worsened health outcomes and greater disease burden, may be of greater priority (Government of UK, 2018; Lawrence, D., & Kisely, 2010).

Healthcare professionals including nurses, the most trusted professionals in Canada, play a key role in the promotion of healthy behaviours and prevention of disease among vulnerable populations (Villeneuve, 2017). Educating nurses on existing disparities in physical health among people with mental illness, including higher prevalence of communicable and non-communicable diseases, the significance of flu vaccines and its determinants will encourage nurses to view mental health patients with a holistic and systems lens (Lawrence, D., & Kisely, 2010; Mazereel et al., 2021; Warren et al., 2020); to recognize the interrelationship between mental illness, physical health, social, and environmental aspects (CMHA, n.d.); and to understand their risks and broader needs (Lawrence, D., & Kisely, 2010; Mazereel et al., 2021; Warren et al., 2020). This will equip healthcare providers to communicate with their patients in a manner that is transparent, individualized, and supportive (Lawrence, D., & Kisely, 2010; Mazereel et al., 2021; Warren et al., 2020); and to focus on health promotion and prevention within mental health (CMHA, n.d.; Lawrence, D., & Kisely, 2010; Mazereel et al., 2021; Warren et al., 2020). They will be enabled to delicately balance between factors that enhance vaccinations and factors that hinder vaccinations with their mental health patients, while facilitating active participation and informed decision making to increase awareness, confidence, and acceptance of flu vaccines, highly aligning with patient centered care (CMHA, n.d.; Lawrence, D., & Kisely, 2010; Mazereel et al., 2021; Warren et al., 2020).

On a macro level, nurses have a unique opportunity to advocate for the rights of their vulnerable populations, for healthy public policy (Villeneuve, 2017, p. 7). Nurses as leaders can take charge, challenge the status quo, and influence the political agenda (Villeneuve, 2017). Thus, when nurses are empirically informed, they will be empowered with the knowledge to advocate for priority access to influenza vaccination and higher vaccine uptake for people with mental illness (Government of UK, 2021; Mazereel et al., 2021; Warren et al., 2020). In partnership with key stakeholders, interest groups and policy makers, nurses can shape social and health policy decisions "that will govern and shape every aspect of the scope, quality, and outcomes of care" for their vulnerable patients (Villeneuve, 2017, p. 7).

Definition of Terms

In this section, I provide definitions for five key terms to enhance understanding: Primary terms that have shaped this study. They include seasonal influenza, influenza vaccine, mental illness, mood disorders, and anxiety disorders.

Seasonal Influenza

According to the WHO (2018c), seasonal influenza is defined as "an acute respiratory infection caused by influenza viruses which circulate in all parts of the world" (para. 1). Type A and B viruses are primary influenza viruses responsible for annual influenza pandemics during the fall and winter seasons (WHO, 2018c). Historically, descriptions of influenza-like symptoms have appeared for centuries (Barberis et al., 2016). In fact, one of the earliest descriptions dates back to 412 BC in the "Book of Epidemics" by Hippocrates (Barberis et al., 2016). However, the word "influenza" originated in Italy in the 15th century, as the "influence of stars" was originally believed to cause the flu epidemic in Europe (Barberis et al., 2016, p. 115). From the 15th until the 19th century, the world experienced over 30 recorded influenza epidemics, and eight pandemics (Barberis et al., 2016). One of the most devastating pandemics in 1918, the Spanish influenza, was described as "the greatest medical holocaust in history" (Barberis et al., 2016, p. 116)

As science progressed, bacteria were presumed to be the primary cause of influenza, particularly in the 19th century (Barberis et al., 2016). It was not until 1932-1933 that English scientists discovered the true source of influenza, viruses (Barberis et al., 2016), when scientists successfully isolated the first influenza virus and demonstrated its human transmission (Barberis et al., 2016). Over the years, the etiology of influenza was better understood, leading to important scientific and health related developments including the discovery of influenza vaccines (Barberis et al., 2016).

Influenza viruses spread through droplet contact such as through sneezing, coughing, or speaking within six feet of someone (WHO, 2018c). The main signs and symptoms of influenza include dry cough, sore throat, runny nose, headache, muscle pain, fever, and general malaise (WHO, 2018c). The symptoms may last anywhere from two days to several weeks, typically without requiring any urgent medical help (WHO, 2018c). However, while symptoms may be mild, there is a wide range of disease from asymptomatic to severe complications and death, particularly among high-risk groups (WHO, 2018c). Treatments for seasonal influenza include symptomatic treatment to relieve symptoms or antiviral medications and hospitalization for severe illness (WHO, 2018c). To prevent transmission of seasonal influenza people are encouraged to wash hands frequently, and to cover their face when sneezing or coughing (WHO, 2018c). Other non-pharmaceutical measures include self-isolation and keeping a physical distance (WHO, 2018c). However, to date, seasonal influenza vaccine is one of the most effective methods to prevent influenza (PHAC, 2021; WHO, 2018c). For the purposes of this study, it is important to distinguish seasonal influenza from influenza pandemics. Unlike seasonal influenza, influenza pandemics are rare, unpredictable, and different from recent and current circulating viruses (WHO, n.d.b). As such, this study focuses on seasonal influenza.

Influenza Vaccine

Vaccines are preventive measures that save millions of people each year (WHO, 2021). Vaccines "reduce risks of getting a disease by working with your body's natural defenses to build protection. When you get a vaccine, your immune system responds" (WHO, 2021, para. 1). Influenza vaccines are administered to protect individuals against circulating influenza viruses through the development of antibodies (Government of Canada, 2020b). This facilitates a reduction in transmission rates, disease severity and the prevalence of influenza complications and mortality (CDC, n.d.b; Government of Canada, 2020b).

The first influenza vaccine was developed in the 1940s and administered primarily to soldiers during World War II to reduce their death toll from the flu (Barberis et al., 2016). Since then, the development and preparation of the influenza vaccine has evolved, including its safety and effectiveness. In Canada, there are two types of authorized influenza vaccines (Barberis et al., 2016). The first is an inactivated influenza vaccine (IIV) containing trivalent (IIV3) and quadrivalent (IIV4) formulas, administered intramuscularly (PHAC, 2021). The second is a live attenuated influenza vaccine (LAIV) with trivalent (LAIV3) and quadrivalent (LAIV4) formulas, administered nasally (PHAC, 2021).

Each year, the WHO provides recommendations on the design of annual influenza vaccines for the upcoming season (PHAC, 2021; WHO, 2021). The recommendations are based on global surveillance data which monitors and tracks the most common and recent circulating influenza strains (WHO, 2021). Therefore, influenza vaccines will differ slightly from year to year due to the evolving nature of influenza viruses and the loss of immunity over time (PHAC, 2021; WHO, 2018c). Canada has its own surveillance system called FluWatch, and the NACI provides scientific data and advice to individuals, the healthcare system, and governments on influenza vaccines (PHAC, 2013, 2021).

Mental Illness

Mental illnesses are described as conditions that alter mood, thinking, feeling or behavior “associated with significant distress and impaired functioning” (PHAC, 2019, p. 1). Mental illness can occur simultaneously, ranging in severity and duration, from occasional/situational, and short-lasting episodes to ongoing and chronic (PHAC, 2019). Mental illness is multifactorial, resulting from the complex interplay of genetic, psychosocial, biological, and economic factors (Government of Canada, 2017; PHAC, 2019). These include gender, age, trauma, stress, family history, reduced social supports, low income, substance abuse, and chronic medical conditions (Government of Canada, 2017; PHAC, 2019). Mental illness has a wide impact on life, affecting work, school, relationships, and community involvement (Government of Canada, 2017; PHAC, 2019).

Mental illness is often used interchangeably with mental health (WHO, 2018a). However, it is important to distinguish the two terms. The WHO (2018a) defines mental health as “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 is able to make a contribution to his or her community” (para. 2). While mental health plays an integral role in our overall health, there is more to mental health than simply the absence of mental illness (WHO, 2018a). Therefore, a person with a diagnosed mental illness can still experience positive mental health and well-being, while a person without mental illness can experience significant poor mental health (WHO, 2018a). For the purpose of this research project the focus was on mental illness.

There are numerous types of mental disorders as classified by the Diagnostic and

Statistical Manual of Mental Disorders (DSM-5) (PHAC, 2019). Common types of mental illnesses include schizophrenia, personality disorders, eating disorders, autism spectrum disorder, substance abuse, mood disorders and anxiety disorders (Government of Canada, 2017; PHAC, 2019). As mentioned previously, for the purpose of this project, mood disorders and anxiety disorders (the most common types of mental illnesses in Canada) will be the primary focus (PHAC, 2016).

Mood Disorders

Mood disorders are mental illnesses (or disorders) that affect one's mood or emotional state (CMHA, 2013b; PHAC, 2016). There are several types of mood disorders including bipolar disorder, major depression disorder, and dysthymic disorder (CMHA, 2013b; PHAC, 2016). Bipolar disorder is associated with periods of manic and depressive episodes (CMHA, 2013b; PHAC, 2016). During the manic phase, people may experience intense and elevated mood, racing thoughts, pressured speech, restlessness, agitation, impulsivity, and impaired judgment and concentration (CMHA, 2013b; PHAC, 2016). During the depressive phase, people may feel hopeless, helpless, guilty, and numb (CMHA, 2013b; PHAC, 2016). They may also experience severe lack of energy or interest in usual activities, as well as isolation, and social withdrawal (CMHA, 2013b; PHAC, 2016). People with mood disorders may also suffer from psychosis such as delusions and hallucinations, particularly if the mania or depression is severe (CMHA, 2013b; PHAC, 2016). Lastly, dysthymic disorder shares many similarities with depression; however, with milder symptoms and impairment (CMHA, 2013b; PHAC, 2016).

Anxiety Disorders

Anxiety disorders include generalized anxiety disorder, panic disorder, post-traumatic stress disorder, obsessive compulsive disorder, and phobias (CMHA, 2013a; PHAC, 2016).

Although different in criteria, these conditions share several similarities including excessive, prolonged, intense, persistent, and unreasonable feelings of worry, distress, fear, or apprehension (CMHA, 2013a; PHAC, 2016). These experiences can significantly interfere with daily functioning and relationships. People with anxiety disorders may avoid places, events, and situations or compulsively develop rituals to reduce their symptoms of anxiety (CMHA, 2013a; PHAC, 2016). There are other significant symptoms associated with anxiety disorders (CMHA, 2013a; PHAC, 2016): fFor instance, symptoms of chest pain, shortness of breath, dizziness, and stomach discomfort in panic disorders (CMHA, 2013a; PHAC, 2016). Irritability, anger, nightmares, and flashbacks are experience in post-traumatic stress disorder, as well as, fatigue, headache, nausea, and trembling in generalized anxiety disorder (CMHA, 2013a; PHAC, 2016).

Chapter Summary

This chapter provided background information about mental illness, influenza, and influenza vaccination among people with mental illness, including the interrelated risk factors and the challenges faced by our mental health population, such as higher prevalence of physical illness and unhealthy lifestyle behaviours, symptoms of the mental illness, and social determinants of health (Borthwick et al., 2021; CAMH, 2016; Lorenz et al., 2013; Miles et al., 2020; PHAC, 2016). Although the flu vaccine is cost-effective and individuals with mental illness are at high risk for influenza, little is known about their risk or engagement in flu vaccination, particularly within the Canadian context. Thus, to increase understanding and insight, the researcher attempted to identify and compare flu vaccine rates between Canadian adults with and without mental illness (mood and/or anxiety disorders), and explore specific factors associated with flu vaccination among the mental health population in Canada. While there are serious barriers among this population to vaccination against influenza, these findings can inform the development of solutions that must be considered and implemented to promote vaccination and overcome these obstacles.

The factors selected for this study were based on literature, theory (HPM), gaps identified, and the unique needs of the mental health population, which are discussed in chapter two. As detailed in chapter three, data for this study was obtained from the Canadian Community Health Survey (CCHS) 2017-2018 prepared by Statistics Canada. This secondary data analysis includes descriptive, bivariate statistics such as chi-squared and t-tests, as well as multivariate logistic regression to identify influenza vaccine rates and explore associations between flu vaccination and specific factors among adults with mental illness in Canada. To conduct data analysis, the IBM Statistical Package for Social Sciences version 23.0 was utilized

CHAPTER TWO: LITERATURE REVIEW

A comprehensive review of existing literature was undertaken to inform this study on flu vaccine uptake among people with mental illness. Conducting a literature review was necessary to expand understanding and achieve thorough familiarity, provide context, and establish the study's contribution (Polit & Beck, 2020). These insights were facilitated through a concentrated review on identifying common factors associated with flu vaccine uptake, the barriers and promoters, and the flu vaccination rates among people with mental illness. Along the way, theoretical arguments, key developments, and pertinent gaps were discovered. Ultimately, this review served as a foundation for conducting this study, a study that will hopefully lead to the development of practices and interventions that promote the uptake of flu vaccines and improve the health outcomes of people with mental illness.

The following chapter begins by describing the process of conducting the literature review, including the search strategy, screening, and final selection of relevant articles. Then, a theoretical framework for this study is introduced and discussed. Finally, the chapter concludes with an extensive review of the literature, showcasing current knowledge, synthesizing key findings, and developing new insights.

Search Strategy

Initially, a preliminary review was performed in relation to the topic of interest using Google Scholar and Cumulative Index to Nursing and Allied Health Literature (CINAHL) database to gain a broader perspective on the topic and the type of data available. Articles were scoped using a combination of terms such as 'mental illness,' 'influenza vaccine rates,' and 'influenza vaccine uptake.' As well, an attempt was made to search for specific determinants related to flu vaccine rates among people with mental illness. As such, a sense of direction was gained in terms of the search strategy, including the type of keywords and subject headings that may be necessary to access appropriate and applicable articles in future searches. Based on the preliminary review, two major concepts were identified, consisting of the population such as those with mental illness and the topic of interest such as influenza vaccine uptake. In addition, assistance was provided by Trinity Western University's academic librarian and my supervisor to further aid in the search process (See Appendix A for final keywords and headings searched).

Three key electronic databases were utilized for conducting the literature review, beginning with CINAHL complete, Medline, and APA PsycInfo (Polit & Beck, 2020). Within CINAHL, subject headings were the primary terms selected to achieve higher precision as using keywords, in this case, resulted in a higher yet overly broad recall. The first concept included subject headings such as MH "Mental Disorders" and MH "Mental Disorders, Chronic." Similarly, the second concept encompassed a range of pertinent subject headings such as MH "influenza vaccine" and MH "influenza seasonal." Within each major concept, Boolean operator OR was used between each subject heading to expand the search and account for all possible related terms (Polit & Beck, 2020). Next, using the Boolean AND between each major concept narrowed down the searches further (Polit & Beck, 2020). The selected subject headings overall increased the consistency and retrieval of relevant results. Additional subject headings were later entered to broaden the search such as MH "preventive health care," MH "Health care, integrated" and MH "comorbidity"; however, the last two subject headings were eventually excluded due to yielding too many results.

Medline was the second database to be utilized, an international and comprehensive health-related database (Polit & Beck, 2020). Here, the search strategy required slight modification. Evidently, combining subject headings with relevant keywords produced more efficient and effective results. Keywords selected included “mental illness," “seasonal flu vaccine,” “flu clinic” and “flu vaccine status.” British terms for flu and immunization were also incorporated. The keywords were often truncated with an asterisk (*) to improve recall. Little differences existed in the subject headings between Medline and CINAHL databases. The overall strategy yielded more relevant and applicable results.

The third and final database utilized was APA PsycInfo. Using this database would potentially provide a wider range of articles specifically related to mental illness, more so than other databases. Here, numerous broad and narrow controlled vocabulary terms from the thesaurus index were found and selected, including DE “mental disorders” and DE “chronic mental illness.” For the second concept, a combination of thesaurus terms and keywords were combined, as seen in Medline’s search strategy. Overall, this sufficiently widened the search and produced suitable articles.

In the end, the final search strategy yielded a satisfactory number of appropriate articles. Once applying delimiters such as English and peer-reviewed journal articles in each database, the articles were specified and narrowed down further. A total of 812 articles were exported into EndNote to organize the articles, and to facilitate the screening and selection process. Inclusion and exclusion criteria were developed to guide the screening and selection of relevant articles, to provide clarity and prevent vagueness or uncertainty (Polit & Beck, 2020). Initially, articles were excluded based on screening their titles and abstracts only, resulting in the exclusion of 549 articles. Eventually, full text reads were implemented to further identify relevant articles. In the end, 17 articles were included in the final selection, including those found using other search strategies (see Appendix B for the PRISMA flow diagram and Appendix C for the inclusion/exclusion criteria).

Other search strategies were employed to provide supplementary data, useful and necessary strategies such as citation searching and browsing search engines such as Google Scholar. In addition, a decision was made to find and incorporate several recent systematic reviews using other search strategies. Systematic reviews are known to generate highly robust and transparent empirical data (Polit & Beck, 2020). While the systematic reviews did not specifically examine the topic among those with mental illness, it was deemed appropriate as people with mental illness are part of the general adult population. The systematic reviews facilitated greater understanding and provided an overview of relevant primary evidence for a research topic that is highly understudied (Polit & Beck, 2020).

In terms of articles included (see Appendix D for the literature review matrix), the majority were conducted in the United States (US) (13), one was conducted in the United Kingdom (UK), and one in Canada. Two systematic reviews were cross national, carried out in countries such as the USA, Australia, China, Japan, France, Spain, and the Netherlands. The publication years ranged from 2001 to 2021 to obtain a more contemporary understanding of the topic. In terms of study designs, four were cross-sectional, and four were experimental/ interventional studies. The remaining articles were secondary data analysis (1), systematic reviews (2), observational cohort (1), surveillance (1), retrospective (2), comparative analysis (1), and mixed method (1) studies. The systematic reviews primarily included quantitative observational studies. Seven of the articles focused on exploring factors that could predict the use of preventive care services including the flu vaccine. Six articles sought to determine the impact of specific programs on primary care outcomes and quality of preventive care including the flu vaccine for people with mental illness. Four articles focused on exploring whether disparities in preventive care, including the flu vaccine, existed for people with mental illness.

The primary intention of this search was to seek articles that examined factors associated with flu vaccine among adults with mental illness, to inform the selection of the independent variables in this study. The minimal age of participants in most studies (13) was 18 to 19, mainly an adult population with an average age range of 18 to 64; however, several studies (4) solely focused on the older population such as those ages 50 and above. Most of the participants were recruited from outpatient, primary care settings and mental health clinics, excluding one article which conducted its study in a forensic hospital. Lastly, most of the studies included participants with primary psychiatric illnesses such as schizophrenia, bipolar disorders, major depression, and anxiety disorders. One retrospective study examined mentally ill individuals who are also homeless, and two systematic reviews were conducted among individuals in the general population, whilst one of the reviews additionally reported on high-risk groups such as healthcare workers, elderly, those with chronic conditions, pregnant women, and children.

Theoretical Framework

Within the reviewed literature, inclusion of relevant theoretical models or frameworks was often missing. An exception was found in a systematic review by Schmid et al. (2017) and a mixed methods study by Borthwick et al. (2021). These studies utilized common social cognition models such as the Health Belief Model (HBM) and Theory of Planned Behaviour (TPB) to explore micro level determinants of flu vaccine intent, behavior, and vaccine hesitancy (Borthwick et al., 2021; Schmid et al., 2017). The systematic review was conducted among the general adult population while the mixed methods study was conducted among psychiatric patients in a forensic hospital (Borthwick et al., 2021; Schmid et al., 2017). Borthwick et al. (2021) applied the HBM constructs to measure perceived susceptibility and severity of the flu, cues to action, as well as benefits and costs of vaccination (Borthwick et al., 2021). The TPB constructs provided insight into attitudes towards vaccination, perceived subjective norm and behavioural control (Borthwick et al., 2021; Schmid et al., 2017). Overall, the models reliably offer psychological insight to understand and predict health behaviours including vaccination (Borthwick et al., 2021; Schmid et al., 2017).

Nevertheless, there was a desire to search for other potential theories and models suitable for exploring flu vaccine uptake among the mental health population, one that appropriately recognized the holistic aspects and considered the role of health professionals in the promotion of health behaviours. This search eventually led to the discovery of the Health Promotion Model (HPM). This established mid-range nursing model was selected to offer an overarching structure, guide the literature review, and shape this study. Overall, the HPM specifically targets the individual, including their perceptions and choices, as well as interactions with interpersonal and physical environments that shape health promoting behaviours (Khoshnood et al., 2018; Pender, 2011). Examining and gaining understanding of these individual characteristics and perceptions is especially crucial for healthcare professionals including nurses who can then utilize and incorporate this comprehensive knowledge into their assessments to develop personalized and targeted health interventions that will positively influence the adoption of healthy lifestyles or behaviours, which will ultimately result in better health, functionality and quality of life (Khoshnood et al., 2018, Pender, 2011). The following section will provide background information about the model, including its conception, purpose, constructs, and relevance to this study.

The Health Promotion Model

The HPM is a well-known nursing model developed by Pender, a nurse in 1982 and later revised in 1996 to assist healthcare professionals particularly nurses in identifying and understanding major determinants that influence and promote health behaviours (Pender, 2011; Syx, 2008). The model incorporates several theories such as the social cognitive theory and the expectancy value theory to help understand and explain health behavior (Pender, 2011). The social cognitive theory indicates that "thoughts, behaviours and environment interact," and to achieve a change in behaviour, one must first change how the individual thinks (Pender, 2011, p. 2). The expectancy value theory emphasizes that motivation to adopt a behaviour is determined by expectancy and values (Pender, 2011), and by whether the achieved goals "are perceived as possible" and would result in beneficial outcomes (Pender, 2011, p. 2).

Pender's HPM showcases a multitude of interrelated factors that influence an individual's commitment and engagement in the health promoting behaviours (Pender, 2011). The theoretical propositions of the model indicate that prior health related behaviours and personal characteristics including biological factors such as gender, age, and BMI; psychological factors such as self-esteem, one's definition of health and perceived health status; and sociocultural factors such as income, education and race all influence one's behaviour-specific perceptions and affect, and the behavioural change itself (Pender, 2011; Syx, 2008). The model's modifiable behaviour specific factors include perceived barriers and benefits to engaging in health promoting behaviours, perceived self-efficacy, and activity related affect (Pender, 2011).

Perceived benefits are the perceived positive consequences of engaging in a health behaviour, whereas perceived barriers are the obstacles, costs, or blocks that prevent a health behaviour from occurring (Pender, 2011). According to the model, the commitment to engage in health behaviours depends on the anticipated valued benefits of the behaviour, while the commitment to action is heavily constrained by the perceived barriers (Pender, 2011). However, a higher self-efficacy or perceived confidence to perform well in a given behaviour significantly reduces the perceived barriers, leading to a greater likelihood of commitment and enactment of the health promoting behavior (Pender, 2011). Furthermore, positive emotion or affect associated with the behaviour increases the perceived self-efficacy, and thereby, the commitment and behavioural change (Pender, 2011).

Additionally, the model includes perceived situational influences in relation to an individual's external environment, as well as one's interpersonal influences such as peers, family, and healthcare professionals in relation to social support, norms and expectations associated with the health behaviour (Pender, 2011). The situational and interpersonal influences are viewed as vital factors that either facilitate or inhibit the commitment to carry out the behaviour and the behavioural endpoint (Galloway, 2003; Pender, 2011). Lastly, in the final stages of the model, prior to achieving the desired behavioural outcome, one must consider any immediate competing demands and preferences that result in alternative actions and interfere with the intended planned behaviour (Pender, 2011). Altogether, the influences and perceptions included in the HPM motivate and impact one's level of commitment, adoption, and maintenance of the health promoting behaviours (Pender, 2011; Syx, 2008). With this knowledge, the model encourages nurses to work collaboratively with clients, families, and communities, to assess, educate, and motivate in adopting health promoting behaviours and achieving healthy lifestyles that improve the overall well-being, quality of life and self-actualization of individuals (Pender & Pender, 1980; Pender, 2011).

In 1980, a survey study conducted by Pender contributed significantly to the development of the HPM (Pender & Pender, 1980). The cross-sectional study explored behavioural and psychosocial factors that predict consumer intent to utilize health promotion and prevention services offered by nurse practitioners, among 388 adults residing in the United States (Pender &

Pender, 1980). The main independent variables selected in the study were age, education, number of household members, attentiveness to health issues, "major life change score, interest in utilizing health promotion and prevention services, number of medical doctor visits in the past 12 months, number of dentist visits in the past 24 months, use of existing prevention and early detection services, and the use of existing health education and health services" (Pender & Pender, 1980, p. 799). While only education, interest in utilizing prevention and promotion services, and life change score were significant predictors, Pender discussed the importance of testing the nonsignificant predictors in future studies to expand understanding and develop innovative healthcare delivery (Pender & Pender, 1980). In this study, Pender reiterated that focusing on health promotion and prevention will potentially yield lasting health and healthcare benefits including increased longevity, improved quality of life, and reduced healthcare costs (Pender & Pender, 1980). Pender incorporated fundamental concepts of person, environment, health, nursing, and illness that notably set the tone for examining health promotion and prevention behaviours and overall shaped the HPM (Pender & Pender, 1980).

Since the development of the HPM, numerous studies have tested and utilized the model as a theoretical framework. The model has guided various research studies in examining health behaviours such as human papillomavirus (HPV) knowledge and vaccination rates, dietary and self care behaviours, coronary heart disease risk perception, medication adherence, hearing protection, and so forth (Ammouri et al., 2018; Goudarzi et al., 2020; McCutcheon et al., 2017; Shahroodi et al., 2020; Shin et al., 2008). For instance, a survey study by Shin et al. (2008) applied the HPM to examine factors that may predict health promoting behaviours such as physical activity, hygiene, pharmaceutical use, dietary control, and stress management among 389 low income, elderly Korean women. The study found that prior health behaviours and biological factors such as activity limitation had significant indirect effects on health promotion behaviours (Shin et al., 2008). In addition, sociocultural factors such as monthly income; psychological factors such as interest in health, perceived health status and self-esteem; behavioural specific cognitions and affect factors such as perceived self-efficacy, perceived benefits and barriers; as well as environmental factors such as situational influences and social support had direct significant effects on health promoting behaviours, with psychological factors as the most influential predictors (Shin et al., 2008). The above factors significantly explained 73% of the variance in the model (Shin et al., 2008).

Recently, a cross-sectional survey study by Shahroodi et al. (2020) explored healthy dietary behaviours (frequency of food consumption) among 365 Iranian women by applying the model in its nutrition questionnaire. Firstly, the study revealed that higher BMI was negatively associated with healthy behaviours, while higher family income and education were positively associated with healthy dietary behaviours (Shahroodi et al., 2020). Secondly, the study reported that prior behaviours, perceived self-efficacy, and commitment to action had either direct or indirect significant positive effects on the outcome, with commitment as the strongest predictor, suggesting that those with higher self-efficacy had greater intention and commitment levels even in the face of barriers (Shahroodi et al., 2020). Additionally, interpersonal influences of the women resulted in negative significant direct and indirect effects on healthy dietary behaviours, potentially due to reduced cooperation of role models and support systems (Shahroodi et al., 2020).

Finally, a retrospective descriptive-correlational study examined the influence of Pender’s HPM on COVID-19 self-care behaviours among 200 adults in Iran (Pouresmali et al., 2020). The study revealed that perceived self-efficacy, positive affects, interpersonal influences, and perceived benefits significantly predicted the behaviours (Pouresmali et al., 2020). However, perceived benefits and barriers, perceived social support and self-efficacy also indirectly predicted the self-care behaviours through the mediator factor of commitment to action (Pouresmali et al., 2020). Overall, the studies discussed the effectiveness of the HPM in predicting health promoting behaviours and improving healthy lifestyles, suggesting the importance of including the model in future studies, as well as employing it for education interventions and programs to promote individual and community health (Pouresmali et al., 2020; Shahroodi et al, 2020; Shin et al., 2008).

Therefore, Pender's HPM has guided and provided a theoretical framework for the exploration of determinants that may influence influenza vaccine uptake, an engagement in health promoting behaviour among Canadian adults with mental illness (Macintosh et al., 2017). Vaccines are valuable and efficient tools for preventing and protecting against disease, disability, and mortality, for "promoting individual and public health," and for economic growth (Andre et al., 2008, para. 4). Vaccination increases wellness, enhances quality of life, and reduces healthcare utilization, the desired outcomes of health promoting behaviours (Andre et al., 2008; Macintosh et al., 2017).

The HPM is suitable for examining flu vaccine uptake among the mental health population as it recognizes the complexities and mechanisms behind the biopsychosocial aspects of a person, the environmental interactions, and the influences of family, healthcare professionals and other interpersonal influences in adopting a health promoting behaviour such as vaccination (Bittencourt et al., 2018, Pender, 2011). Furthermore, the HPM advocates for individualized care, mutual collaboration and informed decision making between nurses and clients, essential components of mental health (Bittencourt et al., 2018, Pender, 2011). The model reflects holistic, patient centered care and comprehensive concepts, one that effectively combines nursing perspectives with behavioural sciences to recognize unique factors that may influence "the health promotion behaviours of the patients" with mental illness (Bittencourt et al., 2018; Pender, 2011; Syx, 2008, p. 53). In applying this model, policy makers and healthcare professionals including nurses can identify influential factors of influenza vaccination and propose effective tools and interventions that advance knowledge of influenza and influenza vaccine, and encourage vaccination uptake among the mental health population (Bittencourt et al., 2018, Pender, 2011).

While the HPM possesses a multitude of benefits, there are notable limitations that must be acknowledged such as the model does not consider the impact of macro level, structural factors on health promoting behaviour, significant influences that would be of particular importance for the mental health population. Thus, while this study was driven by the theory of Pender, it nonetheless recognizes the need to shift away from an individualistic perspective, and to always consider the fundamental underlying societal causes that influence health and health behaviours (Rieger & Heaman, 2016).

Mental Illness and Influenza Vaccine Prevalence

People with mental illness are a vulnerable population experiencing higher prevalence of mortality and medical comorbidity compared to the general population (Lord et al., 2010; Lorenz et al., 2013; Miles et al., 2020). In addition to carrying higher rates of obesity, hypertension, smoking, and physical inactivity, people with mental illness potentially experience deficits in access and quality of preventive care including the flu vaccine (Lord et al., 2010; Lorenz et al., 2013; Miles et al., 2020). Although research is currently mixed, several studies have revealed potential discrepancies in flu vaccine uptake among people with mental illness compared to those without mental illness, potential disparities that must be further explored. The following section will present studies identified in the literature that examined flu vaccination rates among people with mental illness, including the association between mental illness and flu vaccine uptake. Along the way, gaps within research will be revealed, gaps that must be addressed to gain a better understanding and facilitate the uptake of flu vaccine among this vulnerable population.

To begin, a systematic comparative analysis study by Lord et al. (2010) found noteworthy discrepancies in flu vaccine rates between people over the age of 50 with mental health conditions such as depression and distress in comparison to those without mental illness in several studies. Lord et al. (2010) overall concluded that inferior preventive care in vaccinations was most evident for people with mental illness, among other essential screening services compared to those without mental illness.

A secondary data analysis study by Druss et al. (2008) explored the relationship between major depression and receipt of primary medical care including flu vaccine compared to those without major depression living in the US. The study found adults 50 years of age and older with major depression were more likely to not have a flu vaccine compared to those without major depression (Druss et al., 2008). Additionally, individuals with major depression not receiving any treatment were more likely to not have a flu shot compared to those without major depression (Druss et al., 2008). However, findings for flu vaccine receipt were insignificant among individuals being treated for major depression in primary and mental health settings compared to those without major depression (Druss et al., 2008).

Next, a cross-sectional study conducted in the US by Lorenz et al. (2013) explored factors associated with flu vaccine status among adults with mental illness such as schizophrenia and depression. Here, the flu vaccination rates for patients with varying mental illnesses were

28.4% in the 2010-2011 flu season and 24.2% in 2011-2012 flu season, considerably lower than the national rate of 40.9% in 2010-2011 (Lorenz et al., 2013). Although the study revealed a potential downward trend in flu vaccine status for people with mental illness, the findings are purely descriptive and it cannot be determined whether having a mental illness diagnosis played a factor in this potential discrepancy (Lorenz et al., 2013). Similarly, a Canadian retrospective chart review study identifying flu vaccination rates among 75 homeless adults with mental illness found only 6.7% of this population received flu vaccines compared to the national coverage rate of 28.9% (S. Young et al., 2015).

Conversely, in the literature, similar or significantly higher uptake of flu vaccines for people with mental illness compared to those without were found. Firstly, a systematic comparative analysis by Lord et al. (2010) showcased several studies with insignificant or neutral associations, particularly in European countries, although an upward trend toward higher flu vaccine rates among people with depressive disorder was noted in one of the studies. Secondly, a retrospective cohort study by Yarborough et al. (2018) explored whether potential disparities exist in preventive care for people with mental illness to explain their poor health outcomes. The study compared gap rates or incompletion rates for 12 preventive care services including flu vaccine among 803,276 outpatients (Yarborough et al., 2018). The study consisted of two groups, a reference group not diagnosed with severe mental illness and a group diagnosed with serious mental illness such as bipolar or affective psychosis, schizophrenia, anxiety, and unipolar depression, attending two separate health clinics in the US, KPNW and CHC (Yarborough et al., 2018). According to the findings, within the KPNW health setting, patients with a diagnosis of bipolar/affective psychosis and major depressive disorder had considerably lower care gap rates compared to the reference group (Yarborough et al., 2018). However, for other mental illnesses such as schizophrenia and anxiety disorders the results were insignificant (Yarborough et al., 2018). Within the CHC health setting, individuals with schizophrenia, bipolar/affective psychosis, anxiety disorders, and major depressive disorder were all associated with lower care gap rates compared to the reference group (Yarborough et al., 2018). The findings suggest those with serious mental illness may have a similar or even higher use of preventive care services including the flu vaccine compared to individuals without serious mental illness (Yarborough et al., 2018).

Lastly, a US cross-sectional study by T. Lawrence et al. (2020) investigated the association between mental illness and flu vaccine status among older adults in primary care settings. The study found those diagnosed with either depression, anxiety disorders, or any mental illness were more likely to be in the vaccinated group compared to those without mental illness (T. Lawrence et al., 2020). Upon further analysis, depression and anxiety disorders were also important predictors of flu vaccine uptake in the unadjusted and adjusted regression models (T. Lawrence et al., 2020), suggesting that receipt of the flu vaccine is higher for those with depression and/or anxiety disorders compared to those without depression and anxiety disorders (T. Lawrence et al., 2020).

Overall, research regarding flu vaccine rates among those with mental illness is limited and highly mixed, varying in statistical differences, associations and direction, as well as population and setting. Further, the lack of knowledge and generalizability to the Canadian mental health population has revealed an important research gap that must be addressed. Thus, a need exists to identify the rates of flu vaccine within the Canadian context to reveal novel data and empirically inform the mental health population, the healthcare system, and the government.

Common Factors Associated with Influenza Vaccine Uptake

In the literature reviewed, numerous factors were found to be associated with an individual's flu vaccine uptake (see Table 2.1 for a general overview and Appendix E for a detailed summary of the literature review variables and key findings), the majority of these factors were among the mental health population; however, several systematic reviews among the general adult population were incorporated to broaden understanding and provide supporting evidence for a topic that is highly understudied among those with mental illness. The factors were categorized into the following domains: individual characteristics and experiences such as sociodemographic, medical conditions and comorbidities, lifestyle behaviours, medications, perceived health status, past experiences, and knowledge; behaviour specific cognitions and affect such as perceived benefits and barriers, perceived self-efficacy and affect; interpersonal influences such as provider and family recommendations; and situational influences such as health program type, healthcare access and utilization. Other factors for consideration such as influenza risk perception were also included. In addition, gaps identified within the literature will be highlighted, gaps that provided a basis for further exploration. Ultimately, investigating the determinants of flu vaccine uptake among this population offers important, unique data to inform and prepare healthcare professionals and policy makers in their efforts to reduce morbidity and mortality associated with influenza, promote flu vaccination rates for people with mental illness, and improve health outcomes (Lorenz et al., 2013; Miles et al., 2020).

Table 2.1

Summary of Factors Associated with Flu Vaccination According to Literature (Guided by Pender's HPM)

Group	Factors	Association with Flu Vaccine Uptake/Status or with Overall Preventive Service Use	Study
A. Individual Characteristics and Experiences	Age	**Mixed association**: Higher age either associated with ↑ or ↓ uptake.	Schmid et al., 2017; Yeung et al., 2016.
		Age is not associated.	Borthwick et al., 2021; Lawrence et al., 2020; Lorenz et al., 2013; Schmid et al., 2017; Xiong et al., 2015.
	Gender/Sex (as identified by the authors)	**Mixed association:** Female associated with ↑ preventive service use.	Xiong et al., 2010; Xiong et al., 2015.
		Gender not associated with uptake.	Lawrence et al., 2020; Lorenz et al., 2013; Schmid et al., 2017; Yeung et al., 2016.
	Race/ethnicity	**Mixed association:** Caucasian either ↑ or ↓ uptake flu vaccine.	Schmid et al., 2017.
		Race/ethnicity is not associated.	Yeung et al., 2016; Lawrence et al., 2020; Lorenz et al., 2013; Xiong et al., 2010.
		Non-Caucasian: Latino ↑, Asian ↓, African American not associated (with preventive service use).	Xiong et al., 2015.

Group	Factors	Association with Flu Vaccine Uptake/Status or with Overall Preventive Service Use	Study
	Education	**Mixed association:**	
		Education inconsistently ↑ uptake.	Yeung et al., 2016.
		Higher education ↓ uptake.	Lorenz et al., 2013.
		Education is not associated.	Xiong et al., 2010; Xiong et al., 2015.
	Income	**Mixed association**:	
		Lowest SES ↓ uptake; Upper middle SES ↑ uptake; Highest SES not associated.	Lawrence et al., 2020.
		Income inconsistently associated with uptake.	Yeung et al., 2016.
	Health Insurance	**Mixed association:**	
		↑ uptake/overall preventive services.	Lorenz et al., 2013; Xiong et al., 2010.
		No association.	Xiong et al., 2015.
	Marital Status	**Mixed association:**	
		Married ↑ uptake.	Yeung et al., 2016.
		Unmarried either ↑ or ↓ uptake.	Schmid et al., 2017.
		No associations.	Lawrence et al., 2020; Xiong et al., 2015.
	Living Arrangement	**Mixed association:**	
		Living with children or elders inconsistently ↑ uptake. Living alone ↓ uptake. Household size is not associated with uptake.	Schmid et al., 2017; Yeung et al., 2016.
		Living arrangement is not associated.	Lorenz et al., 2013.

Group	Factors	Association with Flu Vaccine Uptake/Status or with Overall Preventive Service Use	Study
	Medical Conditions and Comorbidities	**Mixed association:** Presence of chronic disease ↑ uptake. Absence of physical disease ↓ uptake/ a barrier. Having illness an important factor in the need to vaccinate. Comorbidities ↓ uptake; Influenza, pneumonia + respiratory d/o are not associated with uptake.	Schmidt et al., 2017; Yeung et al., 2016. Borthwick et al., 2021. Lawrence et al., 2020.
	Mental Illness (i.e., depression, anxiety, schizophrenia, bipolar) - the population of interest in this study.	**Mixed association:** Either ↑, ↓ or not associated with uptake/preventive service use.	Druss et al., 2008; Lawrence et al., 2020; Lord et al., 2010; Yarborough et al., 2018.
	Unhealthy Lifestyle Behaviours (i.e., smoking, alcohol and drug abuse or consumption).	**Mixed association:** Either ↑, ↓ or not associated with uptake. No association.	Schmidt et al. 2017; Yeung et al. 2016. Lawrence et al., 2020.
	Healthy Lifestyle Behaviours (i.e., quitting smoking, frequent exercise, eating well balanced diet, attending regular health checks, and following advice from healthcare professionals).	**Mixed association:** Either ↑ or not associated with uptake. No association.	Schmidt et al. 2017; Yeung et al. 2016. Borthwick et al., 2021.
	Medications	**Mixed association:** Antidepressants ↑ uptake; Antianxiety meds not associated with uptake/status.	Lawrence et al., 2020.

Group	Factors	Association with Flu Vaccine Uptake/Status or with Overall Preventive Service Use	Study
		Antipsychotics either ↓ or not associated with preventive service use; Number of medications is not associated with preventive service use.	Xiong et al., 2015.
	Perceived Health Status	**Mixed association:** "Good" health status ↑ or ↓ uptake. General health status is not associated. "Feeling healthy ↓ uptake/motivation; "Feeling unwell" ↑ willingness to vaccinate.	 Schmidt et al. 2017; Yeung et al. 2016. Borthwick et al., 2021.
	Past Vaccine Status and Experiences	**Strong association:** Past flu vaccines ↑ future vaccines; No previous flu vaccine ↓ uptake. Previous flu status ↑ uptake/intent. Flu vaccine in previous year ↑ flu vaccine intent/behavior; + experience ↑ uptake, - experience ↓ uptake; No experience-relied on informal sources.	 Schmid et al., 2017; Yeung et al., 2016. Lorenz et al., 2013; Lawrence et al., 2020. Borthwick et al., 2021.
	Influenza and Influenza Vaccine Knowledge	**Mixed association:** Better flu/flu vaccine/preventive measures knowledge ↑ uptake. Lack of knowledge a barrier. Lack of flu vaccine knowledge/uncertainty resulted in misbeliefs; Not associated.	 Yeung et al., 2016. Schmid et al., 2017. Borthwick et al., 2021.

Group	Factors	Association with Flu Vaccine Uptake/Status or with Overall Preventive Service Use	Study
		Lack of flu vaccine knowledge/awareness a major barrier to all vaccines.	Miles et al., 2020.
B. Behavior Specific Cognitions and Affect	Perceived Benefits of Flu Vaccine	**Mixed association:** "Flu vaccine safe + effective" ↑ uptake	Yeung et al., 2016.
		"Flu vaccine safe, effective, prevents flu, good reason to get if chronic illness or vaccine is free" either ↑ uptake or not associated with uptake; Positive perceptions of the flu vaccine i.e., effective, supports immune system ↑ intent to vaccinate.	Borthwick et al., 2021.
		Perceived effectiveness of flu vaccine ↑ uptake.	Lorenz et al., 2013.
	Perceived Barriers to Flu Vaccine	**Mixed association:** Negative attitudes toward vaccination ↓ uptake.	Yeung et al., 2016.
		Negative attitudes toward vaccination is not associated with uptake; "Vaccine is inconvenient or interferes with daily activities" is not associated with uptake; Negative perceptions i.e., ineffective, causes the flu is not associated.	Borthwick et al., 2021.
		Perceptions that can get the flu from the vaccine ↓ uptake.	Lorenz et al., 2013.
		Personal cost, negative beliefs/attitudes towards vaccination major barriers to all vaccines.	Miles et al., 2020.
	Perceived Self-Efficacy	**Mixed association**: Low self-efficacy ↓ uptake.	Schmid et al., 2017.

Group	Factors	Association with Flu Vaccine Uptake/Status or with Overall Preventive Service Use	Study
		Self-efficacy is not associated with uptake.	Borthwick et al., 2021.
	Perceived Affect	**Mixed association:** Fear of vaccine adverse events ↓ uptake; Fear of injection is not associated.	Yeung et al., 2016.
		General fears about the flu vaccine barrier to all vaccines.	Miles et al., 2020.
		Consequences and general fears of flu vaccine impacted intent and behaviour; Fear of needles and pain not associated.	Borthwick et al., 2021.
C. Interpersonal Influences	Recommendations, Social Supports, and Role Modelling	**Strong association:** Recommendation/advice to vaccinate from friends, friends and heath care providers strongly associated with ↑ uptake; Relatives and friends' role modelling vaccine behaviours ↑ uptake.	Schmid et al., 2017; Yeung et al., 2016.
		No direct recommendation from healthcare professional/relatives to vaccinate ↓ uptake.	Yeung et al., 2016.
		Not receiving recommendation is a barrier to all vaccines.	Miles et al., 2020.
		Provider recommendations ↑ uptake.	Lorenz et al., 2013.
		Cues to action from doctors/nurses ↑ flu vaccine intent and behaviour.	Borthwick et al., 2021.
	Subjective Norm (i.e., social pressure/expectations).	**Mixed association:** Low social pressure from significant others ↓ uptake.	Yeung et al., 2016.

Group	Factors	Association with Flu Vaccine Uptake/Status or with Overall Preventive Service Use	Study
		Subjective norm (i.e., social pressure/expectations) not associated.	Borthwick et al., 2021.
D. Situational Influences	Healthcare Program/Service (i.e., integrated/coordinated/comprehensive/population based).	**Mixed-Strong association:** Majority ↑ flu rates and preventive services, ↑ intent to vaccinate, ↑ beliefs about vaccine safety and effectiveness. No differences in flu vaccine between usual care and pt. centered care.	Bowdoin et al., 2016; Browne et al., 2019; Cabassa et al., 2018; Druss et al., 2001; Druss et al., 2010; Miles et al., 2020; Xiong et al., 2015. Bowdoin et al., 2016.
	Healthcare Interaction/Utilization	**Strong association:** Having a primary care provider ↑ preventive service use. No regular source of care (i.e., primary care physician) ↓ uptake.	Xiong et al., 2015. Schmid et al., 2017.
		Strong association: Recent medical doctor visits inconsistently associated with ↑ uptake; Fewer medical visits or hospitalization ↓ uptake. Healthcare utilization (i.e., # of visits to primary care) associated with ↑ uptake.	Schmid et al., 2017; Yeung et al., 2016. Lawrence et al., 2020.
	Healthcare Access	**Strong association:** Transportation issues ↓ uptake; Easy access ↑ uptake. Accessibility issues to vaccine clinic a barrier to uptake.	Schmidt et al., 2017; Yeung et al., 2016. Miles et al., 2020.

Group	Factors	Association with Flu Vaccine Uptake/Status or with Overall Preventive Service Use	Study
E. Other Factors for Consideration	Influenza Risk Perception	**Mixed association:** Low risk perception ↓ uptake; High risk perception either ↑ uptake.	Schmidt et al. 2017; Yeung et al., 2016.
		Risk perception is not association; Perceived beliefs (i.e., better to fight the virus off, feeling immune to the flu and confident in the immune system) negatively impacted decisions to vaccinate.	Borthwick et al., 2021.

Sociodemographic Characteristics

Various sociodemographic factors have been found to be associated with flu vaccine uptake (see Table 2.1 and Appendix E). A systematic review by Yeung et al. (2016) indicated that higher age is a predictor of greater influenza vaccine uptake, while another systematic review by Schmid et al. (2017) indicated that higher age is both a promoter and a barrier to vaccinating against the flu. These associations were examined among the general adult population. Findings from the systematic reviews predominantly suggesting that compared to younger adults, older adults potentially receive greater prompting and support to regularly vaccinate (Schmid et al., 2017; Yeung et al., 2016). The results could reflect a common misconception that only those recognized as high risk for influenza complications such as seniors will benefit from vaccination (Farmanara et al., 2018; Roy et al., 2018). Thus, younger adults may need additional advice and encouragement to vaccinate (Farmanara et al., 2018; Roy et al., 2018). Conversely, according to numerous cross-sectional studies exploring this association among the mental health population including psychiatric patients and elderly in primary care, age was not a predictor of flu vaccine status, intent, and behaviour (Borthwick et al., 2021; T. Lawrence et al., 2020; Lorenz et al., 2013; Xiong et al., 2015). The association between age and flu vaccine uptake among the Canadian mental health population is unknown; however, in general, a higher proportion of older adults tend to be vaccinated against the flu compared to younger adults with and without risk factors in Canada (Government of Canada, 2020b; Roy et al., 2018). If similar trends are found among the mental health population, then it warrants prompt attention from healthcare professionals and policy makers to target these individuals, address the misbeliefs, and facilitate flu vaccine uptake across all age groups (Farmanara et al., 2018).

Gender has been shown to be a potentially important yet conflicting factor (see Table 2.1 and Appendix E). A cross-sectional study by Xiong et al. (2010) explored specific factors to predict the use of preventive services including flu vaccine, hypertension, diabetes and cancer testing among 234 adult outpatients attending mental health clinics in the US. The study found that females with mental illness such as major depression, bipolar and psychotic disorders had higher flu vaccine rates and significantly higher overall preventive service utilization compared to men with mental illness (Xiong et al., 2010). Similarly, another cross-sectional study by Xiong et al. (2015) exploring clinical and demographic factors to predict non-cancer preventive services such as flu vaccine, hepatitis, and HIV testing, found gender was a strong predictor of overall non-cancer preventive services. This Indicates that females with mental illness such as bipolar disorder, depression, and schizophrenia were more likely to utilize the services than men with mental illness attending mental health services in the US (Xiong et al., 2015). Gender differences could reflect higher risk-taking behaviours and lower health service utilization among men compared to women with mental illness (Roy et al., 2018; Xiong et al., 2010; Xiong et al., 2015). Nevertheless, other cross-sectional studies and systematic reviews examining the general adult and the mental health population did not support this association, claiming either insignificant or mixed results with flu vaccine uptake (T. Lawrence et al., 2020; Lorenz et al., 2013; Schmid et al., 2017; Yeung et al., 2016). With research suggesting that gender potentially plays a significant role in the uptake of preventive care services including flu vaccine for people with mental illness, exploring this association could inform health promotion and disease prevention programs to address potential gender differences and increase flu vaccine uptake (Farmanara et al., 2018).

Conflicting results have been reported on the association between race or ethnicity and flu vaccine status (see Table 2.1 and Appendix E). Among the general adult population, a systematic review by Schmid et al. (2017) revealed that being Caucasian is both a barrier and a promoter of flu vaccine intent and behaviour. Among the adult mental health population, a US cross-sectional study by Xiong et al. (2015) indicated that identifying as Hispanic or Latino was associated with higher use of non-cancer preventive services including flu vaccine compared to Caucasian and identifying as Asian signified lower use of services than Caucasian, while identifying as African American was found to be an insignificant predictor. Conversely, other studies among the mental health and the general adult population report that race or ethnicity was not associated with flu vaccine status (T. Lawrence et al., 2020; Lorenz et al., 2013; Xiong et al., 2010; Yeung et al., 2016). Overall, the relationship between race/ethnicity and flu vaccine uptake is ambiguous. Nevertheless, undertaking this exploration among Canadian adults may provide unique insight into whether certain ethnic or minority groups with mental illness experience differences in flu vaccine uptake, differences that could reflect issues with discrimination, inequities in health care and beliefs about vaccines (Cabassa et al., 2018).

Education is inconsistently associated with flu vaccine uptake (see Table 2.1 and Appendix E). For instance, a systematic review by Yeung et al. (2016) found education is inconsistently associated with higher flu vaccine uptake among the general adult population. A cross-sectional study among 299 adult mental health outpatients living in the US revealed those with higher than high school education were more likely to be in the unvaccinated group compared to those with high school and less than high school education (Lorenz et al., 2013). According to the study's logistic regression analysis, higher than high school education was also a predictor of reduced flu vaccine status compared to lower education levels, while high school education was reported as an insignificant factor in flu vaccine status (Lorenz et al., 2013).

Contrarily, a cross-sectional study in the US by Xiong et al. (2010) found education was not a predictor of overall preventive service utilization including flu vaccine among 234 adult mental health outpatients. Similarly, another cross-sectional study by Xiong et al. (2015) found education was not associated with total non-cancer services including flu vaccine among the mental health population in a univariate analysis. However, it is difficult to determine its association as clinic type and other factors were not adjusted for in the univariate analysis. To date, there is no research to confirm and establish a consistent finding. Exploring the potential impact of formal education on flu vaccine uptake among the Canadian mental health population may be necessary as this population experiences reduced educational opportunities due to systemic barriers such as stigma and discrimination that could in turn interfere with flu vaccine uptake (Lawrence & Kisely, 2010; Mazereel et al., 2010; WHO, n.d.c). Exploring this association could increase understanding of its influence and potentially demonstrate the importance of education in improving vaccinations, a factor that would have to be considered when vaccine programs and policies are implemented among those with mental illness (Farmanara et al., 2018).

Income is an important economic factor, and a key component of one's socioeconomic status (SES) that may also impact flu vaccination, although literature on this association is inconsistent (see Table 2.1 and Appendix E). A cross-sectional study by T. Lawrence et al. (2020) found that elderly primary care patients living in the US, including 6.7% with depression or anxiety, 2.8% with anxiety, and five percent with depression in the lowest SES were more likely to be in the unvaccinated group. Here, SES was based on a validated index comprised of indicators such as annual income, household income, median home values, and receiving assistance (T. Lawrence et al., 2020). After adjusting for mental illness and covariates such as healthcare utilization, prior flu vaccine and medications, upper middle SES became a substantial predictor of higher flu vaccine status compared to the lowest SES among those with and without existing comorbidities, and in the overall analysis (T. Lawrence et al., 2020). In addition, in the study, it was indicated that lower middle SES was a predictor of higher flu vaccine status for those without comorbidities compared to lowest SES, however, highest SES was not a determinant of flu vaccine status in all regression models (T. Lawrence et al., 2020). Overall, the results suggest that elderly populations in the lowest SES could face significant socioeconomic barriers to vaccination compared to those in higher SES and may need additional support to obtain flu vaccines (T. Lawrence et al., 2020): a significant finding for those with and without mental illness (T. Lawrence et al., 2020).

Contrary to the previous study, a systematic review among the general adult population found income was not a consistent predictor of flu vaccine uptake in many of its studies (Yeung et al., 2016). Although results are mixed, exploring the relationship between income and flu vaccine uptake among the mental health population is crucial as people with mental illness often face major socioeconomic and systematic barriers such as homelessness and poverty, as well as stigma and violations of human rights (D. Lawrence & Kisely, 2010; Mazereel et al., 2010; WHO, n.d.c). These barriers overall contribute to reduced employment opportunities, income, and access to healthcare services, and in turn potentially the uptake of flu vaccine (D. Lawrence & Kisely, 2010; Mazereel et al., 2010; WHO, n.d.c).

Health insurance appears to be a crucial factor impacting flu vaccine uptake within the mental health population (see Table 2.1 and Appendix E). For instance, a US cross-sectional study among adults attending mental health services found those with health insurance were more likely to utilize overall preventive care services including flu vaccine compared to those without health insurance (Xiong et al., 2010). Similarly, a cross-sectional study by Lorenz et al. (2013) found individuals attending an outpatient psychiatric clinic without health insurance were mostly in the unvaccinated group, while those with private health insurance were more likely to get vaccinated against the flu than self-payers (Lorenz et al., 2013). Health insurance, however, was found to be an insignificant predictor of non-cancer preventive services including flu vaccine among adult outpatients with mental illness in a cross-sectional study by Xiong et al. (2015). Notably, these studies were conducted in the US, a country without universal healthcare coverage (Lorenz et al., 2013; Xiong et al., 2010).

Canada’s universal healthcare enables people to access medically necessary services without requiring health insurance (Villeneuve, 2017). However, extended care services such as vision and dental care, prescription medications, long term care and certain mental health services are not fully covered by the government (Villeneuve, 2017). This potentially necessitates people to pay out of pocket, to purchase health insurance either privately or through the employer to receive additional coverage (Villeneuve, 2017). Furthermore, public funding for preventive services such as flu vaccine varies across Canadian provinces. Provinces such as Quebec and British Columbia do not offer universal vaccine coverage (Farmanara et al., 2018; Roy et al., 2018). Only those considered high risk such as adults with chronic medical conditions are offered free influenza vaccine (Farmanara et al., 2018). Thus, people with mental illness are excluded. Ultimately, not having extended health benefits or free vaccines could impact equal access to healthcare services and potentially discourage individuals with mental illness from engaging in preventive healthcare services such as flu vaccination (Farmanara et al., 2018; Roy et al., 2018; Xiong et al., 2010). If factors associated with health insurance are found to influence the uptake of flu vaccine within the Canadian context, then adults with mental illness may need additional support such as social assistance or case management services to appropriately access and obtain the necessary preventive services (Xiong et al., 2010).

Among the general adult population, marital status was found to be an influential predictor in two major systematic reviews (see Table 2.1 and Appendix E). In a review by Yeung et al. (2016) being married increased flu vaccine uptake, and similarly in a review by Schmid et al. (2017) being unmarried reduced flu vaccine uptake. However, this review also found an inverse relationship between being unmarried and flu vaccine uptake (Schmid et al., 2017). suggesting that being unmarried or single allows one to exert power over their own decisions and health (Schmid et al., 2017). Nonetheless, a study by T. Lawrence et al. (2020) did not find any association between marital status and flu vaccine status among its elderly population including those with depression and anxiety disorders. Similarly, a cross-sectional study among the mental health population by Xiong et al. (2015) did not find an association between being married and total non-cancer service utilization including flu vaccine in its univariate analysis. However, in this study, clinic type and other pertinent factors were not controlled for in the univariate analysis, making this association difficult to determine (Xiong et al., 2015).

In terms of living arrangement (see Table 2.1 and Appendix E), according to recent systematic reviews, living with children or elders is an inconsistent promoter of flu vaccine use among the general adult population, while household size was not found to be a predictor (Yeung et al., 2016). Additionally, living alone was reported to reduce flu vaccine uptake in the general adult population due to mediating effects of cues to action and access, potentially from having reduced preventive healthcare visits, assistance and supports from family (Schmid et al., 2017). Conversely, a cross-sectional study among the adult mental health population did not find a relationship between living arrangements and flu vaccine status (Lorenz et al., 2013). Overall, exploring the impact of marital status and living arrangement on flu vaccine may be important as people with mental illness can experience difficulties with relationships, and suffer from a higher prevalence of societal stigma and discrimination that could lead to isolation, loneliness, and social exclusion (Lawrence & Kisely, 2010; Mazereel et al., 2010; PHAC, 2019; WHO, n.d.c). Exploring this association could potentially highlight the importance of social network in facilitating the uptake of flu vaccine, a factor to potentially consider in the delivery of preventive care services and the design of health programs for people with mental illness (August & Sorkin, 2010).

Medical Conditions and Comorbidities

It was found in the literature that the presence of disease and medical comorbidities could impact flu vaccine uptake (see Table 2.1 and Appendix E). Studies exploring this association in the general adult population found the presence of chronic disease was associated with higher flu vaccine uptake, whereas the absence of pre-existing medical conditions acted as a barrier to receiving flu vaccines (Schmid et al., 2017; Yeung et al., 2016). In the UK, a mixed methods study among psychiatric patients in a forensic hospital found that having an illness such as asthma was an important factor for certain participants in their perceived vulnerability to the flu and therefore the need to vaccinate (Borthwick et al., 2021). A US cross-sectional study by T. Lawrence et al. (2020) revealed that among 4,102 elderly primary care patients, those with a higher comorbidity index score including heart failure, cancer, diabetes, liver disease and dementia were more likely to be in the vaccinated group compared to the unvaccinated group. The study also consisted of patients with a diagnosis of depression and anxiety (T. Lawrence et al., 2020). Interestingly, while a greater comorbidity index score was a promoter of flu vaccine status in the bivariate analysis, after adjusting for mental illness and covariates such as healthcare utilization and prior flu vaccine, the index score became associated with reduced receipt of flu vaccine in the final regression model (T. Lawrence et al., 2020).

Furthermore, in this study having physical comorbidities made the association between mental illness and flu vaccine status positive, before and after adjusting for covariates such as age, gender, SES, and healthcare utilization (T. Lawrence et al., 2020). However, the absence of physical comorbidities made the relationship between mental illness and flu vaccine status insignificant after adjusting for covariates (T. Lawrence et al., 2020) Additionally, having an illness such as influenza, pneumonia and respiratory disorder meant these individuals were more likely to be in the vaccinated group compared to the unvaccinated group (T. Lawrence et al., 2020). However, they were not important predictors of flu vaccine status in the final adjusted model (T. Lawrence et al., 2020).

Overall, the findings in many of these studies could reflect higher interaction with the medical system and a high-risk status that possibly contribute to higher vaccine uptake for those with medical conditions and comorbidities (Farmanara et al., 2018; T. Lawrence et al., 2020). Investigating this further could expand understanding of the relationship between physical conditions, mental illness, and health behaviours, as well as highlight whether people with mental illness and medical comorbidities in Canada are being effectively targeted by healthcare professionals and health programs to routinely vaccinate. (T. Lawrence et al., 2020; Miles et al., 2020). This is particularly important as people with mental illness are a vulnerable group with significantly higher prevalence of medical conditions and illnesses such as cardiovascular disease, respiratory illness, diabetes, and a weakened immune system (Lorenz et al., 2013; Miles et al., 2020; PHAC, 2019). Such conditions and illnesses also increase the risk of flu related complications and death (Lorenz et al., 2013; Miles et al., 2020).

Lifestyle Behaviours

Reports are mixed in relation to the association of unhealthy lifestyle behaviours such as smoking, increased alcohol consumption and low physical activity with flu vaccine uptake (see Table 2.1 and Appendix E). Among the general adult population, smoking and alcohol consumption were found to either negatively or positively impact flu vaccine uptake, while other studies reported trivial results according to several systematic reviews (Schmid et al., 2017; Yeung et al., 2016). The reviews also revealed mixed results pertaining to positive health behaviours such as quitting smoking and frequent exercise with flu vaccine uptake, finding either positive or no associations (Schmid et al., 2017; Yeung et al., 2016). However, behaviours such as smoking, drug, and alcohol abuse were not associated with flu vaccine status among the elderly population including those with mental illness in a cross-sectional study by Lawrence et al. (2020). Similarly, an insignificant association was found among psychiatric patients who discussed engaging in health motivating behaviours such as eating well balanced diets, regular exercise, attending regular health checks, and following advice from healthcare professionals in a mixed methods survey and interview study by Borthwick et al. (2021).

Although results are mixed, engaging in negative lifestyle behaviours could be indicative of reduced compliance and adherence to recommended preventive healthcare services such as flu vaccination, a concern that would need to be addressed by healthcare professionals and policy makers as people with mental illness are shown to engage in greater unhealthy lifestyle behaviours such as smoking, substance use and reduced physical activity (Druss et al., 2008; Lorenz et al., 2013; Miles et al., 2020; PHAC, 2016).

Medications

Only a few studies explored the association between medications and flu vaccine status (see Table 2.1 and Appendix E). Firstly, a cross-sectional study by T. Lawrence et al. (2020) discovered that elderly primary care patients residing in the US, including those with mental illness who received a flu vaccine, were more likely to have been prescribed an antidepressant and a benzodiazepine (anti-anxiety) medication. Furthermore, being prescribed an antidepressant was a predictor of flu vaccine status in the overall adjusted model, and for those with and without physical comorbidities (T. Lawrence et al., 2020). Thus, in this study individuals taking antidepressant medications were more likely to vaccinate against the flu compared to those not taking these medications (T. Lawrence et al., 2020). Secondly, a cross-sectional study in the US by Xiong et al. (2015) found that being on antipsychotic medication among the mental health population was negatively associated with total non-cancer compliance service utilization including flu vaccine in its univariate analysis. However, it was not a critical predictor in the multivariate analysis. The number of medications was another factor explored in this study; however, it was not associated with service utilization in the univariate analysis (Xiong et al., 2015). Of importance, clinic type and other relevant factors were not controlled for in the study's univariate analysis; therefore, the associations are difficult to determine (Xiong et al., 2015).

Overall, the relationship between medications and flu vaccine uptake is underexplored. Investigating this further could expand understanding and potentially reveal whether people who take medications such as antidepressants are being offered more flu vaccines, possibly due to greater willingness and compliance with treatment regimen, and higher healthcare utilization (T. Lawrence et al., 2020). Exploring this association is particularly important among the mental health population as antidepressants and anti-anxiety medications are commonly prescribed for those with mental illness such as mood and anxiety disorders (PHAC, 2016).

Perceived Health Status

Perceived health status is a subjective, yet reliable measure of overall "physical, mental and social well-being" (Statistics Canada, 2016, para. 3). Perceived health can capture important aspects such as disease severity, social function, and psychological and physical reserves (Statistics Canada, 2016). According to the literature, self-reported health status can also be a potential barrier or a promoter of flu vaccine uptake among the general adult population (see Table 2.1 and Appendix E). For instance, a systematic review by Schmid et al. (2017) revealed that "good" health status was found to be a barrier to flu vaccine uptake in some studies and a promoter in others. However, a systematic review by Yeung et al. (2016) did not find any associations between self-reported health and flu vaccine uptake (Yeung et al., 2016). In the UK, qualitative data from a mixed methods study by Borthwick et al. (2021) indicated that among 57 psychiatric patients in a forensic hospital, general attitudes toward health such as "feeling healthy" or "not having a disease" made several participants less likely to get flu vaccines, less motivated to engage in preventive behaviours, and have little consideration for future health protection. Conversely, participants who perceived their health status as "unwell" were more willing to consider vaccinating against the flu (Borthwick et al., 2021).

Exploring the influence of perceived health status on flu vaccine uptake is beneficial considering that perceived health status is a useful measure to predict "help seeking behaviours and health service use" (Statistics Canada, 2016, para. 4). Perceived health status can offer insight into one's actual health, the perceived likelihood of catching the virus and its severity, as well as one's motivation or need to engage in essential healthcare services such as vaccination (Borthwick et al., 2021; Farmanara et al., 2018; Statistics Canada, 2016). If similar associations are discovered among the Canadian mental health population, more efforts may be required to communicate the risks of infection and the effectiveness of vaccines, to motivate and advise on routinely vaccinating against influenza (Farmanara et al., 2018)

Past Behaviour and Experience

Research shows previous vaccination status and past experiences with influenza could strongly influence decisions and actions to vaccinate (see Table 2.1 and Appendix E). Among the general adult population, several systematic reviews reported that adults receiving flu vaccines in the past are more likely to vaccinate again, while those without prior experience with the flu vaccine are less likely to vaccinate (Schmid et al., 2017; Yeung et al., 2016). Similar associations were also observed among the mental health population. For instance, a cross-sectional study in the US by Lorenz et al. (2013) reported that the majority of their adult psychiatric outpatients with previous flu vaccination status planned to receive flu vaccines again or have recently received the vaccines compared to those without previous flu vaccine status. A cross-sectional study in the US by T. Lawrence et al. (2020) found those with recent flu vaccine were more likely to have received a prior flu vaccine among an elderly population that also included those with mental illness such as depression and anxiety (T. Lawrence et al., 2020). Similarly, according to a mixed methods study by Borthwick et al. (2021), receiving a flu vaccine in the previous year was a vital predictor of flu vaccine intent in the adjusted regression model and a significant predictor of flu vaccine behaviour in the unadjusted model among psychiatric patients in the UK. Further, their qualitative data revealed decisions to vaccinate were often based on past experiences with the flu vaccine (Borthwick et al., 2021). Those with positive experiences were more likely to vaccinate again, while those with negative experiences were less willing to vaccinate (Borthwick et al., 2021). For participants lacking personal experience with vaccines, informal and formal sources such as the news highly informed their opinions and intentions to vaccinate (Borthwick et al., 2021).

Although decisions to vaccinate are complex, research is suggesting that prior subjective experience with influenza or influenza vaccine carries significant weight in the decision-making process pertaining to receiving influenza vaccine (Borthwick et al., 2021; Lorenz et al., 2013; Schmid et al., 2017). Thus, it is crucial to consider the relevance of habitual behaviours and prior experience with influenza and influenza prevention measures to better understand the decisions of people with mental illness to vaccinate and to facilitate informed decision making and engagement in motivational conversations (Borthwick et al., 2021; Lorenz et al., 2013). In exploring this association, vaccine programs and healthcare professionals could effectively identify those more prone to vaccinate and those in need of encouragement to develop habitual vaccination and increase the uptake of flu vaccine for people with mental illness (Boerner et al., 2013; Telford & Rogers, 2003).

Influenza and Influenza Vaccine Knowledge

Knowledge of influenza infection and influenza vaccine has been shown to be a notable factor in flu vaccine uptake (see Table 2.1 and Appendix E). Among the general adult population, a systematic review by Yeung et al. (2016) indicated that better knowledge of influenza, influenza vaccination, and overall effective measures to prevent influenza were associated with higher flu vaccine uptake. In addition, having knowledge that vaccines are required annually, recommended to high-risk groups, and general knowledge about influenza transmission and treatment were also associated with higher flu vaccine uptake (Yeung et al., 2016). Contrarily, a lack of general knowledge about influenza and influenza vaccine was identified as a significant barrier to flu vaccine uptake in a systematic review by Schmid et al. (2017). In a mixed methods study, semi-structured interviews with 57 psychiatric patients revealed that lack of knowledge or uncertainty about flu vaccines resulted in misbeliefs such as views that vaccines provide permanent immunity or antibiotic resistance (Borthwick et al., 2021). However, the study's quantitative data did not find associations between flu knowledge and flu vaccine intent and behaviour (Borthwick et al., 2021). Finally, survey data from an outpatient immunization quality improvement project involving 329 mental health adults revealed that 42% believed their lack of overall vaccine knowledge and awareness was a major barrier to receiving all vaccines including the flu vaccine (Miles et al., 2020).

With research suggesting that knowledge potentially shapes one's intentions to vaccinate, it may be necessary to consider one's understandings about influenza and influenza vaccine to promote the uptake of flu vaccine (Borthwick et al., 2021). This is particularly important for people with mental illness as they may struggle with the ability to understand or process certain information including information about health technologies such as flu vaccine (Lorenz et al., 2013; Miles et al., 2020; PHAC, 2016). In addition, they may instead utilize informal sources as indicated by Borthwick et al. (2021) such as the internet and friends to form opinions. These perceptions could be based on high levels of emotion and personal interest rather than scientific, objective knowledge (Boerner et al., 2013). Thus, if there are significant inaccuracies and knowledge deficits among people with mental illness pertaining to influenza and influenza vaccine, then current and future programs may need to create stronger communication and knowledge-based strategies to facilitate informed choices about vaccination and equip people with comprehensive information that is objective, scientific, accessible and in plain language (Boerner et al., 2013; Borthwick et al., 2021).

Behaviour Specific Cognitions: Perceived Barriers and Benefits

The literature indicates that intrapersonal influences such as perceived benefits and barriers to flu vaccine are potentially associated with flu vaccine uptake (see Table 2.1 and Appendix E). A systematic review by Yeung et al. (2016) revealed that perceived benefits of flu vaccine such as vaccine safety and effectiveness are associated with higher flu vaccine uptake among the general adult population. Similarly, several studies reported potential links between perceived vaccine benefits and flu vaccine uptake among the mental health population. For instance, a US cross-sectional study by Lorenz et al. (2013) revealed the majority of those in the vaccinated group believed that flu vaccine is effective against the flu and were more likely to vaccinate in the future (Lorenz et al., 2013). A mixed methods study conducted in the UK, measured various psychological constructs using the Health Belief Model in their self-reported questionnaires among 57 psychiatric patients (Borthwick et al., 2021). Benefits of vaccination was one of the constructs containing items such as flu vaccine is safe, effective, prevents the flu, and a good reason to get when having chronic illness or the vaccine is free of charge (Borthwick et al., 2021). Data analysis revealed that perceived vaccine benefits was an important predictor of flu vaccine behaviour and intent in the unadjusted models, however negligible when adjusted for other variables such as vaccine knowledge, past behaviour, and cues to action (Borthwick et al., 2021). Further, their interpretive phenomenology analysis indicated when participants believed that vaccines support the immune system their intent and behaviour to vaccinate increased (Borthwick et al., 2021). Lastly, survey data in a quality immunization improvement project by Miles et al. (2020) revealed that the majority of the mental health participants believed flu vaccines are safe, effective, and important, while negative beliefs and attitudes toward vaccination were not reported as common barriers to receiving flu vaccines.

In terms of perceived barriers, negative attitudes towards the flu vaccine, beliefs that the flu vaccine is ineffective, unsafe and has high adverse events, as well as beliefs in vaccine misconceptions, perceptions of low social benefit or low risk of influenza to others were identified as major barriers to flu vaccine intent, behaviour, and uptake among the general adult population in a systematic review by Yeung et al (2016). For people with mental illness, similar barriers to vaccination were found in several studies. For instance, in a US cross-sectional study by Lorenz et al. (2013), perceptions that one can get the flu from the flu vaccine were common among the unvaccinated group, and associated with being less likely to vaccinate. In the UK, a mixed methods study by Borthwick et al. (2021) reported negative attitudes toward vaccination were a predictor of lower flu vaccine intent in the unadjusted model, however insignificant for flu vaccine behaviour, among 57 psychiatric patients. As well, perceptions such as the vaccine does not prevent the flu, is not effective and causes the flu were predictors of reduced flu vaccine intent and behaviour in the unadjusted models (Borthwick et al., 2021). However, perceptions related to costs of vaccination such as the flu vaccine is inconvenient or interferes with daily activities were overall not associated with flu vaccine intent and behaviour (Borthwick et al., 2021). Lastly, a quality improvement study by Miles et al. (2020) showed that personal cost was a potential barrier to all vaccines including flu vaccine for some participants attending mental health clinics.

All in all, perceived cognitions such as perceived benefits and barriers are the psychological constructs and dimensions that highly predict “the adoption of healthy behaviour” (Roy et al., 2018, para. 26; Schmid et al., 2017). Thus, exploring this association among people with mental illness in Canada can potentially lead to better understanding of their flu vaccine intent and behaviour. This understanding is required to guide future health programs to effectively reduce barriers and vaccine hesitancy (Borthwick et al., 2021; Lorenz et al., 2013; Schmid et al., 2017). Such programs and communication strategies should specifically target this vulnerable population and accurately educate about flu vaccine benefits and effectiveness, and make efforts that dispel misconceptions and mediate safety concerns, empowering people with mental illness to vaccinate (Borthwick et al., 2021; Lorenz et al., 2013; Schmid et al., 2017).

Behaviour Specific Self-Efficacy

Perceived self-efficacy refers to an individual's confidence or belief in their own ability and competency to achieve goals, to successfully execute tasks and behaviours (Borthwick et al., 2021; Pender, 2011). According to research, perceived self-efficacy can also impact one's uptake of flu vaccine; however, the findings are currently mixed and limited (see Table 2.1 and Appendix E). A systematic review by Schmid et al. (2017) found that low self-efficacy is a barrier to flu vaccine uptake among the general adult population. However, for psychiatric patients in a mixed methods study by Borthwick et al. (2021) vaccine self-efficacy such as having confidence in one's ability to get the vaccine if they wished, even if facing barriers was not a predictor of flu vaccine intent and behaviour. Notably, research on the association between self-efficacy and flu vaccine uptake among people with mental illness is scarce. It is worthwhile to explore this association particularly as people with mental illness including depression commonly experience reduced self-efficacy, a factor interfering with daily functioning and self-esteem (Borthwick et al., 2021; Lorenz et al., 2013; Miles et al., 2020; PHAC, 2016). As such, reduced self-efficacy could potentially contribute to impaired cognitive ability, confidence, and motivation for people with mental illness to vaccinate, to take the necessary preventive care measures (Borthwick et al., 2021; Lorenz et al., 2013; Miles et al., 2020; PHAC, 2016).

Behaviour Specific Affect

Behaviour specific affect can be described as feelings or emotions associated with engaging in a specific behaviour such as flu vaccination (Pender, 2011). Within the literature, fear was a dominant emotion impacting flu vaccine uptake (see Table 2.1 and Appendix E). For instance, a systematic review by Yeung et al. (2016) reported that fear of adverse events from the vaccine was associated with reduced flu vaccine uptake for the general adult population. Correspondingly, fears about the consequences of flu vaccines impacted flu vaccine intent and behaviour of psychiatric patients participating in a mixed methods study by Borthwick et al. (2021). In addition, general fears about the flu vaccine were a barrier to all vaccinations including flu vaccine among mental health outpatients in a quality improvement project by Miles et al. (2020). Conversely, fear of injection was found to not be associated with flu vaccine uptake for the general adult population in a systematic review, and fear of needles and pain was not a predictor of flu vaccine intent and behaviour in a mixed methods study among psychiatric patients (Borthwick et al. 2021; Yeung et al., 2016). Although results are mixed, it is important to remember people with mental illness such as mood and generalized anxiety disorders can experience intense mood swings, worry, fear, and anxiety (Borthwick et al., 2021; PHAC, 2016). These could further intensify fears and anxiety about vaccine safety and potentially result in avoidance of the entire behaviour (Borthwick et al., 2021; T. Lawrence et al., 2020). If a similar association exists between behaviour specific affect and flu vaccine uptake, people with mental illness in Canada may need additional support and education about influenza vaccine benefits and harms to facilitate rational thinking, and effectively reduce fear, anxiety and decisional conflict pertaining to the uptake of flu vaccine (Borthwick et al., 2021).

Interpersonal Influences

Interpersonal influences such as social supports and recommendations from healthcare providers and family members to vaccinate have been shown to influence the willingness and ability of individuals to participate in flu vaccination (see Table 2.1 and Appendix E). According to recent systematic reviews, recommendations and advice to vaccinate from relatives, close friends and healthcare professionals including doctors are associated with higher flu vaccine uptake for the general adult population (Schmid et al., 2017; Yeung et al., 2016). Also, role modelling behaviours such as relatives and close friends receiving flu vaccine in the previous year can substantially facilitate vaccination (Schmid et al., 2017; Yeung et al., 2016). Inversely, low pressure from significant others to get vaccinated, and not receiving direct recommendations from medical professionals or relatives to vaccinate reduced flu vaccine uptake among the general adult population according to one of the systematic reviews (Schmid et al., 2017).

Similarly, for people with mental illness, interpersonal influences can play a major role in the promotion of flu vaccines. In the US, a cross-sectional study by Lorenz et al. (2013) found that most participants in the vaccinated group have received provider recommendations to vaccinate compared to the unvaccinated group. Those receiving provider recommendations were also more likely to vaccinate against the flu according to the logistic regression analysis (Lorenz et al., 2013). In the UK, a mixed methods study by Borthwick et al. (2021) found that cues to action from doctors or nurses were a predictor of flu vaccine intent and behaviour in the unadjusted and adjusted regression models, while a subjective norm such as social pressure or expectation to get the flu vaccine was not associated with flu vaccine behaviour and only predicted flu vaccine intent in the unadjusted model. Lastly, not receiving recommendations to vaccinate was a barrier to all vaccinations including flu vaccine among several mental health outpatients participating in a quality improvement project in the US studied by Miles et al. (2020).

Overall, there is strong evidence to suggest that family and provider recommendations can effectively improve flu vaccination rates for those with and without mental illness. If interpersonal factors are found to play an integral role in flu vaccine uptake among Canadian adults with mental illness this knowledge can be used to inform and encourage future health promotion measures to consider the impact of social influences on flu vaccine uptake, including measures that guide healthcare professionals to proactively address concerns, and increase acceptance and offering of influenza vaccination for this population (Borthwick et al., 2021; Lorenz et al., 2013).

Situational Influences

Situational influences are external conditions or contextual factors that influence an individual's decisions and behaviours (Pender, 2011). Situational factors include one's surrounding environment, school, work, and community (Pender, 2011; Schmid et al., 2017). Within the literature, several contextual factors have been found to impact flu vaccine uptake among the general adult population and specifically people with mental illness (see Table 2.1 and Appendix E). To begin, healthcare program type was a common factor reported to influence flu vaccine rates and uptake for people with mental illness. For instance, a randomized, non-blinded experimental trial conducted in the US by Druss et al. (2001) evaluated the impact of different types of primary care programs on quality of preventive care, including influenza vaccination, among 120 adults with mental illness. At the 12- month post-test, the study concluded that individuals in the integrated care group received significantly more flu vaccines compared to the usual care group, non-integrated (Druss et al., 2001). Another randomized trial by Druss et al. (2010) measuring quality of primary care such as flu vaccine reported that among 407 adult mental health outpatients, those in the intervention group receiving population-based approach medical care management had significantly more overall vaccines than those in the usual care group, evaluated at the 12-month post-test (Druss et al., 2010). Furthermore, a pilot intervention study by Cabassa et al. (2018) wished to examine whether delivering a culturally adapted, collaborative and coordinated program to 34 Hispanic mental health outpatients in the US improved their receipt of preventive care including flu vaccine, blood pressure testing, smoking status, and physical exam. According to its linear mixed methods analysis, the receipt of all vaccinations significantly increased at the 12-month post-test, with a moderately strong effect size (Cabassa et al., 2018).

A non-experimental, observational cross-sectional study in the US discovered that mental health outpatients attending a non-integrated community mental health service were less likely to use non-cancer preventive services including flu vaccine compared to those attending an integrated mental health program according to the multilinear regression analysis (Xiong et al., 2015). Further, a US surveillance study by Bowdoin and colleagues (2016) sought to determine whether patient centred medical homes positively influenced receipt of preventive care including flu vaccine for adults with mental illness compared to those receiving care consistent with usual care or not receiving usual care. In comparing the three groups, the study determined that receiving patient centred care resulted in higher flu vaccinion compared to those receiving usual care and no usual care for year one (Bowdoin et al., 2016). For both years, there were similar differences in flu vaccine rates between patient centred care and no usual care; however, the difference was insignificant when comparing usual care with patient centred care (Bowdoin et al., 2016). In the logistic regression analysis, adults receiving patient centred care were more likely to receive flu vaccines compared to no usual care, however, the results were insignificant between patient centred care and usual care (Bowdoin et al., 2016).

Moreover, an observational cohort study by Browne et al. (2019) found that a greater proportion of veterans with mental illness received flu vaccines compared to veterans without mental illness utilizing a patient aligned care team program in the US. However, factors such as patient characteristics and program type could have influenced the results as methods of controlling for covariates were not implemented in the study (Browne et al., 2019). Lastly, to address potential discrepancies in immunization rates and overall health outcomes among people with mental illness, a comprehensive and integrated vaccine clinic implementation program was developed by Miles et al. (2020). The aims were to identify and address barriers to vaccination, increase the rates of vaccines including flu vaccine and increase intent to vaccinate among adults belonging to community mental health clinics in the US (Miles et al.). After its implementation, flu vaccinations increased by three percent, and vital increases were achieved in the intent to receive future vaccinations and in the beliefs about effectiveness and safety of vaccines among this population (Miles et al.).

Overall, the majority of the studies illustrated that receiving integrated, coordinated, comprehensive and patient centred care potentially reduced discrepancies in vaccinations and improved the quality of preventive care for people with mental illness (Miles et al., 2020) (see Table 2.1 and Appendix E). However, these studies were conducted in the US. In Canada, to meet the needs of people with mental illness, attention has also been placed on uniting mental health care with physical health care, by integrating primary care services with community mental health to improve access, treatment, prevention, and coordination (CMHA, 2018; Moroz et al., 2020). As such, multidisciplinary primary healthcare teams, primary care networks and medical homes across Canada were created to enhance access and provide supportive, collaborative, efficient and effective care to vulnerable populations including those with mental illness, to facilitate system change (General Practice Services Committee [GPSC], n.d.). These programs often comprise nurse practitioners, social workers, physicians, care coordinators, dietitians, pharmacists, and health educators to provide holistic and individualized care (GPSC, n.d.). However, within the Canadian context, it is currently unknown whether integrated healthcare programs make a difference in the promotion of flu vaccine uptake for people with mental illnesses. Thus, exploring this association in Canada could offer novel insight into whether programs consistent with integrated approaches can potentially promote the utilization of preventive care services such as the flu vaccine and reduce the occurrences of a life threatening yet preventable respiratory communicable disease for people with mental illness (CMHA, 2018; Miles et al., 2020).

Next, health care interaction and access have been identified as potentially crucial situational factors to influence flu vaccine uptake. For instance, not having a regular source of care such as a primary care physician substantially reduced flu vaccine uptake for the general adult population in a systematic review (Schmid et al., 2017). For people with mental illness, having a primary care provider was an important predictor of greater non-cancer preventive services use including flu vaccine compared to those without a provider in a US cross-sectional study by Xiong et al. (2015). Additionally, according to several systematic reviews, recent medical doctor visits are inconsistently associated with higher flu vaccine uptake, while lower interactions such as fewer medical visits or hospitalizations reduced flu vaccine uptake, for the general adult population (Schmid et al., 2017; Yeung et al., 2016). In a cross-sectional study by T. Lawrence et al. (2020), a positive association was found between healthcare utilization and flu vaccine status, a measure determined by the average number of visits to primary care among elderly adults, including those with anxiety and depression. In the adjusted models, healthcare utilization remained a strong predictor of higher flu vaccine status, including when stratified by those with and without comorbidities (T. Lawrence et al., 2020).

In terms of healthcare access, easy access to healthcare was associated with higher flu vaccine uptake, while transportation issues to vaccines were found to be a significant barrier among the general adult population in recent systematic reviews (Schmidt et al., 2017; Yeung et al., 2016). Issues with accessibility to vaccine clinics were also identified as a situational barrier to receiving all vaccines including the flu vaccine among adult mental health outpatients in an immunization project improvement study by Miles et al. (2020).

The literature stresses the importance of guaranteeing appropriate access and interaction with the healthcare system to effectively address health needs and provide essential preventive care services including the flu vaccine (T. Lawrence et al., 2020; Miles et al, 2020; Schmid et al., 2017; Yeung et al., 2016). Unfortunately, within the Canadian context, complex system level barriers such as lack of family physicians and coordination, reduced community mental health services, shortage of healthcare services particularly in rural and remote areas, as well as long waits have significantly impacted Canada's equitable healthcare access, particularly for vulnerable populations (Canadian Medical Association, 2018; Villeneuve, 2017). However, their influence on flu vaccine uptake for people with mental illness is currently unknown. Therefore, exploring this association within the Canadian context could unpack novel data and guide future strategies to address the system level barriers and foster positive healthcare interaction for people with mental illness (CMHA, 2018; Moroz et al., 2020). Strategies are needed that will specifically target this population and enable people with mental illness to access timely, quality, and appropriate healthcare services that increase their likelihood of being offered flu vaccines and engaging routinely in health promoting behaviours (CMHA, 2018; Miles et al., 2020; Moroz et al., 2020).

Other Factors for Consideration: Influenza Risk Perception

It was found in the literature reviewed that a relationship exists between influenza risk perception and flu vaccine uptake (see Table 2.1 and Appendix E). For the general adult population, perceived chances of contracting the flu and perceived health impact of having influenza are associated with higher flu vaccine uptake according to a systematic review by Yeung et al. (2016). Similarly, findings from a systematic review by Schmidt et al. (2017) indicated that low risk perception of influenza including its severity, susceptibility, likelihood of catching the virus, low worry and anticipation was a significant barrier to flu vaccine intent and behaviour for the general adult population. Conversely, among psychiatric patients, perceived severity and susceptibility to the flu were not associated with flu vaccine intent and behaviour in a mixed methods study by Borthwick et al. (2021). However, the study's qualitative results revealed that for some participants, beliefs it is better to fight the virus off, feeling immune to the flu and confident in the immune system have negatively impacted their decisions to vaccinate (Borthwick et al., 2021). If a similar relationship is discovered for people with mental illness in Canada, there may be a need to convey accurate information through vaccination programs and campaigns about disease severity, susceptibility, and the effectiveness of vaccine that specifically target this population (Borthwick et al., 2021; Farmanara et al., 2018; Lorenz et al., 2013).

Gaps in Literature

Several gaps were noted within current literature reviewed in relation to factors associated with flu vaccine uptake among those with mental illness. Firstly, most of the studies did not use flu vaccine uptake as the primary outcome measure. For example, a study by Xiong et al. (2010) employed a preventive health service utilization score as its dependent outcome, a measure that included a multitude of services in addition to flu vaccines such as testing for cholesterol, diabetes and hypertension, cancer screenings, oral health care and more. Similarly, other studies often created an index or an aggregated score comprising flu vaccine and a variety of other preventive service indicators. The study outcomes often pertained to the overall quality and comprehensiveness of preventive care, overall care gap rates in preventive services and overall vaccinations, thus, making it difficult to draw conclusions specifically pertaining to the relationship between factors and flu vaccine uptake.

Secondly, issues with generalizability became apparent in the literature reviewed. For instance, several studies conducted were among older populations, such as veterans and elderly in primary care. Therefore, findings in these studies may be less applicable to the younger adult population. Further, the majority of the studies were conducted in specific health settings including primary care and community mental health clinics, and often using non-Canadian populations. Therefore, results of the studies may not be generalizable to Canada's healthcare setting and its mental health community. Thus, using data pertaining to the Canadian mental health population provides greater representativeness as well as captures unique and novel information regarding flu vaccine rates, and factors associated with flu vaccine uptake among Canadian adults with mental illness.

Lastly, associations between individual characteristics including sociodemographic factors and flu vaccine uptake remain unclear, creating a need to better understand the mechanisms behind these influences to identify potential barriers to vaccination, raise awareness, and establish effective strategies to promote the uptake of flu vaccine among this population (Farmanara et al., 2018).

All in all, the determinants of flu vaccine uptake are complex and multidimensional, comprising individual level factors such as sociodemographic, physical, and mental health conditions; behavior specific factors such as knowledge, attitudes, and perceptions; interpersonal factors such as family or healthcare provider supports and recommendations; and situational factors such as healthcare programs, access, and utilization. In essence, a multifaceted and holistic approach must be considered in the exploration of determinants, to comprehensively understand their influence on flu vaccine uptake, and to support those with mental illness to vaccinate. An approach that is prominent within mental health, is one that meaningfully considers the diverse biological, psychological, social, and cultural components, as well as one's connection to family, peers, work, school, and community (Bittencourt et al., 2018; Pender, 2011).

Chapter Summary

Overall, a comprehensive review of existing literature was conducted into common factors associated with flu vaccine uptake, the barriers and promoters, and the flu vaccination rates among people with mental illness (see Table 2.1 and Appendix E). Along the way, theoretical arguments, current knowledge, key developments, and pertinent gaps were discovered. Conducting a literature review expanded understanding and insight, as well as provided context and established the study's contribution (Polit & Beck, 2020). As well, Pender's HPM was introduced as a theoretical/conceptual framework that has guided this study.

According to the literature reviewed, research regarding flu vaccine rates among those with mental illness is limited and highly mixed. Similarly, research about factors that influence flu vaccination specifically among the mental health population was scarce and understudied. Finally, the lack of generalizability to the Canadian mental health population has revealed an important research gap that required addressing. Next, chapter three thoroughly describes the study's research design, methods, and techniques utilized to ultimately answer the research questions.

CHAPTER THREE: RESEARCH DESIGN & METHODS

The purpose of this chapter was to carefully outline and describe the research design and methods for conducting this research such as the strategies and techniques used to answer the study's primary research question: *what factors are associated with influenza "flu" vaccination uptake among Canadian adults with mood and anxiety disorders? and the two research sub-questions.* This chapter begins with a discussion on data source and design, followed by the study's sample, measurements, and analytical techniques selected. Next, analysis of missing data and methods for handling the missingness are described before concluding the chapter with quality evaluation, study limitations, and ethical considerations.

CCHS Data Source and Design

Data in this study was obtained from the 2017-2018 Canadian Community Health Survey (CCHS) Public Use Microdata file. The CCHS was a voluntary, cross-sectional survey that collected representative information about Canadians' health status, health care utilization, and health determinants (Statistics Canada, 2018). The survey aimed to produce reliable estimates at the health region level (Statistics Canada, 2019). The CCHS covered approximately 98% of household residents aged 12 and older across all Canadian provinces and territories (Statistics Canada, 2019). The survey did not include full-time members of the Canadian Forces, youth residing in foster homes, institutional residents, residents of remote areas, Indian Reserves and Crown Lands (Statistics Canada, 2019). The exclusions overall represented less than three percent of the Canadian population (Statistics Canada, 2019). The 2017-2018 CCHS data content comprises two major categories: common content and optional content modules (Statistics Canada, 2019). Common content was collected from all participants and consists of three components: annual core content, and one- and two-year theme content (Statistics Canada, 2019). The optional content varies from year to year and is designed to provide provinces and territories with the opportunity to select data that addresses their unique needs and health priorities (Statistics Canada, 2019). Each content of the survey was developed in partnership with specialists from various academic fields, and provincial and federal departments, including Statistics Canada (Statistics Canada, 2019). The 2017-2018 CCHS drew on data from 113,290 cases, in approximately 97 health regions across Canada (Statistics Canada, 2019).

The CCHS used a complex design strategy, with stratification and multi-stage sample allocation, as well as unequal probabilities to select respondents (Statistics Canada, 2018). To target individuals 18 years and older, an area frame was drawn from Canada's Labour Force Survey (LFS) to select a random sample of dwellings (Statistics Canada, 2018). To target youth between the ages of 12 and 17, a list frame from the Canadian Child Tax Benefit (CCTB) files was used to directly select individuals (Statistics Canada, 2018). The survey was conducted by trained interviewers using computer-assisted interviewing such as telephone interviews and personal interviews to collect data from respondents (Statistics Canada, 2019).

Study Design and Sample

This study was a secondary data analysis using an observational, cross-sectional quantitative design (Polit & Beck, 2020). The chosen design allowed the researcher to analyze readily available, representative data of the Canadian population, data that is of high relevance and interest to the researcher. Additionally, the selection of the study's population from a larger Canadian survey allowed for a detailed theory-driven examination of the factors that may be associated with flu vaccine uptake in adults with mood and anxiety disorders.

The chosen sample for this study comprises adults 18 years and older, diagnosed with mood and/or anxiety disorders, living in four Canadian provinces: British Columbia (BC), Alberta (AB), Prince Edward Island (PEI), and Newfoundland and Labrador (NFL). Firstly, age 18 years and older was selected as this study is solely interested in researching the adult population. In terms of the selected mental health population, while mental illness encompasses a multitude of serious disorders, this study focused on mood and anxiety disorders due to a higher prevalence of these disorders among the Canadian population as discussed in chapter one (PHAC, 2016). Further, this specific population of interest was selected given the availability of that population in the CCHS. Of importance, mental health conditions are unique and diverse, varying in duration, severity, and overall impact on one's life (PHAC, 2019). Thus, if this study included a wider range of mental illnesses, one might find different results in terms of flu vaccine prevalence and the associated factors. Nonetheless, this reduced variability can optimize the level of homogeneity within the sample, thereby facilitating a deeper understanding of a particular group, as well as improving the accuracy and interpretability of the research findings (Polit & Beck, 2020). Finally, the four provinces were selected due to the availability of relevant variables for this study, particularly those associated with interpersonal influences which were found to be vital factors in the literature, and for the mental health population. In addition, Alberta and BC are two of the largest provinces in Canada by population (Statistics Canada, 2021).

Study Measurements

To answer the study research questions, one dependent variable and 24 independent variables were originally selected based on the literature review and Pender's Health Promotion Model (HPM) which provided the theoretical basis for this study. As well, the variable selection was informed by relevance to the mental health population, and the availability of variables in the CCHS.

Overall, the majority of the 24 independent variables were consistent with Pender's Individual Characteristics and Experiences category. They were characteristics with a direct impact on one's behaviour specific cognitions and affect, vital motivational factors that can be targeted by healthcare professionals to facilitate and support healthy behaviours (Pender, 2011). Furthermore, the HPM is compatible with the CCHS, which similarly explores health related factors at the individual level. Of note, focusing on individual perspectives and perceptions may shift the emphasis away from broader issues that can significantly impact one's health promoting behaviours, such as stigma and discrimination, and other key social, economic, environmental and healthcare related factors (Borthwick et al., 2021; Raingruber, 2017).

Dependent Variable

The outcome of interest for this study is flu vaccination uptake. Conceptually, this refers to the seasonal flu vaccine that is typically administered in the fall to mitigate the effects of the influenza virus during the Canadian flu season which typically occurs from September to April. To measure this outcome, the CCHS survey (see Appendix F, Table F1) includes this question, "Have you ever had a seasonal flu shot, excluding the H1N1 flu shot?" (Statistics Canada, 2020a, p. 247). It is a dichotomous variable, consisting of two categories, "yes" coded as (1) and "no" coded as (2) (Statistics Canada, 2020a). "Had a seasonal flu shot - lifetime (FLU_005)" variable was used as the outcome for which the independent variables were regressed in the analyses. Lifetime flu shot was selected as the outcome variable in this study to capture two distinct groups of respondents: those with vaccination experience (i.e., those more prone to vaccinate), and those who never received a vaccine (i.e., those in need of added encouragement).

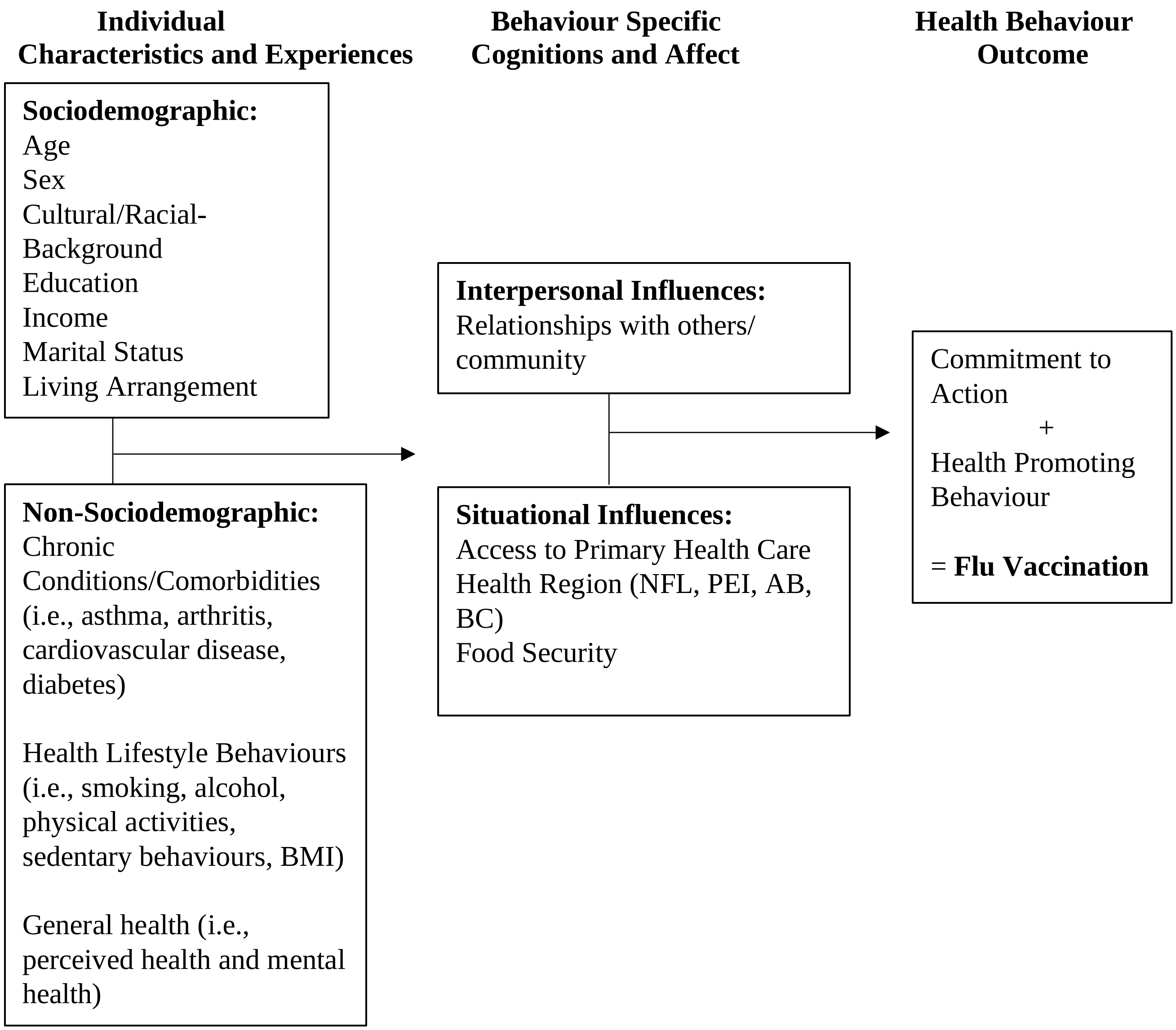
Independent Variables

The researcher analyzed three major categories of variables consistent with Pender's

Health Promotion Model (HPM) and the literature review findings (see Figure 3.1 and Appendix F, Table F1): (a) individual characteristics (i.e., sociodemographic factors, chronic conditions and comorbidities, health lifestyle behaviours, and perceived health status); (b) interpersonal influences (i.e., relationships, recommendations, and social supports); and (c) situational influences (i.e., healthcare access/utilization, health regions and food security). The initial variable selection process was iterative in nature. Each stage involved selecting variables based on common and significant findings in the literature, literature gaps, Pender's HPM, relevance to the mental health population, and the availability of variables in the CCHS. Variables pertaining to behaviour specific cognitions, affect and self-efficacy, as identified in Pender's HPM, were not available in the CCHS and therefore not included in this study. Similarly, variables related to situational influencers/factors such as health program service (i.e., integrative programs), and healthcare access (i.e., location, transportation, availability) were not available in the CCHS.

Figure 3.1

Framework Guided by Pender's HPM to Explore Associations with Flu Vaccination



To further aid in the initial selection process, correlations such as Phi/Cramer's V for categorical predictor variables, and Pearson's *r* for continuous predictor variables were examined to measure the strength of association between each independent variable with the dependent variable (Polit & Beck, 2020). Variables with trivial/weak correlations and/or minimal evidence in the literature/theory to support their inclusion in the study were excluded. This selection process ultimately led to the inclusion of 24 predictor/independent variables within the three broad categories listed above. All variables included in the study, along with the corresponding wording of the questions and response options are found in Appendix F, Table F1. According to the literature review and Pender's HPM, Table F1 is a mapping of the key concepts and corresponding survey questions, as well as response options along with the variable name and additional comments. Furthermore, the table lists the original variables and how they were transformed during the data cleaning process and preparation for analysis. These changes also aid in the interpretation of the study findings.

Individual Characteristics

The individual characteristics are comprised of four sub-categories: (i) sociodemographic (7 variables), (ii) chronic conditions and comorbidities (6 variables), (iii) health lifestyle behaviours (7 variables), and (iv) perceived health status (2 variables). In total, there are 22 variables that are consistent with individual characteristics as depicted in Pender's HPM.

Sociodemographic (see Appendix F, Table F1). This study contains seven variables pertaining to sociodemographic data: age, sex, cultural/racial, education, income, marital status, and living arrangements (Statistics Canada, 2020a). To begin, age is an ordinal variable with 16 categories, ranging from 12 to 80 and above. For the purposes of studying adults and to aid in interpretation, the age variable was recoded into three age group categories, ranging from 18 years and up. The age groups were determined based on respondents' response to the question: "What is your age?" Higher scores indicate older adults. The next variable is respondents' sex, which consists of two response options, that is "male" coded as (1) and "female" coded as (2).

The variable **cultural/racial background** indicated the cultural or racial background of the participants, information derived from other sections in the survey. This variable consists of two response options, “white” coded as (1) and “non-white” coded as (2). Those who identified themselves as Aboriginal in another section of the survey, were not asked about their cultural or racial background. Of significance, concerns about measuring race and culture as variables within health research have been reported and must be acknowledged. Historically, using race/culture as constructs have resulted in lacks of clarity, richness in data, inclusivity, and consistency (Ross et al., 2020). Some have argued that exploring these as scientific constructs may be unreliable as the concepts of race/culture are deeply connected with political connotations (Chick, 2009). Furthermore, utilizing race/culture as a variable can raise or perpetuate harmful beliefs about race and that differences between groups are rooted in biological factors rather than structural factors, social determinates of health or institutionalized racism (Ross et al., 2020; Yudell, 2021).

In this study, race and ethnicity were not used to explore “biological facts,” rather their potential underlying social experiences and issues such as ethnic bias, systemic racism, discrimination, and stereotyping (Ross et al., 2020, p. 318). Race and ethnicity variables are mentioned in the literature and Pender’s HPM as potential factors that may play a significant role in the engagement of health promoting behavior including flu vaccination. Exploring the underlying issues associated with race and ethnicity is of particular importance for the mental health population, a vulnerable group that already faces societal discrimination and stigma (WHO, n.d.c).

To measure education, the respondents were asked about their **highest level of education** achieved according to three categories ranging from (1) less than secondary to (3) post-secondary degree. Higher scores are indicative of higher levels of education. Individuals’ socioeconomic status was determined by the **total household income - all sources**, an ordinal variable with five categories, ranging from (1) no income to (5) $80,000 and up. According to Pender's HPM, education and income are acquired personal factors that could influence the beliefs and engagement in health promoting behaviour (Pender, 2011). In the literature, income is often utilized as a proxy variable for living standard or socioeconomic status (Kuhn, 2019). Thus, it was used in this study to measure whether varying household income levels are important determinants of flu vaccine uptake among the mental health population, a population that already experiences income disparities and reduced employment opportunities (WHO, n.d.c). The literature has suggested that socioeconomic constraints could be significant barriers for individuals to be vaccinated, even after adjusting for covariates such as healthcare utilization (T. Lawrence et al., 2020).

The final two sociodemographic variables are **marital status**, a nominal variable with four categories, and **living/family arrangement**, a nominal variable containing eight categories (Statistics Canada, 2020a). Marital status and living arrangement variables are viewed as important social factors that may exert an influence on ones' health behaviours and decisions (August & Sorkin, 2010).

Chronic conditions and comorbidities (see Appendix F, Table F1). This sub-category aimed to capture whether the presence of a chronic condition or disease and thus a high-risk status would facilitate a higher uptake of the flu vaccine. The chronic conditions and comorbidities variables were specifically selected due to their increased prevalence among the mental health population, and for being common risk factors for influenza morbidity and mortality (Lorenz et al., 2013; Miles et al., 2020; PHAC, 2019). Six chronic condition variables were selected for this study, each asking the respondent whether they have the following conditions: **asthma**, **arthritis**, **high blood pressure, high blood cholesterol/lipids, heart**

disease, and **diabetes** (Statistics Canada, 2020a). Each variable consists of two response options, a (1) “yes” and a (2) “no” (Statistics Canada, 2020a). The three variables - high blood pressure, high blood cholesterol/lipids, and heart disease were then combined into a single dichotomous variable called **CVD** to represent cardiovascular disease (Acton et al., 2009; PHAC, 2016; Statistics Canada, 2020a). For this transformed variable, (1) is coded as “yes”, indicating a presence of cardiovascular disease and a (2) is coded as “no”, indicating an absence of any cardiovascular disease.

Health lifestyle behaviours (see Appendix F, Table F1). Health behaviours are valid indicators of health, often shaped by individual decisions and external constraints (Lorenz et al., 2013; Miles et al., 2020; PHAC, 2016). In the literature, there are positive patterns of behaviours such as physical activity, quitting smoking, and eating well balanced diets, as well as negative patterns of behaviours such as smoking, drugs and heavy alcohol consumption that may act as either significant promoters or barriers to engaging in flu vaccination (T. Lawrence et al., 2020; Schmidt et al., 2017; Yeung et al., 2016). Furthermore, Pender (2011) considers BMI, balance, agility, aerobic capacity, and strength as biological personal factors that impact engagement in health promoting behaviours. Exploring the influence of health behaviours on flu vaccination is particularly important for the mental health population, as prevalence of behavioral risk factors such as smoking, obesity, impaired nutrition and physical inactivity is high (Lorenz et al., 2013; Miles et al., 2020; PHAC, 2019).

In this study, a total of seven variables were selected that represent health lifestyle behaviours: smoking status, type of drinker, physical activities (2 variables), sedentary behaviours (2 variables), and BMI. To begin, **smoking status (type II) according to traditional definition** is a derived ordinal variable with six categories ranging from (1) current daily smoker to (6) lifetime abstainer (Statistics Canada, 2020a). Higher scores are indicative of lower nicotine intake from cigarette smoking by the respondent. For drinking habits, **type of drinker in the past 12 months** was selected, an ordinal variable with three categories, ranging from (1) regular drinker to (3) did not drink in the past 12 months (Statistics Canada, 20201a). Higher scores represent lower alcohol consumption. Two variables were selected pertaining to respondents' physical activities in the last seven days. Firstly, **physical activity indicator**, an ordinal variable with three categories based on the Canadian Physical Activities Guidelines, ranging from (1) physically active at/above recommended level to (3) no physical activity minutes reported. Higher scores represent lower physical activity. Secondly, **number of days physically active - 7 d**, a continuous variable, ranging from zero to seven days (Statistics Canada, 2020a). Here, higher scores are indicative of greater physical activity in the last seven days.

For sedentary activities in the past seven days, two variables were included: **time sitting/lying watching screen on school/workday**, an ordinal variable ranging from (1) two hours or less to (6) was not at work or school (in the past seven days); and **time sitting/lying watching screen not on school/workday** (leisure), an ordinal variable with five categories ranging from (1) two hours or less to (5) eight hours or more (Statistics Canada, 2020a). For both of these variables, lower scores represent the least amount of time one engages in sedentary activities. Lastly, **BMI**, a health indicator was selected, categorizing respondents into four body mass index classifications, ranging from (1) underweight to (4) obese (Statistics Canada, 2020a). Lower scores indicate lower BMI classifications.

Perceived health status (see Appendix F, Table F1). Perceived health status is a subjective, yet reliable measure of "overall mental, physical and social well-being" (Statistics Canada, 2016, para. 3), at times considered more effective than clinical measures to predict health service utilization and help seeking behaviours (Statistics Canada, 2016, para. 4). Further, Pender's HPM states that perceived health and definition of one's health are important psychological factors that influence behavior specific cognitions and affect, and the health promoting behavior itself (Pender, 2011). Overall, measuring perceived health can capture one's actual health, their perceived susceptibility, as well as their motivation or willingness to engage in preventive behaviours such as flu vaccination (Borthwick et al., 2021; Farmanara et al., 2018; Statistics Canada, 2016). For this study, two ordinal variables were chosen to indicate one's general health status, such as **perceived health** and **perceived mental health.** The **perceived health** variable is measured on a five-point Likert scale ranging from excellent (1) to poor (5), higher scores represent worse health perceptions. Conversely, the **perceived mental health** variable is measured on a five-point Likert scale ranging from poor (0) to excellent (4), with higher scores representing better mental health perceptions (Statistics Canada, 2020a).

Interpersonal Influences

Relationships, recommendations, and social supports (see Appendix F, Table F1)**.** Interpersonal influences include primary sources that provide emotional encouragement, recommendations, support, and modelling (Pender, 2011). Sources of interpersonal influences are family, coworkers, peers, and healthcare providers (Pender, 2011). The interpersonal sources are reported to be instrumental in influencing one's commitment and engagement in health promoting behavior (Pender, 2011). Ten variables were included in this study to measure one's level of belonging, social supports and relationship with others or community. Nine of the variables belong to the social provisions' module, asking respondents questions about current relationships with family, friends, co-workers, and community (Statistics Canada, 2020a). All nine variables are ordinal, based on a four-point Likert scale ranging from strongly agree (1) to strongly disagree (4) (Statistics Canada, 2020a). Higher scores represent reduced relationships with others. The following nine variables were:

- talents and abilities are admired,
- people to depend on for help,
- people who enjoy same social activities,
- relationships that provide a sense of emotional security and wellbeing,
- trustworthy person I could turn to for advice,
- someone to talk to about important decisions,
- being a part of a group who share attitudes and beliefs,
- strong emotional bond with at least one person, and
- people to count on in an emergency (Statistics Canada, 20201a).

The tenth ordinal variable is from the general health module asking about one's **sense of belonging to local community**, based on a four-point Likert scale, ranging from very strong (1) to very weak (4); higher scores represent weaker sense of belonging (Statistics Canada, 2020a).

To facilitate the inclusion of all ten variables in this study, the variables were combined into a single index variable called **Relationships - relationships with others/community** (see Appendix F, Table F1), now measured on a scale ranging from (1) strongest indication of one's relationships with others/community to (4) weakest indication. Higher scores indicate weaker relationships. Prior to creating an index variable, it was important to assess for Cronbach's alpha and ensure that all ten variables or items were closely related and measured the same concept (Laerd Statistics, n.d.b). In this case, the Cronbach's alpha was 0.902 (range 0 to 1), indicating an excellent level of reliability (Laerd Statistics, n.d.b).

Situational Influences

The situational influences are comprised of three sub-categories (see Appendix F, Table F1): (i) health care access/utilization (2 variables), (ii) health region, and (iii) food security. Situational influences are contextual factors or external conditions such as school, work, and community that influence one's decisions and behaviours (Pender, 2011; Schmidt et al., 2017). Pender (2011) also describes them as perceived available options, and the surrounding physical environment in which a health promoting behavior is expected to occur. The literature has further suggested that complex system level issues such as type of healthcare access and utilization play a key role in providing timely, appropriate, and equitable health care services (Villeneuve, 2017). Thus, the researcher attempted to measure whether certain situational factors also play a role in flu vaccination among the Canadian mental health population.

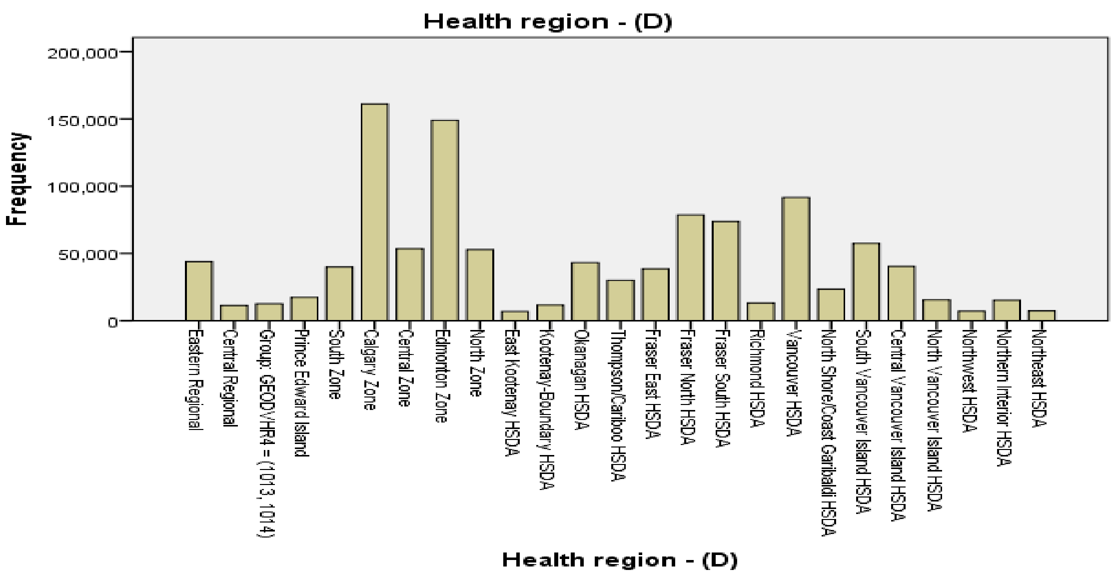
Health care access/utilization. Two variables were chosen, asking respondents the following questions about using Canada's primary health care: whether one **has a usual place for immediate care for minor problem,** and **has a regular health care provider**. Both variables consist of two response options, a (1) "yes" and a (2) "no". As both variables are asking about the same concept, they were combined into a single dichotomous variable called **Primary Care-access to primary health care** (Acton et al., 2009; Statistics Canada, 2020a) (see Appendix F, Table F1).

Health region. This study included the **health region** variable, derived from the survey frame and geographic data provided by the respondents (Statistics Canada, 2020b) The focus was on examining health regions in BC, AB, PEI, and NFL (study's sample). Exploring the health regions in these four provinces could showcase potential variations in flu vaccination between the eastern and the western health regions, as well as potential differences between health regions in BC, a province without universal vaccine coverage during 2017-2018, and health regions in provinces with universal health coverage such as AB, PEI, and NFL (Farmanara et al., 2018; Roy et al., 2018).

For interpretation purposes, the health region variable was recoded, as it originally consisted of 25 categories - each representing 25 health regions across the four provinces. The new variable now consists of four categories: NFL health regions (comprising three NFL health regions), PEI health region (comprising one PEI health region), AB health regions (comprising five AB health regions), and BC health regions (comprising 16 BC health regions).

Figure 3.2

Bar Chart of Original Health Region Variable



Food security (see Appendix F, Table F1). Questions about food security were included in this study as they pertain to Pender's HPM, of "immediate competing demands and preferences that result in alternative actions and interfere with the intended planned behavior" (Pender, 2011, p. 4). Thus, concerns about food and issues with food security could potentially interfere with one's ability or intentions to engage in preventive care, including receiving a flu vaccine. Further, within the Canadian context, food insecurity is a serious public health concern, referring to inadequate access to food due to financial barriers (PROOF, n.d.; Statistics Canada, 2020a). It has negative consequences for mental, physical, and social health, and is a sign "of broader material deprivation and at its root is the lack of adequate and stable income for Canadians to make ends meet" (PROOF, n.d., para. 2; Statistics Canada, 2020a).

Two food security variables were chosen: **worried food would run out**, and **food didn't last and no money to buy more**, both ordinal, containing three categories, ranging from (1) often true to (3) never true. Higher scores represent greater food security. These closely related variables were then combined into an index variable called **food security** (see Appendix C, Table C1), now measured on a scale from (1) highly insecure to (3) highly secure. Prior to creating an index variable, Cronbach's alpha was assessed to confirm these variables were closely related and represented a shared concept (Laerd Statistics, n.d.b). The Cronbach's alpha was 0.882, indicating a good level of reliability (Laerd Statistics, n.d.b).

Data Preparation

The process of data preparation was undertaken to allow for efficient organization, analysis, interpretation, and enrichment of data (Acton et al., 2009). The overall process included data transformation such as recoding, collapsing, and blending of variables to effectively meet the needs of this study (Acton et al., 2009). The following section carefully outlines the steps of data preparation and the variables involved.

Recoding and Combining Variables

Firstly, to facilitate the inclusion of all pertinent variables in the initial stages of this study, it was necessary to combine certain variables of similar concepts as mentioned in the previous section. Thus, two index variables were created (using the compute and mean function in SPSS) after passing the Cronbach's alpha test, called Food Security and Relationships - relationships with others/community (see Appendix F, Table F1). Variables that did not pass the Cronbach's alpha test yet represented similar concepts either according to CCHS or the literature, were combined into new variables (using the compute and if statements in SPSS), called CVD-cardiovascular disease and Primary Care-access to primary health care (see Appendix F, Table F1). Additionally, to ensure these variables were correctly combined, descriptive analyses including frequencies and crosstabulations were conducted. As previously mentioned, the variables age and health region were recoded into fewer yet more meaningful categories (see Appendix F, Table F1).

Valid Skips

In the CCHS, there were valid skips to capture skipped questions that were not applicable to the respondents and thus considered as missing values. The variables cultural/racial background and time sitting / lying watching screen - school / workday - 7d (see Appendix F, Table F1) contained high valid skips that for the purposes of this study were recoded from missing to non-missing values and used in the analyses (Statistics Canada, 2020a). The cultural/racial background valid skip was initially coded as 6 (missing) and applied to all individuals who identified elsewhere as Aboriginal (Statistics Canada, 2020b). The valid skip was first recoded from a missing value to a non-missing value and then combined with category 2 of the variable- "non-white."

Similarly, the valid skip for time sitting / lying watching screen - school / workday – in the last seven days variable was originally coded as 96 (missing), and represented individuals aged 12 to 74, who indicated elsewhere to not working in the past 12 months or not currently attending school (Statistics Canada, 2020a). Thus, the valid skip was first recoded from a missing value of 96 to a non-missing value and then combined with category 6 of the variable – “was not at work or school (7 d),” for interpretation and regression purposes.

Analytical Techniques

The researcher has applied several essential statistical methods and techniques to examine sample characteristics, associations between variables, and make inferences. These include descriptive and bivariate analyses (i.e., percentages, proportions, measures of central tendency, dispersions, chi square and t-tests) and regression analysis (i.e., logistic regression). The following section describes the descriptive and regression methods utilized to ultimately answer the primary research questions.

Descriptive and Bivariate Analysis

Descriptive and bivariate analyses in this study included a summary of baseline characteristics for each independent variable, and the dependent variable, as well as t-tests and chi square tests of independence (Polit & Beck, 2020). In terms of describing the sample characteristics (for individuals with and without mental illness) for categorical variables, percentages, proportions, and frequencies were computed (Polit & Beck, 2020). For continuous variables, the means and standard deviations were calculated (Polit & Beck, 2020). The chi square test of independence was measured to ascertain the associations between categorical independent variables and the dependent variable. An independent samples t-test was utilized to compare group differences between continuous independent variables and the dependent variable. In keeping with current practice, specific p-values were identified in the analyses.

Conducting these analyses allowed the first research question to be addressed: *What are the Influenza vaccination rates for Canadian adults with mood and anxiety disorders compared to those without*? In addition to comparing vaccination rates, this study also compared vaccination times and reasons for non-vaccination, to provide further insight into whether vaccinations occurred recently, and what the commonly reported reasons were for non-vaccination. Reasons that closely align with key concepts from theoretical models such as Pender's HPM and the Health Belief Model (Farmanara et al., 2018; Roy et al., 2018).

Logistic Regression Analysis

Logistic regression was conducted to explore the relationships between a group of independent variables and a binary/dichotomous dependent variable. Logistic regression is a type of inferential statistics that seeks to predict and generalize the results to the larger population, to find patterns existing beyond the study's sample (Laerd Statistics, n.d.a; Polit & Beck, 2020). To answer the study's second research question: *What specific factors may be associated with influenza vaccination uptake among Canadian adults with mood and anxiety disorders*, a multiple binary logistic regression analysis was conducted. This analysis included exploring the association between having a seasonal flu shot (lifetime) and 24 independent variables including continuous and categorical variables belonging to three major categories: individual characteristics, interpersonal influences, and situational influences (Laerd Statistics, n.d.a). One of the analytical objectives in this statistical test involved predicting the probability of being in a particular category of the dependent variable "given the independent variables" (Laerd Statistics, n.d.a, para. 2). Overall, a multiple binary logistic regression yielded interpretable information by providing the adjusted odds ratio and its 95% confidence interval (Polit & Beck, 2020). For interpretation and logistic purposes, a referent group was selected for each of the categorical independent variable (Laerd Statistics, n.d.a). All statistical analyses were conducted with the IBM Statistical Package for the Social Science (SPSS) software version 23.

Logistic Regression Assumptions

To accurately conduct a multiple binary logistic regression, one must consider seven important assumptions. The first four assumptions pertain to the measurements chosen and the study design, such as having 1) a dichotomous dependent variable; 2) one or more categorical or continuous independent variables; 3) no relationship or independence of observations between the observations in each category of the dependent variable, and in each category of a nominal independent variable, or between the categories; and 4) the independent variable must contain a minimum of 15 to 50 cases (Laerd Statistics, n.d.a). In this study (see Table 3.1), the first four assumptions were met as the dependent variable is binary, the independent variables include both categorical and continuous level of measurements, there was no dependence of observations nor relationships between the dependent categories and the nominal independent variables as per the CCHS design, and the independent variables contained over 15-50 cases.

Assumptions five, six and seven pertain to data's fit in the logistic regression model, assumptions that were tested using SPSS software, such as testing for 5) a linear association between the independent continuous variables and the logit transformation of the dependent variable using the Box-Tidwell approach; 6) multicollinearity by inspecting the Tolerance/VIF values, and the correlation coefficients; and 7) inspection for extreme outliers, influential or leverage points using case-wise diagnostics (Laerd Statistics, n.d.a). In this study, (see Table 3.1) assumption five was partially met as linearity between relationships and flu vaccine existed in the original data, yet it failed under the multiple imputed data. This assumption however was fully met for number of days physically active and food security variables. There was no multicollinearity between the independent variables as evident by the tolerance and VIF values. Lastly, the case wise diagnostic tool revealed multiple cases with potential outliers in the original and multiple imputed data. However, for feasibility reasons, this study did not remove any outliers.

Overall, when assumptions are found to be violated one can proceed in several ways such as by correcting the data, selecting an alternative statistical test, or continuing with the analysis and cautiously interpreting the results (Laerd Statistics, n.d.a). Ultimately, meeting the assumptions of a logistic regression enabled the researcher to test how well these data fit the regression model and the hypothesis on the regression equation, as well as, to obtain valid results/predictions, and examine the variation in the dependent variable explained by the independent variables, such as by interpreting the Cox & Snell R Square and Nagelkerke R Square (Laerd Statistics, n.d.a).

Table 3.1

Summary of the Logistic Regression Assumptions in the Study

Assumption Number	Assumption	Met	Results	Comments
1	A dichotomous dependent variable.	Yes	Dependent variable consists of 2 categories (yes and no).	N/A
2	One or more independent variables measured either on a continuous or nominal/ordinal scale.	Yes	21 independent variables are nominal/ordinal, and 3 are continuous.	N/A
3	Independence of observation, and categories of the dichotomous dependent variable and all nominal independent variables should be mutually exclusive and exhaustive.	Yes	No relationships between each category of the dependent variable, or each category of the nominal independent variables. No dependence of observations.	Based on the study design-CCHS.

Assumption Number	Assumption	Met	Results	Comments
4	A minimum of 15 cases per independent variable.	Yes	Crosstabulation of all independent variables with the dependent variable showed no variables with less than 15 cases. Minimum cases found in a variable: 73 (original data) and 74 (imputed pooled data).	N/A
5	Linear relationships between the continuous independent variables and the logit transformation of the dependent variable.	Partly	Interaction terms for (1) **number of days physically active** and (2) **food security** variables were not statistically significant, thus were linearly related to the logit of the dependent variable as per the Box-Tidwell procedure in SPSS. (3) **relationship with others/community** variable was statistically significant, thus did not pass the linearity test. Applied the Bonferroni correction based on **all** terms (variables), including the intercept in the model. The p-value 0.001 became the new level at which statistical significance would be accepted. Based on this, the '**relationships with others'** variable remained statistically significant	**Number of days physically active** and **food security** interaction terms were not statistically significant; thus, the original variables are linearly related to the logit of the dependent variable. In the imputed data- **relationship with others/community** is not linearly related to the logit of the dependent variable, even after applying Bonferroni correction, and performing 2 different power transformations. However, in the original data, **relationship with others/community** did pass the test after applying the Bonferroni correction. A study limitation.

Assumption Number	Assumption	Met	Results	Comments
			(not linearly related) as per imputed data. After applying 2 different power transformations/by the power of lambda: (1) raising X to the power of -0.5 and (2) to the power of -1, the **relationships** variable remained significant, and did not pass the test.	
6	There should be no multicollinearity	Yes	Assessed original, and each imputed iteration (x20) via linear regression model: there were **no** tolerance levels less than 0.10 and VIF levels greater than 10.	No multicollinearity was found.
7	There should be no significant outliers, leverage, or influential points.	No	Via case-wise diagnostic in logistic regression SPSS, multiple cases with standardized residual values of > 2.5 were identified in the original data and imputed data x20 iterations Overall, less than 5% of total potential outliers were identified in the entire study, with a range of 18 to 36 outliers across the 20 iterations (0.4% to 0.8%). Pooled results not provided in SPSS	Not feasible to remove all cases with standardized residual values of > 2.5. A study limitation.

Final Variable Selection Process

There are a multitude of approaches to assist researchers in selecting variables that will result in the “best” model within logistic regression (Hosmer et al., 2013). The criteria for selecting variables vary across disciplines, research goals, and problems (Hosmer et al., 2013). In fact, there are no superior methods, and according to Hosmer and colleagues (2013) one must always take into consideration the science, statistical methods, experience, and common sense in their model building strategy. Thus, to achieve a meaningful final model, this study followed an iterative process proposed by Hosmer et al. (2013). Their techniques allow researchers to “yield the best possible model,” a non-overfit model that takes into consideration the significance level of variables whilst retaining all intuitive and clinically relevant variables in the final model. (Hosmer et al., 2013, p. 89).

According to Hosmer et al. (2013) within the multivariate logistic regression context, initially all predictor variables are entered into the model. The variable with the highest p-value is removed, and the remaining predictor variables are then re-entered into the regression model (Hosmer et al., 2013). Next, a new variable with the highest remaining p-value is removed, and the remaining variables are once again re-entered into the model (Hosmer et al., 2013). If the removal of a particular variable leads to considerable changes in the regression coefficients in any of the remaining predictor variables (i.e., change of > 20%), then that variable is re-entered into the model, and the next variable with the highest p-value is removed (Hosmer et al., 2013). The steps of examining, removing, re-examining, and re-entering of predictor variables continue until an appropriate model with pertinent variables is found. Of importance, variables with substantial relevance to the population, literature and /or theory remain in the model regardless of their significance levels. Overall, the study’s final variable selection approach broadly followed the principles of Hosmer et al. (2013) and considered variables with strong theoretical foundation, literature support, and relevance to the mental health population. Chapter four provides specific details of the process utilized to arrive at the final model.

Sampling Weight

To ensure data produced from the CCHS is representative of the population and not just the study's sample, a sampling weight must be applied during all analyses (Statistics Canada, 2019). Thus prior to conducting a univariate descriptive analysis, the CCHS sampling weight (WTS_M) was applied to ascertain accurate population estimates for the applicable variables, (Statistics Canada, 2019). Typically, in the CCHS, each respondent was given a survey weight corresponding to the total population that the respondent represents (Statistics Canada, 2019). Initially, individual person-level weights are used for each frame: an area frame and a telephone frame (Statistics Canada, 2019). Adjustments based on modeling probabilities are then applied to each weight (Statistics Canada, 2019). Subsequently, groups of respondents and non-respondents are created based on the probabilities, to transfer the weights of the non-respondents to the respondents (Statistics Canada, 2019). Lastly, a single set of weights is created by combining the person-level weights from each frame, and further adjustments are applied-Winsorization and Calibration to ultimately become the final person-level weights (Statistics Canada, 2019).

Further, to perform inferential statistical analyses, the CCHS sampling weight was rescaled to the actual size of the sample analyzed (Statistics Canada, 2019). This allows us to yield accurate inferential estimates such as confidence intervals and P-values, thus preventing bias (Statistics Canada, 2019). The sampling weight was rescaled by dividing the master sampling weight by the population size (1,094,274) multiplied by the sample size (4,740) used in the analysis - WTS_M / 1094274*4740.

Missing Data

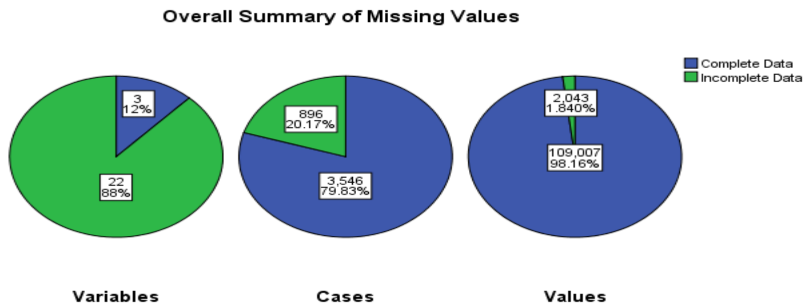
Prior to conducting a logistic regression, a careful examination of missing data was performed. Dealing with missing data is essential to reduce its potential bias on the inferential results and improve the statistical power (Graham, 2009; Rassler et al., 2013). There are three important mechanisms of missingness to consider: data that is missing completely at random (MCAT), missing at random (MAR), and missing not at random (MNAR) - data that is missing due to unknown characteristics (Graham, 2009). To assess the amount, extent, and pattern of missing data in the predictor and outcome variables, two interrelated analysis procedures were performed in SPSS: Missing Value Analysis and Analyze Patterns (in Multiple Imputation) (IBM, n.d.a). Further, within the Missing Value Analysis, Little's MCAR test was performed to test the null hypothesis that the data are MCAR (IBM, n.d.a). If the P-value for the test is higher than 0.05 it can be concluded that the data are MCAR. However, If the P-value is less than 0.05 then data are not MCAR (IBM, n.d.a).

Overall Missing Data Analysis Results

According to the missing values analysis (see Figure 3.3), 88% (22) of the variables had missing data, while 12% (3) of the variables contained no missing data. In terms of total cases, 20.17% (896) of cases were incomplete and 79.83% (3,546) were complete. From the total values assessed, 2.04% of values were missing, while 98.16% of values were complete (no missing data).

Figure 3.3

Summary of Missing Values Analysis



The analysis variable summary also revealed the number of missing values for each variable. Typically, less than 5.0% of missingness is considered to be acceptable (Graham, 2009). The dependent variable - **had a seasonal flu shot - lifetime** had 6.8% of missing values. The following is a list of the missing values for the independent variables from lowest to highest percentage of missingness:

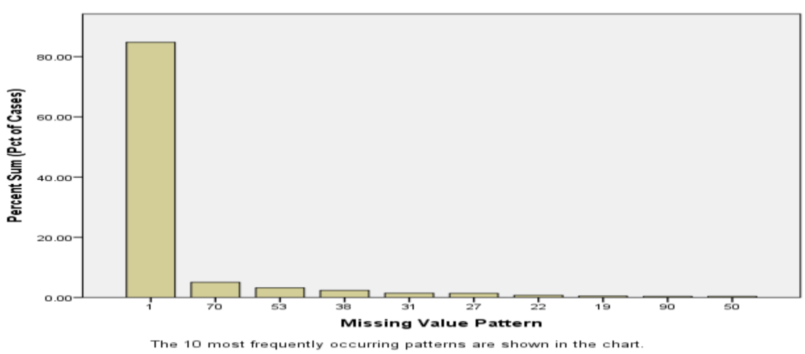
- variables **sex, age group of respondent** and **health region** had 0% missing values;
- individual characteristics-sociodemographic (**income, living arrangement, marital status, cultural/racial background,** and **highest level of education**) ranged from 0.1% to 2.0%;
- chronic conditions and comorbidities (**has diabetes, asthma, arthritis,** and **CVD - cardiovascular disease**) ranged from 0.1% to 2.3%;
- health lifestyle behaviours (**smoking status, time sitting/lying watching screen - not school/workday - 7d, time sitting/lying watching screen - school/workday - 7d, type of drinker - 12 mo., physical activity indicator, numb of days physically active - 7d,** and **BMI**) ranged from 0.2% to 10.2%;

- perceived health status variables (**perceived health** and **perceived mental health**) ranged from 0.4% to 6.7%;
- missingness from interpersonal influences - **Relationships - relationships with others/community** was 6.4%, situational influences-**Primary Care - access to primary health care** was 0.5%., and **Food Security** was 1.5%.

Next in the analysis was a review of the pattern frequencies chart (see Figure 3.4) displaying the "percentage of cases for each pattern," showing that more than half of the cases contain pattern one, the most common pattern for cases with no missing values (IBM, n.d.a, para. 4). The remaining patterns were much less prevalent, representing cases with missing values, including patterns with missing values occurring across more than one variable.

Figure 3.4

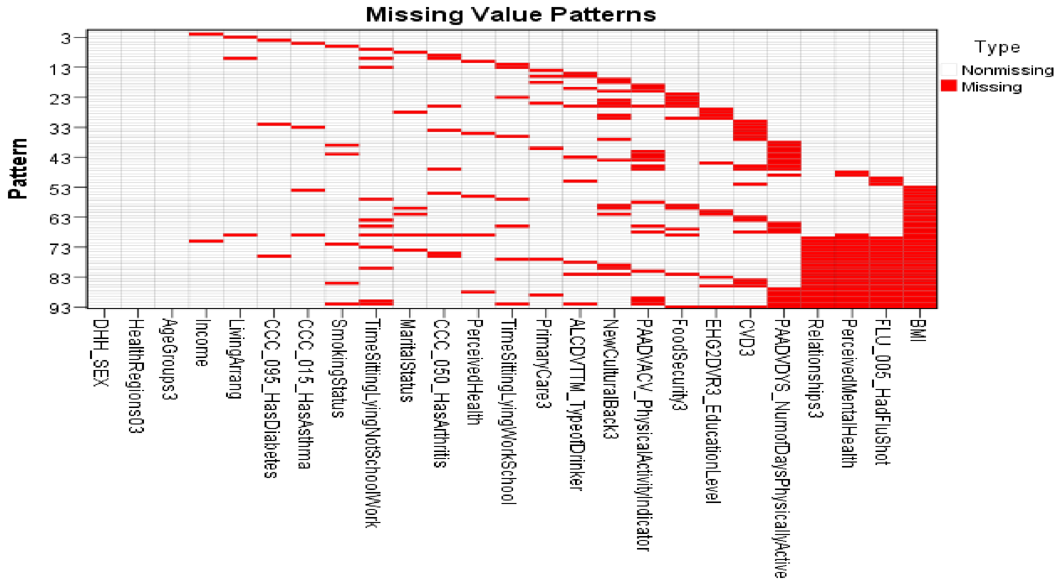
Missing Value Frequency Pattern



Lastly, the missing value patterns chart revealed no observed monotone patterns (see Figure 3.5), and Little's MCAR test was significant: chi-square= 40.32, df= 8, p= 0.000; thus, the null hypothesis was rejected, the data are not MCAR. Overall, upon running and evaluating the missing data analyses, it was concluded that the data are missing at random (MAR).

Figure 3.5

Missing Value Patterns



Multiple Imputation

If data are missing at random, then methods such as multiple imputation are necessary to handle the missing data, to ultimately enhance the accuracy of the binary logistic regression analysis and reduce non-response bias (Graham, 2019; Goeij et al., 2013; Rassler et al., 2013; Rubin, 1996). Multiple imputation is a sophisticated, iterative process of replacing the missing values and "creating several complete sets of data" (IBM, n.d.b, p. 11). SPSS uses an intuitive multiple imputation method called Multiple Imputation Chained Equations (MICE), an alternative approach to traditional methods (Azur et al., 2011; IBM, n.d.b; Nguyen et al., 2021). Within MICE, the Fully Conditional Specification (FCS) method was custom selected for this study, which is appropriate for when the pattern of missingness is arbitrary (Azur et al., 2011; IBM, n.d.a; IBM, n.d.b; Nguyen et al., 2021). Then, the Predictive Mean Matching (PMM) model was chosen "to be used as a univariate model for scale variables" (IBM, n.d.b, p. 14). One of the advantages of PMM is its robustness to normality violations (Nguyen et al., 2021).

Typically, in multiple imputation, applicable variables are imputed over several stages, first undergoing simple mean imputations, then a regression phase to predict the missing values for each variable (Azur et al., 2011; Goeij et al., 2013; IBM, n.d.b). "At the end of one cycle, all of the missing values have been replaced with predictions from regression that reflect relationships in the data" (Azur et al., 2021, p. 42). This study included the outcome variable and all 24 predictor variables in the multiple imputation process, as inclusion of all relevant and associated variables assists the prediction of missing values in the regression model (Azur et al., 2021; Ginkel et al., 2019; Goeij et al., 2020; Graham, 2019; Rassler et al., 2013). Further, following the recommendations of Graham (2019), 20 imputations were selected, reflecting the percentage of total cases missing in this study.

Variable Preparation for Multiple Imputation

To successfully conduct multiple imputation, a total of nine predictor (categorical) variables required collapsing of response option categories prior to undergoing the procedure (see Appendix F, Table F1): **smoking status, time sitting/lying watching screen - not school/workday - 7d, time sitting/lying watching screen - school/workday - 7d, BMI, income, living arrangement, marital status, perceived health**, and **perceived mental health**. In general, numerical issues including perfect prediction and exceeding parameter limits can occur when imputing categorical variables, particularly ones with sparse categories (Azur et al., 2021; Ginkel et al., 2019; Goeij et al., 2013). In the event of such numerical issues, one of the proposed strategies within SPSS and literature is to collapse certain categorical variables with more than two categories to manage sparsity and produce greater cell sizes (Azur et al., 2021; Ginkel et al., 2019; Goeij et al., 2013). Ultimately, collapsing the nine categorical variables resolved the problem, and multiple imputation was run successfully. However, it is important to note the limitation of collapsing variables as meaningful information may be lost (Ratner & Sawatzky, 2009). Regardless of the limitations of multiple imputation, and the necessary re-categorization of response options, the decision was seen as beneficial to mitigate bias attributed to missing data.

Ethical Considerations

To ensure principles of research ethics are upheld, this study was continually reviewed, guided, and supported by TWU's supervisor Dr. Angela Wolff, and second reader Dr. Kendra Rieger. In addition, participation in the CCHS was voluntary, and required verbal consent from participants (Statistics Canada, 2019). The CCHS interviewers and personnel are highly trained and specialized, including speaking a wide range of languages to reduce any language barriers, and ensure participants understand the process and the questions of the survey (Statistics Canada, 2019). Overall, in alignment with the guidance of the TWU Human Research Ethics Board (HREB), application to the research ethics board of TWU was deemed unnecessary as the study possessed minimal risk and the CCHS produced a publicly available data file (Statistics Canada, 2019).

Chapter Summary

In conclusion, this study analyzed data from the 2017-2018 CCHS to answer the research questions. The CCHS produces reliable and representative data of the Canadian population. Initially, this study included 24 predictors variables, belonging to three major categories that correspond to literature and theory. The analytical techniques selected for this study include univariate descriptive analysis and logistic regression. Prior to performing inferential statistical analysis, missing data was analyzed and handled using multiple imputation to produce reliable estimates and reduce bias. Assumptions of logistic regression were thoroughly tested, and then a final variable selection process within logistic regression was conducted, using techniques inspired by Hosmer et al. (2013). Notably, this study contains several limitations including the use of secondary data and the collapsing of variables. Overall, this study possessed minimal risk and was continually supported and reviewed by TWU supervisors. The next chapter (four) reports the findings of the descriptive and logistic regression analyses, which included the variable selection process.

CHAPTER FOUR: STUDY FINDINGS

Guided by the literature and Pender's HPM, the purpose of this study was to investigate influenza vaccination among individuals with mental illness in Canada. Specifically, I explored influenza vaccine rates and the relationships between receiving a vaccine and specific factors such as individual characteristics, interpersonal and situational influences. The sample was drawn from the CCHS records for 2017-2018 and analyzed using bivariate and logistic multiple regression. The following chapter provides results of the analyses. This chapter begins with presenting the total sample characteristics followed by the findings for each research question. Additional sub-analyses pertaining to question one are detailed to describe and compare flu shot times, reasons for non-vaccination, and to further understand the characteristics of the mental health population that has "had a flu shot - lifetime."

Sample Characteristics

The total sample (adults with and without mental illness) for this study (N= 31,468) comprises adults 18 years and older living in four Canadian provinces: British Columbia (BC), Alberta (AB), Prince Edward Island (PEI), and Newfoundland and Labrador (NFL). Table 4.1 portrays the distributions of individual-sociodemographic characteristics in the total sample.

Table 4.1

Sample Characteristics of the Adult Respondents Living in NFL, PEI, AB, and BC

Characteristics	**Has a Mental Illness** frequency (%)	**No Mental Illness** frequency (%)	**Total Sample** frequency (%)	**Between Group Comparison Statistic**	**Total Missing %**
Age group				X^2=97.61 p = .00 (df=2)	0.0
18-39	1,640 (43.6)	7657 (37.6)	9327 (38.4)		
40-59	1,638 (34.5)	8184 (33.8)	9862 (33.9)		
60 +	1,462 (21.9)	10748 (28.6)	12274 (27.8)		

Characteristics	**Has a Mental Illness** frequency (%)	**No Mental Illness** frequency (%)	**Total Sample** frequency (%)	**Between Group Comparison Statistic**	**Total Missing %**
Sex				X^2=371.76 p = .00 (df=1)	0.0
Male	1,611 (36.4)	12835 (51.9)	14518 (49.7)		
Female	3,129 (63.6)	13754 (48.1)	16950 (50.3)		
Cultural/racial background				X^2=122.51 p = .00 (df=1)	1.4
White	3,838 (76.8)	20595 (68.5)	24526 (69.7)		
Non-white	844 (36.4)	5713 (31.5)	6596 (30.3)		
Highest level of education				X^2=86.12 p = .00 (df=2)	1.5
Less than secondary-school graduation	675 (10.7)	3320 (9.0)	4036 (9.4)		
Secondary school graduation-no post secondary education	1,342 (31.9)	6511 (26.2)	7883 (27.0)		
Post-secondary certificate diploma or univ degree	2,656 (57.5)	16419 (64.8)	19139 (63.6)		
Total household income-all sources				X^2=268.33 p = .00 (df=2)	0.1
No income or less than $20,000	720 (9.8)	1762 (4.8)	2497 (5.6)		
$20,000 to $79,999	2304 (41.6)	11924 (36.5)	14302 (37.3)		
$80,000 or more	1711 (48.5)	12883 (87.9)	14644 (57.2)		
Marital Status				X^2=424.90 p = .00 (df=2)	0.3
Married/Common law	2072 (50.6)	15485 (66.5)	17618 (64.2)		
Widowed/divorced/ separated	1193 (15.9)	552 (11.3)	6782 (12.0)		
Single	1459 (33.6)	5480 (22.2)	6979 (23.8)		
Living Arrangement				X^2=250.01	0.2

Characteristics	**Has a Mental Illness** frequency (%)	**No Mental Illness** frequency (%)	**Total Sample** frequency (%)	**Between Group Comparison Statistic**	**Total Missing %**
				p = .00 (df=2)	
Unattached individual: living alone or living with others	1939 (27.5)	8797 (20.5)	10792 (21.5)		
Attached individual or a parent: individual living with spouse/partner, or parent living with spouse/partner and child(ren), or single parent living with children	2201 (49.2)	15361 (61.8)	17619 (59.9)		
Child or other: child living with a single parent with or without siblings, or child living with two parents with or without siblings, or other	586 (23.2)	2369 (17.8)	2980 (18.6)		

X^2=Chi squared test.

Notes. Total *N*=31,468, Mental illness group n=4,740, No mental Illness group n=26,728. Mental illness: mood and/or anxiety disorders. Valid percent used. Sampling weight rescaled for percentages and bivariate statistics.

To begin, 15% of adults living in these four provinces have a mental illness (mood and/or anxiety disorder) (n=4,740), whereas 85% denied having a mental illness (n=26,728). Majority of the total sample are between the ages of 18 and 59 (72.3%), and 27.8% are ages 60 and higher. Half of the respondents are female (50.3%), slightly over two thirds (69.7%) identify as "white," 63.6% obtained a post-secondary degree, and 57.2% earned an annual household income of $80,000 or more. Lastly, nearly two thirds (64.2%) are married or common law, and 60.0% are an attached individual or a parent. Additionally, differences for the mental illness groups were found for **age** (X^2=97.61, p = .00, (df=2)), **sex** (X^2=371.76, p = .00, (df=1)), **culture/racial background** (X^2=122.51, p = .00, (df=1)), **education** (X^2=10.9, p = .00, (df=2)), **income** (X^2=268.33, p = .00, (df=2)), **marital status** (X^2=424.90, p = .00, (df=2)), and **living arrangement** (X^2=250.01, p = .00, (df=2)) (see Table 3.0).

In summary, compared to those with no mental illness, a greater proportion of individuals with mental illness are between the ages of 18 and 59 (78.1% vs. 71.4%), female (63.6% vs. 48.1%, respectively), and identify as "white" (76.8% vs. 68.5%). More individuals with mental illness reported obtaining less than post-secondary education (42.6%) and earning less than $80,000 in annual household income (51.4%) compared to those with no mental illness (35.2% and 41.3%, respectively). Finally, a lower proportion of adults with mental illness are married or common law (50.6%), as well as attached individual or parent (49.2%), compared to the no mental illness group (66.5% and 61.8%, respectively).

Research Question One

The following section reports the influenza vaccine rates between Canadian adults with and without mental illness. For further insight and enrichment, additional post-hoc analyses were conducted to further understand the mental illness population in terms of their vaccine times, reasons for non-vaccination, and vaccine status.

Among the adult population sampled, nearly two thirds (65.1%) of individuals with mental illness received a **flu shot - lifetime** compared to 59.0% of individuals without a mental illness (X^2=56.6, p = .00, (df=1)) (see Table 4.2 and Figure 4.1). Upon further examination, receipt of **flu shot - last time** was more recent among those without a mental illness compared to those with a mental illness (see Table 4.3 and Figure 4.2). Specifically, 55.9% of respondents with mental illness received the flu shot less than one year ago compared to 59.9% without a mental illness (U=17,103,586.5, p = .0001, (z= -4.3)).

Table 4.2

Lifetime Flu Shot Rates: A Comparison Between Canadian Adults with and without Mental Illness

Flu Shot Variable	**Has a Mental Illness** frequency (%)	**No Mental Illness** frequency (%)	**Total Sample** frequency (%)	**Between Group Comparison Statistic**
Had a seasonal flu shot (lifetime)				X^2= 56.6 p = .00 (df=1)
Yes	**2,960 (65.1)**	**15,665 (59.0)**	18,701 (59.9)	
No	1,556 (34.9)	10,268 (41.0)	11,867 (40.1)	

X^2=Chi squared test.

Notes. Total N=31,468, Mental illness group n=4,740, No mental illness group n=26,728. Mental illness: mood and/or anxiety disorders. Valid percent used. Sampling weight rescaled for percentages and bivariate statistics.

Figure 4.1

Lifetime Flu Shot Rates: A Comparison Between Canadian Adults with and without Mental Illness

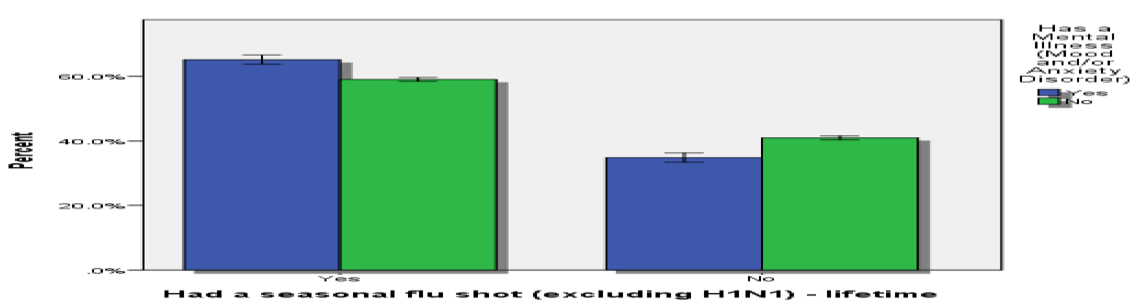


Table 4.3

Flu Shot - Last Time Comparisons Between Canadian Adults with and without Mental Illness

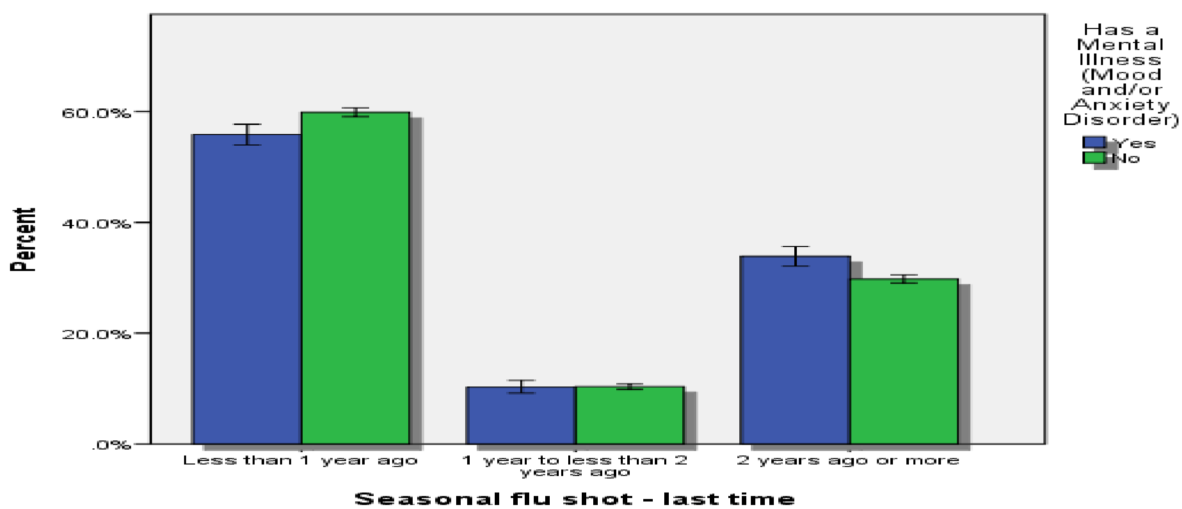
Flu Shot Variable	**Has a Mental Illness** frequency (%)	**No Mental Illness** frequency (%)	**Total Sample** frequency (%)	**Between Group Comparison Statistic**
Seasonal flu shot- last time				*U*= 17,103,586.5 *p* = .0001 (z= -4.3)
Less than 1 year ago	**1,749 (55.9)**	**9,935 (59.9)**	11,735 (59.3)	
1 year or less than 2 years ago	289 (10.3)	1,440 (10.3)	1,739 (10.3)	
2 years ago, and more	**914 (33.9)**	**4,249 (29.8)**	5,177 (30.4)	

U=Mann Whitney U Test.

Notes. Total *N*=31,468, Mental illness group, n=4,740, No mental illness group, n=26,728. Mental illness: mood and/or anxiety disorders. Valid percent used. Sampling weight rescaled for percentages and bivariate statistics.

Figure 4.2

Flu Shot -Last Time Comparisons Between Canadian Adults with and without Mental Illness



Reasons for Influenza Non-Vaccination Comparisons Between Canadian Adults with and without Mental Illness

To further understand vaccination receipt, additional post-hoc bivariate analyses were completed to compare the **reasons for influenza non-vaccination** between the mental illness groups. The CCHS asked respondents who were not vaccinated to provide reasons for not receiving the flu shot. These questions are reflective of major frameworks such as the health belief model that have informed research on individuals' health behaviours including vaccination (Farmanara et al., 2018). The top six reasons for non-vaccination in the mental illness group were (see Table 4.4): respondent did not think it was necessary (52%), does not believe in benefits (14%), lack of time (11%), bad reaction to previous flu shot (10%), fear/discomfort (5%), and fear of what it contains (5%). Of those reasons, a greater proportion of respondents with mental illness reported: lack of time (11%), bad reaction to previous flu shot (10%), and fear of what it contains (5%) compared to those without mental illness (9%, 7% and 4%, respectively).

Table 4.4

Reasons for Non-Vaccination (Flu) among Canadian Adults with and without Mental Illness

Reasons	**Has a Mental Illness** frequency (%)	**No Mental Illness** frequency (%)	**Total Sample** frequency (%)	**Between Group Comparison Statistic**
Lack of time				X^2=8.4 p = .004 (df=1)
Yes	**232 (11.0)**	**1,230 (9.2)**	1,464 (9.4)	
No	2,491 (89.0)	14,491 (90.8)	17,044 (90.6)	
Respondent did not think it was necessary				X^2=45.0 p = .00 (df=1)
Yes	**1,409 (51.9)**	**9,295 (58.9**)	10,741 (57.9)	

Reasons	Has a Mental Illness frequency (%)	No Mental Illness frequency (%)	Total Sample frequency (%)	Between Group Comparison Statistic
No	1,314 (48.1)	6,426 (41.1)	7,767 (42.1)	
Doctor did not think it was necessary				$X^2 = 0.0$ $p = .972$ (df=1)
Yes	40 (1.6)	265 (1.6)	310 (1.6)	
No	2,683 (98.4)	15,456 (98.4)	18,198 (98.4)	
N/a at time required				$X^2 = 0.1$ $p = .829$ (df=1)
Yes	55 (1.9)	263 (1.9)	320 (1.9)	
No	2,668 (98.1)	15,458 (98.1)	18,188 (98.1)	
Did not know where to go/uninformed				$X^2 = 0.1$ $p = .754$ (df=1)
Yes	38 (1.5)	200 (1.6)	239 (1.6)	
No	2,685 (98.5)	15,521 (98.4)	18,269 (98.4)	
Fear/discomfort				$X^2 = 3.6$ $p = .057$ (df=1)
Yes	145 (4.6)	595 (3.8)	742 (3.9)	
No	2,578 (93.6)	15,126 (96.2)	17,766 (96.1)	
Bad reaction to previous flu shot				$X^2 = 34.2$ $p = .00$ (df=1)
Yes	**288 (9.7)**	**1,141 (6.5)**	1,433 (7.0)	
No	2,435 (90.3)	14,580 (93.5)	17,075 (93.0)	
Bad reaction to previous vaccine other				$X^2 = 1.0$ $p = .320$ (df=1)
Yes	49 (1.4)	219 (1.2)	268 (1.2)	
No	2,674 (98.6)	15,502 (98.8)	18,240 (98.8)	
Does not believe in benefits				$X^2 = 2.8$ $p = .095$ (df=1)
Yes	416 (13.6)	2,458 (14.9)	2,881 (14.7)	

Reasons	**Has a Mental Illness** frequency (%)	**No Mental Illness** frequency (%)	**Total Sample** frequency (%)	**Between Group Comparison Statistic**
No	2,307 (86.4)	13,263 (85.1)	15,627 (85.3)	
Fear of what it contains				X^2= 6.3 *p* = .012 (df=1)
Yes	**150 (4.5)**	**659 (3.6)**	811 (3.7)	
No	2,573 (95.5)	15,062 (96.4)	17,697 (96.3)	
Other *				X^2= 7.4 *p* = 0.006 (df=1)
Yes	**350 (12.7)**	**1,785 (10.9)**	2,145 (11.1)	
No	2,373 (87.3)	13,936 (89.1)	16,363 (88.9)	

X^2=Chi squared test.

* not specified in the CCHS.

Notes. Total *N* sample=31,468, Mental illness n=4,740, No mental illness n=26,728. Mental illness: mood and/or anxiety disorders. Stated reasons for flu non-vaccination as per the exact wording in the CCHS. Valid percent used. Sampling weight rescaled for percentages and bivariate statistics.

Description of the Mental Health Sample

In terms of the mental health respondents, the next post-hoc analysis was to describe their sample characteristics and examine the differences between the vaccinated and unvaccinated: sociodemographic, non-sociodemographic, interpersonal, and situational influences.

Sociodemographic Individual Characteristics

Table 4.5 portrays the distributions and bivariate results of individual-sociodemographic characteristics in the **mental illness sample** (N=4,740) such as age, sex, cultural/racial background, education, income, marital status and living arrangement. **Age** differences were noted between the vaccinated and unvaccinated group (X^2=85.2, p = .00, (df=2)). Three quarters

(78.1%) of the sample are between the ages of 18 and 59, and the predominant age group in the unvaccinated group was 18 to 39 (50.8%) compared to the vaccinated group (39.5%). Notable differences in **sex** were noted (X^2=17.8, p = .00, (df=1): more than half of the mental illness sample are female (63.6%), and the flu shot group had more females (67.4%). Further, the majority of the respondents identified as white (76.8%). In terms of **education**, more than half (57.5%) report having a post-secondary certificate diploma/university degree, while the remainder (42.6%) have secondary and less than secondary school education. Notably, the flu shot group had more respondents with post-secondary education (60.6%) relative to the unvaccinated group (55.5%), (X^2=10.9, p = .004, (df=2)). Almost half of the respondents (48.5%) earned an annual **household income** of $80,000 or more, 41.6% earned between $20,000 and $79,000, whereas only 9.8% reported earnings of less than $20,000 or no income. Further, the flu shot group had more respondents with household incomes of $20,000 to $79,000 and $80,000 or more compared to the unvaccinated group (X^2=7.0, p = .031, (df=2)). In terms of **marital status**, approximately half (50.6%) of the sample are married or common law, and the remainder (49.5%) are either single or widowed/divorced/separated. As well, the flu shot group had more married/common-law respondents (53.6%) relative to those who did not have a flu shot (47.4%), (X^2=38.2, p = .00, (df=2)). Lastly, for **living arrangement**, slightly less than half of the sample (49.2%) are attached individuals living with spouse/partner or are parents with spouse/partner and child. However, 27.5% are unattached individuals living alone or with others. The vaccinated group had more respondents with a living arrangement of attached individuals (51.9%) such as those living with spouse/partner or parent living with spouse/partner and child(ren) relative to the unvaccinated group (46.8%), (X^2=13.3, p = .001, (df=2).

Table 4.5

Sociodemographic Characteristics and Flu Shot - Lifetime Group Comparisons of the Mental Health Respondents

Characteristics	**Had a Flu shot** frequency (%)	**No Flu Shot** frequency (%)	**Total Mental Illness Sample** frequency (%)	**Between Group Comparison Statistic**	**Total Missing %**
Age group				$X^2 = 85.2$ $p = .00$ (df=2)	0.0
18-39	**905 (39.5)**	**655 (50.8)**	1,640 (43.6)		
40-59	1,019 (36.1)	588 (35.4)	1,638 (34.5)		
60 +	**1,036 (24.4)**	**313 (13.7)**	1,462 (21.9)		
Sex				$X^2 = 17.8$ $p = .00$ (df=1)	0.0
Male	**904 (32.6)**	**578 (38.9)**	1,611 (36.4)		
Female	2,056 (67.4)	978 (61.6)	3,129 (63.6)		
Cultural/racial background				$X^2 = 1.0$ $p = .751$ (df=1)	1.3
White	2,426 (77.4)	1,273 (76.9)	3,838 (76.8)		
Non-white	502 (22.6)	296 (23.1)	844 (36.4)		
Highest level of education				$X^2 = 10.9$ $p = .004$ (df=2)	2.0
Less than secondary-school graduation	**359 (9.5)**	**250 (11.1)**	675 (10.7)		
Secondary school graduation-no post secondary education	778 (29.9)	494 (33.4)	1,342 (31.9)		
Post-secondary certificate diploma or univ degree	**1,785 (60.6)**	**791 (55.5)**	2,656 (57.5)		
Total household income-all sources				$X^2 = 7.0$ $p = .031$ (df=2)	0.1

Characteristics	**Had a Flu shot** frequency (%)	**No Flu Shot** frequency (%)	**Total Mental Illness Sample** frequency (%)	**Between Group Comparison Statistic**	**Total Missing %**
No income or less than $20,000	**409 (9.2)**	**290 (11.6)**	720 (9.8)		
$20,000 to $79,999	1448 (41.0)	728 (40.9)	2304 (41.6)		
$80,000 or more	**1100 (49.8)**	**537 (47.5)**	1711 (48.5)		
Marital Status				X^2= 38.2 *p* = .00 (df=2)	0.4
Married/Common law	**1356 (53.6)**	**616 (47.4)**	2072 (50.6)		
Widowed/divorced/ separated	794 (17.1)	362 (14.1)	1193 (15.9)		
Single	**800 (29.3)**	**573 (38.4)**	1459 (33.6)		
Living Arrangement				X^2= 13.3 *p* = .001 (df=2)	0.1
Unattached individual: living alone or living with others	1223 (28.3)	675 (29.4)	1939 (27.5)		
Attached individual or a parent: individual living with spouse/partner, or parent living with spouse/partner and child(ren), or single parent living with children	**1421 (51.9)**	**678 (46.8)**	2201 (49.2)		
Child or other: child living with single parent with/out sib, or child living with 2 parents with/out sib, or other	311 (19.8)	194 (23.8)	586 (23.2)		

X^2=Chi squared test.

Notes. Total *N*=4,740, “Had a flu shot” group n=2,960, “No flu shot” group n=1,556. Valid percent used. Sampling weight rescaled for percentages and bivariate statistics.

Non-Sociodemographic Individual Characteristics

Tables 4.6 and 4.7 provide the distributions and bivariate results of non-sociodemographic individual characteristics in the mental illness sample such as chronic conditions and comorbidities (i.e., asthma, arthritis, cardiovascular disease, and diabetes), as well as health lifestyle behaviours (i.e., smoking status, type of drinker, physical activity indicator, number of days physically active, sedentary behaviours, and BMI). In terms of chronic conditions, majority of the respondents reported “no” to having **diabetes** (91.7%), **asthma** (84.3%), **arthritis** (73.1%), and **cardiovascular disease** (72.6%). Differences were found for asthma (X^2=32.0, p = .00, (df=1)), arthritis (X^2=46.6, p = .00, (df=1)), cardiovascular disease (X^2=46.9, p = .00, (df=1)), and diabetes (X^2=42.1, p = .00, (df=2)). Relative to those who did not have a flu shot, the vaccinated group had more respondents with asthma (17.8%), arthritis (30.2%), cardiovascular disease (30.5%), and diabetes (10.0%).

Moving on to health lifestyle behaviours, for **smoking status**, only 27.1% of the mental health respondents currently smoke (daily or occasional), while the remainder (73.0%) denied currently smoking (i.e., former or lifetime abstainers/experimental). Additionally, the vaccinated group had more respondents who formerly smoked cigarettes (43.5%) and those who experimented in the past or completely abstained from smoking (32.1%) compared to the unvaccinated group (36% and 30.2% respectively), (X^2=47.2, p = .00, (df=2)). For **type of drinker**, more than half of the sample drink regularly (59.6%), whereas 20.2% did not drink in the past 12 months. However, the unvaccinated group had slightly more individuals who regularly or occasionally drink (83.8%) compared to the vaccinated group (80%), (X^2=10.0, p = .007, (df=2)). In terms of **physical activity indicator**, more than half (59.8%) are physically active at or above the recommended, and the average number of days that respondents are physically active in any given week is 4.0 days (SD=2.7). The flu shot group had a higher number of individuals physically active below the recommended levels or with no reported physical activity minutes (41.3%) (X^2=22.3, p = .00, (df=2)), and with lower mean scores (M=3.9, SD=2.7) for number of days physically active (t= -4.2, p = .00, (df=4288)), relative to those who did not receive a flu shot. In terms of **sedentary behaviours during school/workday**, more than half (60.3%) of the sample spent less than eight hours sitting/lying watching screen per day. For sedentary behaviours-not during school/workday (leisure) in the past seven days, almost two thirds (60.2%) spent less than four hours per day sitting/lying watching screen, and only (9.1%) spent eight or more hours per day. The vaccinated group had a greater percentage of individuals who were not at work/school in the past seven days or more (38.4%) (X^2=36.3, p = .00, (df=2)) and spent less than four hours per day (63.5%) sitting/lying during leisure times (X^2=10.6, p = .005, (df=2)), relative to the unvaccinated group. Lastly, in terms of **self-reported BMI**, more than half (58.4%) are classified as overweight or obese, whereas 38.9% are of normal weight and only 2.7% are underweight.

Table 4.6

Chronic Conditions and Comorbidities Characteristics and Flu Shot - Lifetime Group Comparisons of the Mental Health Respondents

Characteristics	**Had a Flu shot** frequency (%)	**No Flu Shot** frequency (%)	**Total Mental Illness Sample** frequency (%)	**Between Group Comparison Statistic**	**Total Missing %**
Has asthma				X^2= 32.0 p = .00 (df=1)	0.2
Yes	**503 (17.8)**	**188 (11.4)**	723 (15.7)		
No	2,453 (82.2)	1,364 (88.6)	4,008 (84.3)		
Has arthritis				X^2= 46.6 p = .00	0.4

Characteristics	Had a Flu shot frequency (%)	No Flu Shot frequency (%)	Total Mental Illness Sample frequency (%)	Between Group Comparison Statistic	Total Missing %
				(df=1)	
Yes	**1,103 (30.2)**	**424 (20.7)**	1,606 (26.9)		
No	1,847 (69.8)	1,126 (79.3)	3,116 (73.1)		
Has cardiovascular disease				X^2= 46.9 p = .00 (df=1)	2.3
Yes	**1,064 (30.5)**	**400 (20.8)**	1,544 (27.4)		
No	1,831 (69.5)	1,116 (79.2)	3,081 (72.6)		
Has diabetes				X^2= 42.1 p = .00 (df=1)	0.1
Yes	**364 (10.0)**	**112 (4.4)**	502 (8.3)		
No	2,595 (90.0)	1,441 (95.6)	4,233 (91.7)		

X^2=Chi squared test.

Notes. Total *N*=4,740, "Had a flu shot" group n=2,960, "No flu shot" group n=1,556. Valid percent used. Sampling weight rescaled for percentages and bivariate statistics.

Table 4.7

Health Lifestyle Behaviours Characteristics and Flu Shot - Lifetime Group Comparisons of the Mental Health Respondents

Characteristics	Had a Flu shot frequency (% or mean)	No Flu Shot frequency (% or mean)	Total Mental Illness Sample frequency (% or mean)	Between Group Comparison Statistic	Total Missing %
Smoking status-traditional definition				X^2= 47.2 p = .00 (df=2)	0.3
Current smoker (daily or occasional)	**759 (24.4)**	**564 (33.8)**	1366 (27.1)		
Former smoker (daily or occasional)	**1328 (43.5)**	**574 (36.0)**	1980 (40.4)		
Experimental smoker (at least 1	868 (32.1)	413 (30.2)	1378 (32.6)		

Characteristics	**Had a Flu shot** frequency (% or mean)	**No Flu Shot** frequency (% or mean)	**Total Mental Illness Sample** frequency (% or mean)	**Between Group Comparison Statistic**	**Total Missing %**
cig, non-smoker now), or lifetime abstainer (never smoked a whole cig)					
Type of drinker-12 mo.				X^2= 10.0 *p* = .007 (df=2)	0.6
Regular drinker	**1,626 (60.8)**	**916 (62.8)**	2,623 (59.6)		
Occasional drinker	649 (19.2)	324 (21.0)	1,020 (20.2)		
Did not drink in the past 12 mo.	**672 (20.0)**	**310 (16.2)**	1,073 (20.2)		
Physical activity indicator				X^2= 22.3 *p* = .00 (df=2)	1.6
Physically active at/ above recommended level from CPAG	**1,602 (58.8)**	**937 (66.1)**	2,602 (59.8)		
Physically active below recommended level from CPAG	**736 (24.3)**	**344 (19.8)**	1,121 (22.5)		
No physical activity minutes reported	**573 (17.0)**	**251 (14.1)**	932 (17.7)		
Number of days-physically active-7d				*t*= -4.2 *p* = .00 (df=4288)	3.7
	2,847 **M=4.0, SD=2.7**	1,504 **M=4.3, SD=2.6**	4,559 (96.3) M=4.0, SD=2.7		
Time sitting / lying watching screen – school / workday – 7d				X^2= 36.3 *p* = .00 (df=2)	0.5
Less than 8 hours	**1507 (60.0)**	**900 (66.7)**	2453 (60.3)		
8 hours or more per day	51 (1.6)	33 (3.1)	88 (2.1)		

Characteristics	**Had a Flu shot** frequency (% or mean)	**No Flu Shot** frequency (% or mean)	**Total Mental Illness Sample** frequency (% or mean)	**Between Group Comparison Statistic**	**Total Missing %**
Was not at work or school for 7 d or more	**1397 (38.4)**	**613 (30.2)**	2180 (37.6)		
Time sitting / lying watching screen – not school / workday – 7d				X^2= 10.6 *p* = .005 (df=2)	0.4
Less than 4 hours	**1786 (63.5)**	**877 (58.7)**	2744 (60.2)		
4 hours to less than 8 hours	901 (28.3)	526 (32.8)	1510 (30.6)		
8 hours or more per day	266 (8.2)	146 (8.6)	467 (9.1)		
BMI classification 18 and + (self-reported) – Intl standard				X^2= 4.4 *p* = .112 (df=2)	9.8
Underweight	61 (2.3)	38 (3.3)	100 (2.7)		
Normal weight	1008 (38.7)	559 (39.6)	1574 (38.9)		
Overweight, or Obese-Class I, II, III	1775 (59.0)	894 (57.1)	2677 (58.4)		

M=Mean. SD=Standard deviation. X^2=Chi squared test. *t*=Independent samples t-test.

Notes. Total *N*=4,740, “Had a flu shot” group n=2,960, “No flu shot” group n=1,556. Valid percent used. Sampling weight rescaled for percentages and bivariate statistics.

Perceived Health (Non-Sociodemographic Individual Characteristics), Interpersonal and Situational Influences

Table 4.8 depicts the remainder of sample characteristics and bivariate results of the mental health respondents in this study: general health (i.e., perceive health and perceived mental health), interpersonal influences (i.e., relationships with others/community) and situational influences (i.e., access to primary health care, health region, and food security). For **general**

health, 36.4% perceive their health as “excellent-very good,” 53.5% as “good-fair” and only 10.1% reported “poor” health. For perceived mental health, slightly over one fourth reported (27.9%) “very good-excellent” mental health, nearly two thirds (62.6%) reported “fair-good” mental health, and only 9.5% reported “poor” mental health. Compared to the unvaccinated group, the flu shot group had more respondents with “fair-good” (63.2%) and “very good-excellent” (28.1%) mental health perceptions (X^2=6.0, p = .052, (df=2)).

Shifting to interpersonal influences, the mean average score for **relationships with others/community** in this sample is 1.7 (SD=0.5), overall an indication of strong relationships, where (1) represents strong relationships and (4) weak relationships. Respondents who received a flu shot reported stronger relationships with others/community, compared to those who did not receive a flu shot (t=-2.2, p = .025, (df=2892.8)). As for situational influences, most respondents in the sample (96.5%) reported having access to primary health care. Notably, the vaccinated group had more respondents with access to primary care (97.4%) relative to the unvaccinated group (94.4%), (X^2=24.9, p = .00, (df=1)). The most predominant **health regions** were BC (50.6%) and AB (41.7%). Further, the vaccinated group had more respondents living in AB health regions (43.9%) relative to the unvaccinated group (38.7%), (X^2=13.7, p = .003, (df=3)). Lastly, for **food security**, the average mean score was 2.8 (SD=0.5), an indication of higher food security in this sample, where (1) represents low food security and (3) high food security. The vaccinated group had more respondents reporting slightly greater food security compared to those unvaccinated (t=2.4, p = .019, (df=2910.3)).

Table 4.8

General Health Characteristics, Interpersonal and Situational Influences, and Flu Shot - Lifetime Group Comparisons of the Mental Health Respondents

Characteristics	**Had a Flu shot** frequency (% or mean)	**No Flu Shot** frequency (% or mean)	**Total Mental Illness Sample** frequency (% or mean)	**Between Group Comparison Statistic**	**Total Missing %**
General health:					
Perceived health				X^2= 3.9 p = .143 (df=2)	0.4
Excellent, or very good	958 (36.8)	545 (38.4)	1550 (36.4)		
Good or fair	1657 (54.0)	855 (54.1)	2632 (53.5)		
Poor	340 (9.2)	151 (7.5)	547 (10.1)		
Perceived mental health				X^2= 6.0 p = .052 (df=2)	6.4
Poor	262 (8.6)	164 (10.9)	430 (9.5)		
Fair or good	**1853 (63.2)**	**948 (61.4)**	2811 (62.6)		
Very good or excellent	**836 (28.1)**	**438 (27.7)**	1276 (27.9)		
Interpersonal influences:					
Relationships with others/ community				t= -2.2 p = .025 (df=2892.8)	6.0
	2,960 **M=1.7, SD=0.5**	1,556 **M=1.7, SD=0.5**	4,532 (94.0) M=1.7, SD=0.5		
Situational influences:					
Has access to primary health care				X^2= 24.9 p = .00 (df=1)	0.5

Characteristics	**Had a Flu shot** frequency (% or mean)	**No Flu Shot** frequency (% or mean)	**Total Mental Illness Sample** frequency (% or mean)	**Between Group Comparison Statistic**	**Total Missing %**
Yes	**2,877 (97.4)**	**1,474 (94.4)**	4,571 (96.5)		
No	73 (2.6)	76 (5.6)	151 (3.5)		
Health region				X^2= 13.7 p = .003 (df=3)	0.0
NFL	254 (5.5)	168 (7.2)	447 (6.2)		
PEI	169 (1.6)	90 (1.7)	268 (1.6)		
AB	**1,229 (43.9)**	**594 (38.7)**	1,896 (41.7)		
BC	**1,308 (49.0)**	**704 (52.5)**	2,129 (50.6)		
Food security				t= 2.4 p = .019 (df=2910.3)	1.5
	2,935 **M=2.8, SD=0.5**	1,543 **M=2.7, SD=0.5**	4,699 (98.5) M=2.8, SD=0.5		

M=Mean. SD=Standard deviation. X^2=Chi squared test. t=Independent samples t-test.

Notes. Total *N*=4,740, “Had a flu shot” group n=2,960, “No flu shot” group n=1,556. Valid percent used. Sampling weight rescaled for percentages and bivariate statistics.

Summary

To conclude this section, the analyses revealed that **higher lifetime-flu vaccination** was evident in the mental illness sample (65%) compared to those without a mental illness (59%). However, it terms of **seasonal flu vaccine-last time** (i.e., those who received a lifetime flu vaccine), it was more recent for individuals without a mental illness (60% vs 56%, respectively). Furthermore, top reasons for non-vaccination (in a lifetime or past year) among those with mental illness were: respondent did not think it was necessary, does not believe in benefits, lack of time, bad reaction to previous flu shot, fear/discomfort and fear of what it contains.

Bivariate associations were detected between the primary dependent variable (flu vaccine lifetime) and specific characteristics among the Canadian adult mental health population: characteristics such as sociodemographic (age, sex, education, income, marital status and living arrangement), non-sociodemographic (chronic conditions/comorbidities, smoking and drinking status, physical activities, sedentary behaviours, and perceived mental health), interpersonal influences (relationships with others/community) and situational influences (access to primary health care, health region and food security). What this means is that half of the unvaccinated mental illness sample belongs to the youngest age group (18-39 years). The vaccinated mental illness group has more females, individuals with higher education and income levels, married or common law, and individuals or parent(s) living with others, compared to the unvaccinated group. The presence of chronic conditions/comorbidities (asthma, arthritis, cardiovascular disease, diabetes), certain healthy lifestyle behaviours (non-smoking and non-drinking status) and unhealthy lifestyle behaviours (reduced physical activity and sedentary patterns during leisure), and greater perceived mental health were more prevalent in the vaccinated group compared to those unvaccinated. As well, greater extent of relationships, access to primary health care, living in AB health region and stronger food security were higher in the vaccinated group compared to the unvaccinated sample. The next section answers the second research question revealing which factors had a crucial role in flu vaccination among the Canadian adult mental health population.

Research Question Two

This final section reports the results of the multiple logistic regression, conducted to estimate the associations with the inclusion of all covariates "to adjust the odds ratios for potential cofounding" (Ratner & Sawatzky, 2009, p. 55). This analysis ultimately answered the study's second research question: *What specific factors can explain Influenza vaccination receipt among Canadian adults with mental illness?* The following section begins with describing the process of purposefully selecting variables to produce a final multivariate model and then concludes with presenting the results of the final model.

Purposeful Selection of Variables

To arrive at the final model with the best fit, variables were selected based on the guidelines offered by Hosmer et al. (2013). As discussed in chapter three (methods section), all 24 predictor variables were carefully examined and purposefully selected to build a final multivariable model. The process of purposeful selection of variables began with identifying the variable with the highest p-value, eliminating it (unless strongly theoretically/clinically relevant), and then assessing the impact of its removal on variables remaining in the smaller model (Hosmer et al., 2013; Zhang, 2016). In this study, if that deleted variable was not theoretically or clinically relevant and if the removal did not significantly impact the overall model, including the direction of coefficients, their odds ratios, standard errors, and p-values, then the variable could safely be removed despite the >20% change in coefficients. The iterative model building strategy although not comprehensively followed in this study, allowed the researcher to minimize the number of predictor variables in the model and produce a numerically stable parsimonious model, whilst also retaining all clinically/theoretically relevant variables, irrespective of their statistical significance (Hosmer et al., 2013; Zhang, 2016).

In this study, **food security** was the first variable removed, with the largest p-value and no impact on the remaining coefficients after its removal. **Type of drinker** and then **perceived health** were the next two variables eliminated, and although type of drinker resulted in a 24% coefficient change in BMI, the overall impact was trivial. **Living arrangement** was removed from the model next; however it caused a 33% change in the marital status coefficient. It was determined these two variables were moderately to strongly correlated (Cramer's *V*=0.58), potentially explaining the change in marital status. Further, the remaining variables in the smaller model were not impacted, and the overall effects on marital status (i.e., odds ratio, p-value, standard error) were negligible. Therefore, due to little impact on the model and weak support in literature, the living arrangement variable was not re-entered into the model. The following deleted variable with the highest p-value was **number of days physically active**. The deletion led to 21%-48% changes in the **physical activity indicator** coefficients. However, it was determined through correlations (i.e., Pearson) these two variables are strongly correlated (- 0.79) and thus the large impact was unsurprising. As well, the impact on the overall model was minimal.

Next, **marital status** was removed and impacted the first **age** group category (30% coefficient change); however, the overall variable (i.e., odds ratio, p-value, standard error) and the model were minimally changed and it was not as theoretically relevant. Afterwards, **BMI** was removed, resulting in trivial impact on the remaining model and had minimal theoretical support. Thereafter, **time sitting/lying watching screen-leisure (not during work/school)** was deleted from the newer model due to a high p-value. A 33% coefficient change in age (first category) and a 28% change in perceived mental health were noted after the deletion; however, the two variables experienced trivial changes in their odds ratios, p-values, and standard errors. Additionally, the deleted variable is not strongly relevant in literature or theory. Lastly, **physical activity indicator** and then **cultural/racial background** variables were removed from the final model, respectively. Removal of the physical activity indicator led to a 40% change in the second health region category (PEI). Similarly, removing cultural/racial background also resulted in a 32% change in the second health region category. However, the impact in both cases was negligible on the overall variables and the model; furthermore, their inclusion was not strongly substantiated in theory or the literature. **Perceived mental health** although statistically insignificant was kept in the final model due to its relevance to the study's population and theory.

Hosmer et al. (2013) also recommends checking for potential interactions among variables in the final candidate model, in case the impact of a certain variable on the response variable is reliant on another variable. However, in this study, checking for interactions was beyond the scope of the project. Nevertheless, as per Hosmer et al. the impacts between covariates in the final candidate model were assessed in SPSS by removing one variable at a time and examining the changes due to the removal on each remaining variable. Although, several changes were noted between variables, the changes were not outstanding and could often be explained by either their correlations or theoretical/clinical perspectives (Hosmer et al., 2013; Zhang, 2016).

Final Multivariate Model: Logistic Regression

The final multivariate model consists of 14 predictor variables (see Table 4.9):

- Sociodemographic: age, sex, education, and income;
- Chronic conditions and comorbidities: asthma, arthritis, cardiovascular disease, and diabetes;
- Health lifestyle behaviours: smoking status, and time sitting/lying watching screen-during workday/school;
- General health: perceived mental health;
- Interpersonal influences: relationships with others/community;

- Situational influences: access to primary health care, and health regions.

The following 11 variables excluded from the final model were:

- Sociodemographic: culture/racial background, marital status, and living arrangement;
- Health lifestyle behaviours: type of drinker, physical activity indicator, number of days physically active, time sitting/lying watching screen - leisure, and BMI;
- General health: perceived health;
- Situational influences: food security.

The final logistic regression model (original data) was statistically significant, χ^2 (22) =277.44, p = .001 (see Table 4.9). For imputed data, all 20 iterations/imputations were statistically significant, χ^2 (22) =272.12 to 326.67 (range), p = .001. Further, in the original data, the Hosmer and Lemeshow test (in SPSS) was not statistically significant (p = .098), indicating the model was not a poor fit (Laerd, n.d.). The Hosmer and Lemeshow test for imputed data varies: 11 out of 20 iterations were not statistically significant (range of p = .051 to .588), while the remaining 9 iterations were statistically significant (range of p = .00 to .044). Lastly, for original data, the model explained 8.8% (Nagelkerke R^2) of the variance in flu shot-lifetime. For imputed data, the model explained 7.7% to 9.2% (range) of the variance in flu shot-lifetime. Pooled (imputed) data for variance explained, model significance and fit was not provided by SPSS. Nevertheless, results for each iteration are provided in Appendix G, Tables G1-G3. Odds ratios with 95% confidence intervals (CI) were computed in this analysis, to assess the magnitude of the associations between the independent and dependent variables. Figure 4.3 provides a visual illustration of the adjusted odds ratios and their CIs.

Table 4.9

Predictor Variables Parameter Estimates (Pooled Imputed Data) for the Mental Illness Sample

Characteristics	***B***	**SE**	***P***	**Odds Ratio (adjusted)**	**95% CI Lower**	**for OR Upper**
1. Age						
18-39 (reference group)						
40-59	0.08	0.08	.335	1.08	0.92	1.27
60 +	0.49	0.12	**.000**	1.63	1.28	2.08
2. Sex: Male [tt]	-0.19	0.07	**.009**	0.82	0.71	0.95
3. Highest Level of Education						
Less than secondary school graduation (reference group)						
Secondary school graduation, no post-secondary education	0.15	0.13	.257	1.16	0.90	1.49
Post-secondary certificate diploma or univ degree	0.33	0.12	**.005**	1.39	1.10	1.75
4. Household Income						
No income or less than $20,000 (reference group)						
$20,000 to $79,999	0.23	0.13	.071	1.25	0.98	1.60
$80,000 or more	0.32	0.13	**.012**	1.38	1.07	1.77
5. Has asthma [t]	0.58	0.12	**.000**	1.78	1.41	2.24
6. Has arthritis [t]	0.27	0.10	**.004**	1.31	1.09	1.58
7. Has cardiovascular disease [t]	0.21	0.10	**.035**	1.23	1.02	1.49
8. Has diabetes [t]	0.60	0.16	**.000**	1.82	1.34	2.48

Characteristics	*B*	SE	*P*	Odds Ratio (adjusted)	95% CI Lower	for OR Upper
9. Smoking status (type 2) - traditional definition						
Current smoker (daily or occasional) (reference group)						
Former smoker (daily or occasional)	0.34	0.09	**.000**	1.40	1.18	1.65
Experimental smoker (at least 1 cig, non-smoker now), or lifetime abstainer (never smoked a whole cig)	0.28	0.10	**.003**	1.32	1.10	1.60
10. Time sitting / lying watching screen - school / workday						
Less than 8 hours (reference group)						
8 hours or more per day	-0.56	0.21	**.008**	0.57	0.37	0.86
Was not at work or School for 7 d or more	0.13	0.09	.136	1.14	0.96	1.36
11. Perceived mental health						
Poor (reference group)						
Fair, or Good	0.23	0.13	.080	1.26	0.97	1.63
Very good, or Excellent	0.13	0.14	.371	1.14	0.86	1.50
12. Relationships- relationships with others/community	-0.18	0.08	**.018**	0.84	0.72	0.97
13. Has access to primary health care [t]	0.45	0.17	**.008**	1.56	1.13	2.17

Characteristics	*B*	SE	*P*	Odds Ratio (adjusted)	95% CI for OR Lower	Upper
14. Health region						
NFL	-0.21	0.15	.166	0.81	0.61	1.09
PEI	-0.06	0.26	.829	0.95	0.57	1.56
AB	0.22	0.08	**.006**	1.24	1.07	1.45
BC (reference group)						

[t] reference category is "No" for all binary characteristics.

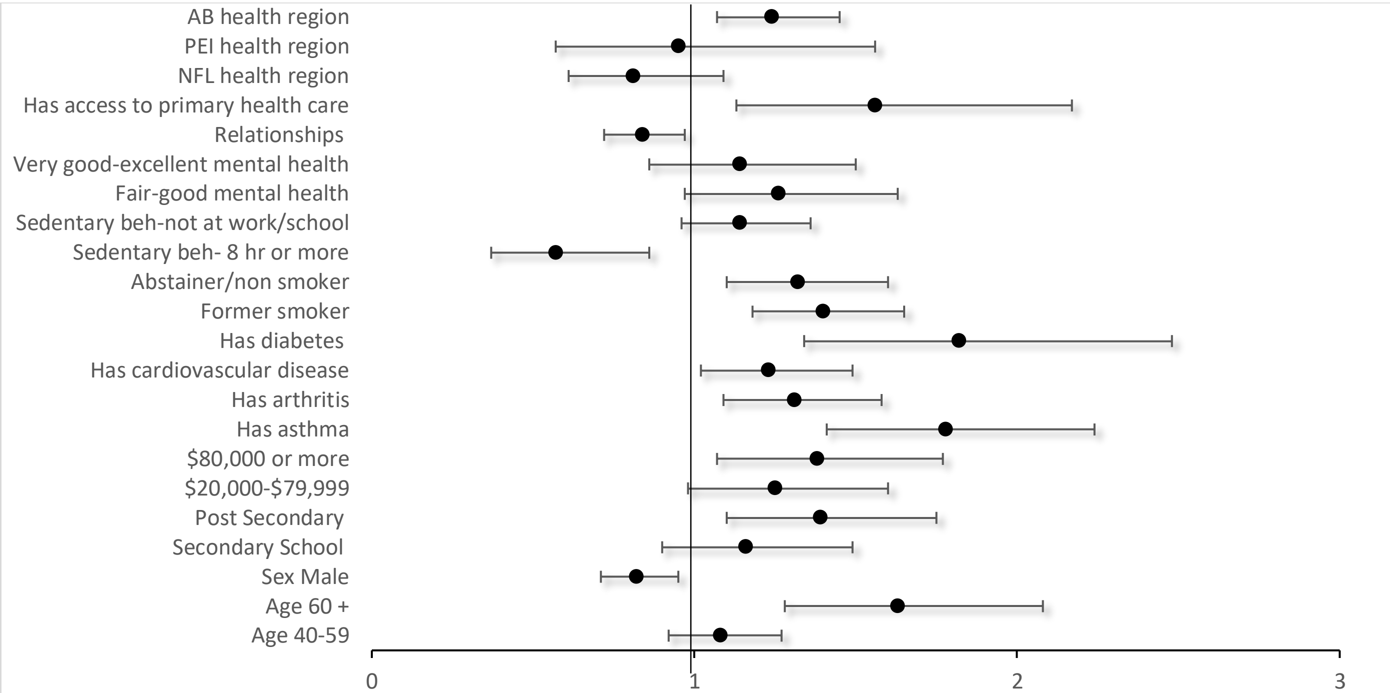
[tt] reference category is female.

B-coefficient. SE-standard error. CI-confidence interval.

Notes. All estimates are produced after multiple imputation for missing data. Sampling weight rescaled prior to analysis.

Figure 4.3

Adjusted Odds Ratios and 95% CIs for the Associations Between Specific Factors and Flu Vaccine-Lifetime for the Mental Illness Sample in the Final Multivariate Logistic Regression Model



Note. In this figure, age group 18-39, female, less than secondary education, $20,000 or less household income, no chronic diseases (no asthma, arthritis, cardiovascular disease, diabetes), regular smoker, sedentary behaviour- less than 8 hrs, poor mental health, no access to primary health care, and BC health region are considered as the reference group.

Beginning with sociodemographic predictors, for those with a mental illness, higher **age** was associated with an increased likelihood of receiving a flu shot compared to the youngest age group (18-39 years). Among those with a mental illness, those 60 years of age or greater were 1.63 times more likely to obtain a flu vaccine (OR=1.63, p = .000). Next, **males** had lower odds (OR=0.82, p = .009) of receiving a flu shot than females. Males with a mental illness were .8 time less likely than females to have a flu shot. In terms of socioeconomic factors, respondents with higher **levels of education** such as secondary and post-secondary education had higher odds (OR=1.16, p = .257 and **OR=1.39**, **p = .005**, respectively) of receiving a flu shot compared to those with less than secondary education, Similarly, those with higher **household incomes** (i.e., $20,000-$79,000 and $80,000 +) exhibited greater odds (OR=1.25, p = .071 and **OR=1.38, p = .012**, respectively) of receiving a flu shot compared to respondents earning less than $20,000 or no income. In summary, those with a mental illness that are more likely to receive a flu vaccine are 60 years of age or older, females, educated (i.e., post-secondary education) and have higher household incomes (i.e., $80,000 +).

All four chronic conditions and comorbidities such as **asthma**, **arthritis**, **cardiovascular disease**, and **diabetes** were associated with having a flu shot (ORs=1.78, 1.31, 1.23 and 1.82, respectively) compared to those without the chronic conditions and comorbidities. Shifting to health lifestyle behaviours, not currently smoking cigarettes (i.e., **former and experimental/lifetime abstainer)** was associated with higher odds of having a flu shot (OR=1.40, p = .000 and OR=1.32, p = .003, respectively) than those currently smoking (daily or occasional). In terms **of sedentary behaviours**, spending eight hours or more per day sitting/lying watching screen-during school/workday was associated with a reduction in the likelihood (OR=0.57, p = .008) of having a flu shot compared to those who spend less than eight hours per day during school/workday. In summary, individuals with a mental illness who are more likely to obtain a flu vaccine are those with chronic conditions/comorbidities, non-smoking and non-sedentary behaviours.

For general health, perceptions of **mental health status** were not associated with having a flu shot (see Table 4.9). Moving on to interpersonal influences, the analysis showed that a weaker **relationship with others/community** was associated with a reduction in the odds

(OR=0.84, p = .018)) of having a flu shot. Lastly, for situational influences, those with **access to primary health care** had 1.56 times greater odds (p = .008) of receiving a flu shot compared to those without access. Furthermore, individuals living with mental illness in both BC and **AB** (OR=1.24, p = .006) health regions had a higher likelihood of receiving a flu shot. In summary, individuals who receive flu vaccines typically had relationships with others/community, had access to primary care, and lived in the provinces of BC and AB.

Chapter Summary

In this study, the analysis pertaining to research question one overall revealed that for 2017-2018 data collection, higher lifetime flu vaccination was evident in the mental illness sample (65.1%) compared to those without a mental illness (59.0%). However, among those who received a lifetime flu vaccination, it was more recent for individuals without a mental illness (59.9% vs. 55.9). Next, the sub analysis specifically among those with mental illness revealed that majority of the respondents were between the ages of 18 to 59, female, white, with higher levels of education and household incomes, half were married or common law and attached individuals or parents. The majority also denied having chronic diseases and comorbidities, did not currently smoke cigarettes, and regularly or occasionally drank alcohol. More than half were physically active at or above recommended level, spent less than 8 hours engaging in sedentary activities during school/workday and spent less than 4 hours per day during leisure times, and classified as overweight or obese. The majority also reported excellent-fair health perceptions including mental health, had stronger relationships with others/community, had access to primary health care, lived in BC and AB health regions and exhibited higher food security. Differences between the flu vaccination groups were found for all sociodemographic factors expect cultural/racial background; chronic diseases and comorbidities; all health lifestyle behaviours except BMI; perceived mental health, interpersonal and situational influences.

Finally, the purposeful selection of variables resulted in the retention of 14 predictor variables: age, sex, education, income, asthma, arthritis, cardiovascular disease, diabetes, smoking status, sedentary activities, perceived mental health, relationships with others/community, primary health care access and health regions in the final multivariate logistic model to explain influenza vaccination among Canadian adults with mental illness. The final overall model was statistically significant, and more than half of the iterations (multiple imputation) showed that the model was not a poor fit and explained 7.7% to 9.2% (iteration range) of the variance in flu shot-lifetime specifically among the mental health population. In summary, those with a mental illness that are more likely to receive a lifetime flu vaccine are 60 years of age or older (OR=**1.63**), females, educated (OR=1.16 and **1.39**) and have higher household incomes (OR=1.25 and **1.38**). As well, individuals with a mental illness who are more likely to obtain a flu vaccine are those with chronic conditions/comorbidities (ORs **1.23-1.82**), non-smoking status (OR=**1.40** and **1.32**), and non-sedentary behaviours. Finally, individuals who receive flu vaccines typically have relationships with others/community (OR=**0.84**), have access to primary care (**1.56**), and live in the provinces of BC and **AB** (OR=**1.24**). The next chapter (five) focuses on discussing and interpreting the analysis findings, including relating the findings to existing literature and Pender's HPM.

CHAPTER FIVE: DISCUSSION

The overall aim of this study was to identify and compare influenza vaccine rates between Canadian adults with and without mental illness, and then explore specific factors that could explain flu vaccination uptake specifically among the adult mental health population in Canada. According to the findings, the lifetime influenza vaccination rate for Canadian adults with mental illness was 65.1% compared to 59.0% with no mental illness. Of those who received a lifetime vaccine, 55.9% with mental illness received it in the past one year (for 2017-2018) compared to 59.9% with no mental illness. While lifetime vaccination rates were higher for Canadian adults with mental illness, the recent vaccination rates (in the past one year) were significantly lower than for adults without mental illness, revealing a potential discrepancy in annual vaccination rates. In terms of the determinants of lifetime influenza vaccination among the mental health respondents, the results overall indicated that higher age, being a female, higher education and income levels, having asthma, arthritis, cardiovascular disease, and diabetes, not smoking cigarettes, engaging less in sedentary activities, strong relationships with others/community, having primary health care access and residing in the AB health regions were associated with having a flu vaccine - lifetime, compared to their referent groups.

This next section attempts to understand these potential differences in influenza vaccine rates and the underlying mechanisms behind the factors associated with influenza vaccination specifically among the mental health population. This understanding can ultimately inform healthcare practice and governments/decision makers of the potential promoters and barriers to flu vaccination, and help design strategies that target these factors and increase the promotion of flu vaccination among the mental health population in Canada. The following chapter discusses and interprets the study's findings, within the context of existing literature and Pender's HPM, which guided this research study.

Influenza Vaccine Prevalence

According to previous research, there was strong indication that people with various mental illnesses experienced reduced essential preventive services including influenza vaccination, compared to the general population (Borthwick et al., 2021; CAMH, 2016; Lord et al., 2010; Lorenz et al., 2013; Miles et al., 2020). Recognizing the importance and the significant implications of this potential disparity, this study aimed to identify within the Canadian context the influenza vaccination rates among adults with mental illness: mood and/or anxiety disorders. This study discovered that for 2017-2018 survey, 65.1% of adults with mental illness had received a flu shot in their lifetime. Of those who received a lifetime vaccine, **55.9%** with mental illness received it in the past one year (for 2017-2018). In comparison, published data from Canada's Seasonal Influenza Vaccination Coverage Survey in 2017-2018 shows that only **38%** of all Canadian adults (18 years +) received a flu vaccine that season (Government of Canada, 2019). In terms of specific high-risk groups, **39%** of adults with chronic medical conditions and **70%** of seniors (ages 65 +) received a vaccine that year (Government of Canada, 2019). Evidently, vaccination rates have fallen short of the 80% national coverage goal. In sum, this study provides an indication of Canadian rates for those with a mental illness being higher than the general population. Nevertheless, in my study while fewer people with mental illness are unvaccinated compared to those without mental illness, approximately 35% of the mental illness sample have never received a flu vaccine, a troubling number for a population that possesses a greater risk of experiencing flu related complications compared to the general population. Furthermore, among those who did receive a vaccine in their lifetime (65.1%), recent vaccination rates were lower, and approximately 34% received the vaccine two years ago or more, compared to those without a mental illness (30%). These findings may illustrate that it can be challenging for those living with a mental illness to regularly follow up on annual vaccines. Thus, it is necessary to increase awareness and promotion of flu vaccines among the Canadian mental health population to receive the vaccine annually and reach the 80% coverage goal, and warrants serious attention from health care professionals (Lorenz et al., 2013).

Several studies have argued that individuals with mental illnesses such as depression and anxiety may experience withdrawal, impaired self-efficacy, distress, as well as endure higher amounts of negative emotion, anticipation, and expectation in relation to obtaining a vaccine, which can lead to sustaining actual adverse reactions from the vaccine, also known as the nocebo effect (Druss et al., 2008; Lawrence, 2018). These symptoms and experiences can ultimately contribute to reduced likelihood of utilizing healthcare, receiving subsequent vaccinations and following through future preventive services (Lawrence, 2018; Pender, 2011). According to my study, a greater proportion of respondents with mental illness reported that lack of time, bad reaction to previous flu shot, and fear of what the vaccine contains were reasons for non-vaccination (either in the past one year or in a lifetime) compared to those without mental illness. Thus, it may be plausible, though cannot be confirmed, that symptoms and challenges associated with depression and anxiety contributed to either lifetime non-vaccination or less recent vaccination (i.e., among those who received a vaccine in their lifetime) for the mental health population in my study. Ultimately, these findings could inform health education and initiatives amongst this population

In terms of lifetime flu vaccination rates, people with mental illness may have higher rates and lower non-vaccination than individuals without mental illness for several intertwining reasons such as the mental illness itself, increased physical comorbidities, and greater healthcare utilization (Browne et al., 2019; T. Lawrence, 2018; T. Lawrence et al., 2020; Lord et al., 2010). Firstly, living with a mental health condition potentially requires one to seek and experience frequent visits to their primary care providers which could in turn result in greater opportunities for flu vaccination, compared to those without a mental illness, as purported by T. Lawrence et al. (2020). Further, suffering from mild to moderate mental illness symptoms such as anxiety could in effect facilitate engagement in flu vaccination through cues to action, an internal stimulus or reminder that motivates individuals to act promptly and accept the recommended health behaviour (Borthwick et al., 2021; T. Lawrence et al., 2020; Lord et al., 2010). Lastly, an observational cohort study by Browne et al. (2019) found that flu vaccination rates were higher for veterans with mental illness including depression and anxiety disorders compared to veterans without mental illness. Primary health care utilization and access to provisions of healthcare outside primary care were several reasons proposed by Browne et al. (2019) that potentially explained higher rates among veterans with mental illness. Thus, it may be hypothesized that for some, having a mental illness can increase the belief, motivation, and the chances to vaccinate compared to individuals without a mental illness. This finding underscores the importance of having a primary care provider. This is further elaborated upon in the specific factors associated with flu vaccination uptake. As such, a deeper understanding is required into the factors influencing influenza vaccination and their underlying mechanisms to reduce barriers, as well as to prioritize and specifically target individuals with mental illness to vaccinate and to annually meet (or surpass) the Canadian influenza vaccination coverage goal.

Factors Associated with Influenza Vaccination among Canadian Adults with Mental Illness

As previously indicated, of the 24 predictor variables, 13 substantially contributed to flu vaccination, including four socio-demographic factors, four chronic conditions and comorbidities, two health lifestyle behaviours, one interpersonal and two situational influences. This study was interested in exploring and understanding these associations specifically among individuals with mental illness. The following section discusses the findings in relation to previous research and applies the theoretical perspectives of Pender's HPM to further explicate the associations with having an influenza vaccine among Canadian adults with mental illness (i.e., mood and/or anxiety disorders).

Individuals Factors

According to Pender's HPM, previous experiences, biological, socio-cultural, and psychological factors are unique individual characteristics (micro level) that impact health behaviours and actions (Pender, 2011). In this study, individual factors such as age, gender, income, education, chronic diseases, smoking status, and sedentary activities proved to be important in having a flu vaccine among the Canadian mental health population (see Appendix E). Although some of the factors may be unmodifiable or difficult to change, personal factors play a key role in affecting the central components of the model (i.e., the perceived benefits, barriers, affect and self-efficacy) to ultimately meet goals and engage in health promoting behaviours, such as influenza vaccination (Estrada, 2016; Pender, 2011). Self-efficacy and affect are vital factors of the HPM that directly impact the commitment and engagement in health promoting behaviours (Pender, 2011). For instance, if the emotions (affect) and beliefs associated with flu vaccine are positive then the likelihood of anticipating valued benefits and experiencing further positive emotions will increase (Pender, 2011). This results in reduced perceived barriers to undertaking a health behaviour and increases the perceived self-efficacy to execute the health behaviour, thereby, leading to greater commitment and actual performance of the health promoting behaviours (Pender, 2011). Furthermore, the greater the commitment, the more likely one will maintain a consistent engagement in the specific health behaviour. Overall, the HPM proposes that by modifying the way individuals perceive and engage with their environments, it strengthens the likelihood of committing and living a health promoting behaviour or lifestyle (Estrada, 2016; Pender, 2011).

Sociodemographic Factors

In the study's logistic multivariate analysis**,** four sociodemographic factors remained significantly associated with having a flu shot, including **age**, **sex**, **education,** and **income**. In terms of **age**, being older (60 years old and up) was associated with higher odds of having a flu shot compared to the youngest age group, ages 18 to 39. Research among the non-Canadian mental health population did not find age to be predictive of flu vaccine uptake, behaviour, intent, and overall preventive service utilization (Borthwick et al., 2021; T. Lawrence et al., 2020; Lorenz et al., 2013; Xiong et al., 2010; Xiong et al., 2015). Potential reasons for the findings in previous studies are that for some the outcome focussed more on total preventive services, and the studies were primarily conducted in the US. Therefore, when looking at specific preventive services such as flu vaccination within the Canadian context, age becomes important in receiving a flu vaccine.

Our findings could be attributed to several reasons. First, in Canada, groups considered high-risk by the NACI include seniors 65 years and older (BCCDC, n.d.; Government of Canada, 2020b). Thus, having a high-risk status potentially encourages older individuals with mental illness to prioritize their health and actively engage in regular preventive care measures such as flu vaccination, compared to younger adults (Farmanara et al., 2018; Roy et al., 2018). Second, older adults may also receive greater attention and direct recommendations from their healthcare providers and other interpersonal sources to vaccinate (Farmanara et al., 2018; Roy et al., 2018). This affirms the importance of interpersonal and situational influences which according to Pender's HPM promote positive activity related affect and directly impact one's self-efficacy (Estrada, 2016; Pender, 2011). Altogether, such influences can strengthen the motivation and commitment to implement a behaviour and maintain it over time (Estrada, 2016; Pender, 2011). Another potential reason for why older adults with a mental illness were more likely to vaccinate is that younger individuals may possess a false perception of influenza vaccines only benefiting high risk groups such as seniors, which may be a deterrent against influenza vaccine uptake (Farmanara et al., 2018). For instance, in this study, a greater proportion of individuals between the ages of 18 to 39 were in the unvaccinated group, compared to the vaccinated group. Therefore, it may be necessary for healthcare professionals to increase promotion and offering of the flu vaccine across all age groups to dispel the misconceptions and educate others on the importance of flu vaccine (Farmanara et al., 2018).

Biological **sex** was another sociodemographic factor in receiving a flu shot, revealing males were less likely than females to have a flu shot in their lifetime. As well, more females belonged to the flu shot group compared to their male counterparts. Study findings about sex as an explanatory factor have been mixed. The findings of this study are consistent with two studies among the mental health population in the United States. For instance, Xiong et al. (2010) found females had significantly higher overall preventive service utilization including flu vaccine than males, as well as higher vaccine rates in all three psychiatric disorder groups such as psychosis and major depressive disorder. In a different study by Xiong et al. (2015), sex once more was a significant predictor, with females more likely to use non-cancer preventive services including flu vaccine than males, among those attending community mental health services in the US. The authors surmised that in general women tend to participate in more preventive services compared to men, whereas men also tend to engage in higher risk-taking behaviours and utilize less ambulatory medical services than females (Xiong et al., 2010; Xiong et al., 2015). As such, these suggestions could potentially explicate why men were less likely to receive a flu vaccine in this study. Conversely, the predominant non-Canadian literature reported no associations between sex and flu vaccine status (T. Lawrence et al., 2020; Lorenz et al., 2013; Schmid et al., 2017; Yeung et al., 2016). Possible explanations for the findings in past studies is that for some the focus was on either non-Canadian or non-mental health populations. Perhaps, when the focus is on examining specifically the Canadian mental health population, then sex does prove to be pertinent. The potential sex disparity in flu vaccination found in this study needs to be further explored to better understand the differences, which persisted even after adjusting for other sociodemographic and health related factors (Farmanara et al., 2018).

In terms of socioeconomic factors, **levels of education** and **household income** held significant influences on influenza vaccination among the Canadian mental health population. Amongst those living with a mental illness, individuals with higher levels of education and household incomes were more likely to have a flu vaccine than individuals with less than secondary education and an income of $20,000 or less per year. Education and income are vital social determinants of health and health equity (Government of Canada, 2013). Whilst in this study only a small percentage reported lower levels of education and household incomes, overall individuals with mental illness tend to face greater socioeconomic inequalities than those without mental illness (Lorenz et al., 2013; Miles et al., 2020; Young, S., et al., 2015). According to my study findings and supported by Pender's HPM, a lower socioeconomic status may be a potential barrier to accessing and engaging in healthcare services including essential preventive and health promoting services such as flu vaccination, compared to those with higher status.

However, the prevailing non-Canadian literature offers highly inconclusive results pertaining to these associations. For instance, in a major systematic review among the general population, **education** is inconsistently significant with flu vaccine uptake (Yeung et al., 2016). Conversely, among the adult community mental health population in the US, education is often not a predictor of overall preventive service utilization and total non-cancer compliance index including flu vaccines (Xiong et al., 2010; Xiong et al., 2015). Interestingly, in one US study, a significant although reverse association was discovered by Lorenz et al. (2013), where individuals with mental illness and higher than high school education were less likely to receive a flu vaccine and were mostly in the unvaccinated group compared to those with high school and less than high school education. A possible explanation for the findings in past studies is that the outcome focussed more on preventive services rather than specifically vaccination rates. It stands to reason that when primarily looking at vaccine rate outcomes, as one prevention strategy, then education does matter.

Nevertheless, research shows that higher education is strongly associated with greater scope for informed decision-making regarding health, and for raising personal, economic, and social resources necessary for better physical as well as mental health outcomes (Braveman & Gottlieb, 2014; Government of Canada, 2013; Hobbs & Buxton, 2014; Lucyk et al., 2019). Higher education is also known to increase the perceived personal control over one's life resulting in improved social supports and health related behaviours (Braveman & Gottlieb, 2014; Government of Canada, 2013; Hobbs & Buxton, 2014; Lucyk et al., 2019). Furthermore, researchers suggest individuals with lower educational attainment may be less willing to adopt essential preventive health practices due to reduced health literacy (Roy et al., 2018). Thus, factors associated with education such as informed decision making, acquired resources, perceived control over one's life and health literacy may influence the likelihood of accessing healthcare and receiving a flu vaccine among the Canadian mental health population (Braveman & Gottlieb, 2014; Government of Canada, 2013; Hobbs & Buxton, 2014; Lucyk et al., 2019).

Similarly, for **income,** inconsistent associations were commonly reported in the literature. Of note, in a US study by Lawrence et al. (2020), whilst highest SES was not associated with flu vaccine uptake, upper middle SES was consistently associated with having a flu vaccine compared to the lowest SES group in the final adjusted model, and when stratified by those with and without physical comorbidities, among elderly adults including those with depression and anxiety disorders. In two American studies, personal cost was identified as one of the main barriers to all vaccines for adults with severe and persistent mental illness living in the community (Miles et al., 2020) and financial barriers have been a key factor in flu vaccination among their mental health population (Lorenz et al., 2013). According to research not specific to the mental health population, income status may be linked to pertinent related factors that influence health behaviours and awareness of prevention programs such as higher levels of education, well-paid employment opportunities and employee benefits (Braveman & Gottlieb, 2014; Government of Canada, 2013; Hobbs & Buxton, 2014; Lucyk et al., 2019). Individuals with higher socioeconomic status may also possess the resources necessary to access health care and preventive services such as transportation, the ability to take time off work, and exhibit trust in the healthcare system (Braveman & Gottlieb, 2014; Government of Canada, 2013; Hobbs & Buxton, 2014; Lucyk et al., 2019). Pender's HPM purports that when individuals perceive excessive barriers (i.e., socioeconomic) to engaging in a behavior, their commitment to action is hindered, and the competing demands and preferences begin to predominate (Estrada, 2016; Pender, 2011). Thus, while the connection between flu vaccination and socioeconomic factors needs to be further researched and understood, overall, the results of this study potentially highlight the interrelated impact of being older, female, having higher education and income on one's health knowledge, status and behaviours; these also effect one's willingness or ability to access healthcare access and engage in preventive services.

Non-Sociodemographic Factors

According to research, people with mental illness have an increased risk of acquiring and dying from influenza related complications due to higher prevalence of **chronic medical diseases and conditions** such as cardiovascular disease, diabetes, pulmonary disease, and musculoskeletal disorders (Borthwick et al., 2021; Lorenz et al., 2013; Miles et al., 2020). Literature has further revealed a potential relationship between having a chronic disease/comorbidity and flu vaccination (Borthwick et al., 2021; T. Lawrence et al., 2020; Schmid et al., 2017; Yeung et al., 2016). In my study, while the majority denied having physical illnesses such as **asthma**, **arthritis**, **cardiovascular disease**, and **diabetes**, a greater proportion of individuals without these illnesses were in the unvaccinated group, and in the regression analysis, all four diseases were associated with being more likely to have a flu vaccine compared to those without such illnesses.

These findings are supported by several non-Canadian studies conducted among the general and the mental health population. For instance, several systematic reviews reported that presence of chronic disease was a significant predictor of higher flu vaccine uptake, while the absence of pre-existing medical conditions was a barrier to flu vaccines (Schmid et al., 2017;

Yeung et al., 2016). Similar findings were found specifically among those with mental illness. Participants in a UK mixed methods study by Borthwick et al. (2021) believed having a physical illness was a key factor in their perceived vulnerability and susceptibility to the flu, and thus the need to vaccinate. The increase in perceived threat of disease potentially motivates individuals to engage in preventive measures that boost health and minimize further deterioration (Borthwick et al., 2021; T. Lawrence, 2018). Additionally, having physical comorbidities such as heart failure, diabetes and cancer made the association between having a mental illness and flu vaccine uptake significant and positive in a US study by Lawrence et al. (2020). According to literature, factors related to physical comorbidities such as higher healthcare utilization may provide individuals with greater opportunities to receive vaccinations (Farmanara et al., 2018; T. Lawrence et al., 2020). Due to a high-risk status, regular encouragements and prompts to vaccinate by their healthcare providers may also increase. It is further suggested that adults with a CMC may experience worsened health perceptions potentially leading to more frequent medical visits (Farmanara et al., 2018; T. Lawrence et al., 2020). Thus, physical illness can act as a strong promoter of flu vaccination among those with mental illness (T. Lawrence, 2018; T. Lawrence et al., 2020). Taken together, individuals living with a mental illness and comorbidities, who seek medical services, are more likely to receive a flu vaccine. This speaks to the importance of access to health care services.

Thus, results from my study and the literature potentially infer that those Canadian adults with mental illness and certain physical comorbidities are being appropriately targeted by healthcare providers and vaccination programs to vaccinate. This is an important finding, as flu vaccines are not only effective in reducing the chances of acquiring the flu, but also in reducing the risk of chronic disease exacerbation, as well as influenza related complications and hospitalizations (CDC, 2021). However, it is also important for individuals without CMC to vaccinate, not only to reduce their chances of experiencing flu related complications but to avoid transmission and infecting more vulnerable groups (CDC, 2021).

This study selected smoking status, type of drinker, physical activity, sedentary activities and BMI to capture the impact of **health lifestyle behaviours** on receiving a flu vaccine, which has rarely been captured in previous studies. Negative health lifestyle behaviours carry a multitude of harmful effects on health that also increase the chances of acquiring and dying from influenza (Borthwick et al., 2021; Lorenz et al. 2013; Miles et al., 2020). Further, engaging in these health risk behaviours have been shown to have a potentially negative impact on flu vaccine uptake; and these are behaviours reported to be more prevalent among the mental health population (Lorenz et al., 2013; Miles et al., 2020; Schmid et al., 2017; Yeung et al., 2016). Given that secondary data analysis was conducted, it was not feasible to examine all health lifestyle behaviours. BMI (a proxy for obesity) and levels of physical activity were initially included but did not remain in the final model. Thus, the lifestyle behaviours predictive of vaccination were **smoking status** and **time sitting/lying watching screen - during school/workday** (proxy for sedentary work-life). Firstly, results demonstrated that respondents denying smoking cigarettes (i.e., former and lifetime abstainers) were more likely to have a flu vaccine than those currently smoking. Secondly, engaging in sedentary activities for eight or more hours during school or workday was associated with not having a flu vaccine compared to those engaging less in sedentary activities.

Although literature on the influence of health lifestyle behaviours is limited, several systematic reviews have found smoking habits negatively impacted flu vaccine uptake, while quitting smoking positively influenced vaccine uptake (Schmid et al., 2017; Yeung et al., 2016).

However, research specifically among the mental health population found no associations between flu vaccine uptake and health behaviours such as smoking, drugs, alcohol abuse, eating well balanced diets, and regular exercise (Borthwick et al., 2021; T. Lawrence et al., 2020). Similarly, alcohol abuse and regular exercise were excluded from our final model. It is suggested that the relationship between health variables such as smoking and flu vaccine uptake may be confounded by factors including health status, attitudes regarding vaccinations, and the perspectives of healthcare providers towards the health of individuals who smoke cigarettes (Schmid et al., 2017). Other research explains when individuals engage in healthy behavior patterns, they may also exhibit greater adherence and commitment to additional recommended health promoting measures, for instance flu vaccination (Pender, 2011; Shahroodi et al., 2020). Pender's HPM further expounded that those personal factors such as strength and aerobic capacity can influence behavior specific beliefs, affect and enactment of the health promoting behavior (Pender, 2011). Perhaps possessing positive attitudes and beliefs regarding the benefits of engaging in healthy lifestyle patterns (i.e., reduced sedentary activities and abstinence from smoking) inevitably contributes to self-confidence and positive cognitions toward flu vaccination, another health promoting behavior (Pender, 2011; Shahroodi et al., 2020).

Past Experience and Behaviour Specific Cognitions and Affect

Reasons for Flu Non-Vaccination

Although reasons for not being vaccinated could not be included in the logistic regression model, exploring these commonly stated reasons in the post-hoc analyses revealed important information consistent with Pender's Past Experiences and Behaviour Specific Cognitions and Affect categories. Firstly, the top three reasons for non-vaccination in the mental illness group, i.e. respondent did not think it was necessary, does not believe in benefits, and lack of time, suggested that perceived benefits of vaccination and perceived risk of influenza may be low for these individuals. Pender (2011) indicates that higher perceived barriers can significantly derail commitment to action, a vital mediator of the actual behaviour. Furthermore, according to several studies in the literature, individuals exhibiting vaccine misconceptions, negative attitudes towards the flu vaccine, and a lower risk perception also tend to lack motivation and have short term thinking regarding health and future health protection such as engaging in preventive behaviours (Borthwick et al., 2021; Lorenz et al., 2013; Yeung et al., 2016). Additionally, individuals with a lower vulnerability and susceptibility to illness may access and utilize healthcare services less often which can reduce external cues to action and in turn reduce opportunities to receive a vaccine (Borthwick et al., 2021; Farmanara et al., 2018; Lorenz et al., 2013). Interestingly, in a UK mixed methods study among respondents expressing doubt and uncertainty about the effectiveness and benefits of the flu vaccine, many could overcome these perceptions when the vaccine was being offered by others, highlighting the significance of external cues to action (Borthwick et al., 2021).

Secondly, bad reaction to previous flu shot was another common reason for not vaccinating in the mental illness group. According to Pender (2011) and Borthwick et al. (2021), individuals heavily rely on their past experiences to inform future vaccine perceptions, commitment and engagement in vaccination. Further, in a mixed methods study, individuals with mental illness reporting positive vaccine experiences overall repeated vaccination in subsequent years; conversely, individuals describing negative or unpleasant experiences were less likely to continue with the behaviour (Borthwick et al., 2021). Lastly, fear/discomfort and fear of what the vaccine contains were among the top six reasons for non-vaccination in the mental illness group.

These align with Pender's (2011) Perceived Affect construct, indicating that positive feelings or emotions towards a specific behaviour (e.g., flu vaccine) can result in higher perceived self-efficacy and in turn an even greater positive affect that will raise the probability of intent and action. Conversely, general fears about the vaccine, as well as fears of vaccine side effects and consequences were substantial barriers that reduced vaccine uptake in the general population and adults with mental illness in several studies (Borthwick et al., 2021; Miles et al., 2020; Yeung et al., 2016).

Interpersonal Influences

Social inclusion and social safety network, both major social determinants of health, exert a strong influence on our lives and health outcomes; these determinants play an especially important role among vulnerable populations including those with mental illness, where social isolation, disconnection, and lack of support may be of higher prevalence (Canadian Public Health Association [CPHA], n.d.; Government of Canada, 2013). Having positive interpersonal influences is vital for one's sense of belonging and well-being, as well as for dealing with adversity, problem solving, and gaining mastery of one's life circumstances (CPHA, n.d.; Government of Canada, 2013). In fact, health behaviours including flu vaccination are also strongly influenced by the extent of one's interpersonal relationships with family, friends, coworkers, health providers, and community (Borthwick et al., 2021; Lorenz et al., 2013; Miles et al., 2020; Pender, 2011; Schmid et al., 2017; Yeung et al., 2016). According to Pender's HPM, when individuals have supportive and emotionally encouraging family, friends, healthcare providers (i.e., nurses) and communities, including those who actively place expectations and role model positive health behaviours, the likelihood of engaging in health promoting behaviours is enhanced (Pender, 2011).

In my study, stronger **relationships with others and community**, rather than marital status or cohabitation, had a positive influence on having a flu vaccine among those with mental illness. The findings additionally revealed that people with stronger relationships were more likely to be in the vaccinated group compared to those with weaker relationships. It seems having a sense of belonging, social supports and relationships with family members, friends, co-workers and community predominate over being married or simply living with someone, which may not offer sufficient support or encouragement to impact health promoting behaviours. The findings firmly align with previous research that demonstrated influenza vaccine uptake among individuals with mental illness is highly influenced by social processes such as drawing on information gathered by those around them to make decisions about vaccination (Borthwick et al., 2021). This was particularly evident among individuals lacking firsthand experiences of receiving the flu vaccine and thus heavily relied on informal sources (Borthwick et al., 2021). Further, a systematic review found that advice and social supports from healthcare providers, relatives and close friends were strongly associated with receiving a flu vaccine (Yeung et al., 2016). Other studies reported that lack of support or recommendation for vaccination from healthcare providers reduced flu vaccine status and overall preventive health services (Lorenz et al., 2013; Xiong et al., 2010). In a mixed methods study by Borthwick et al. (2021), healthcare professionals including nurses bore a great amount of influence in the decision-making processes regarding flu vaccinations for most of the participants with mental illness. Those who accepted the vaccines reported receiving guidance and encouragement from healthcare providers (Borthwick et al., 2021). These individuals also expressed a high degree of trust in their healthcare professionals, strongly valuing their professional experience and academic expertise (Borthwick et al., 2021). This was especially apparent when the recommendations to vaccinate were delicately balanced with respect for the client's autonomy (Borthwick et al., 2021). Lastly, the perceived social benefit of vaccination may be higher among those with strong connections and sense of belonging (Schmidt et al., 2017).

Situational Influences

Pender (2011) describes situational influences as features of the environment carrying direct and indirect impact on the behaviours and the commitment to participating in a health promoting behavior. These influences are personal perceptions and cognitions of one’s environment or life context and their compatibility with engaging in a certain health behavior (Pender, 2011). Situational factors can include the perceived demands, available choices for participating in a health behavior, and the aesthetic aspects within the environment, including the accessibility of economic and human resources required for wellness and healthy living (Estrada, 2016; Masters, 2015; Pender, 2011). In my study, situational factors such as **primary health care access** and **health regions** proved to be important in the health behaviours of individuals with mental illness.

Healthcare access is a social determinant of health, a major influence on health status and outcomes (Healthy People, n.d.). Guaranteeing appropriate access and interaction with the healthcare system is necessary for one’s physical as well as mental health and wellbeing (CAMH, 2016). However, impaired healthcare access can result in unmet health needs, inappropriate care, and reduced engagement in health services such as preventive services (CAMH, 2016; Healthy People, n.d.). In Canada, vulnerable populations including the mental health population are reported to experience difficulties accessing and receiving high quality care, particularly primary care and mental health services (Canadian Medical Association, 2018; CAMH, 2016). Addressing the complex barriers to healthcare access may potentially improve regular engagement in preventive services such as flu vaccine, and overall ensure that individuals with mental illness receive the “healthcare to which they are entitled” (CAMH, 2016, p. 15).

Pender believes that identifying one’s situational influences and considering if the influences are perceived as supportive or discouraging is beneficial in strengthening the participation in a health promoting behavior (Estrada, 2016; Pender, 2011). Over time, the individual in all their “biopsychosocial complexity” with support from family, healthcare professionals, community and other stakeholders can learn to modify their situational environments along with cognitions and affect to develop incentives for health behavior change (Pender, 2011, p. 5).

Access to Primary Health Care

Inequities in healthcare access are associated with different morbidity and mortality rates for certain populations including those with mental illness (McGibbon et al., 2008; Miles et al., 2020). Mental illness is believed to be a strong predictor of inequitable health care, and individuals with mental illness are more likely to experience inappropriate or poor healthcare access than those without mental illness (Kurdyak & Sockalingam, 2014). In the literature, issues with healthcare access such as not having a regular source of care and infrequent healthcare interactions were also identified as common barriers affecting the opportunity for vaccination and the likelihood for flu vaccine receipt. Indeed, my study showed people with mental illness and access to primary care (i.e., having a regular place for immediate care and a regular healthcare provider) were more likely to have a flu vaccine compared to those without primary care access.

According to previous studies, individuals are more likely to vaccinate when their healthcare utilization is higher and have a regular source of primary care, whereas lack of a regular primary care physician and fewer visits to the doctor significantly hindered the uptake of flu vaccine for many risk groups, including those with mental illness (Schmid et al., 2017; T. Lawrence et al., 2020; Xiong et al., 2015). Interactions with healthcare providers such as doctors and nurses, the vital sources of interpersonal influences, enable opportunities for external cues to action (Borthwick et al., 2021; Schmidt et al., 2017; Lawrence et al., 2020; Lorenz et al., 2013). Cues to action is the most consistent and major predictor of flu vaccine intent and behavior in the majority of the studies among those with mental illness (Borthwick et al., 2021; Lorenz et al., 2013; Miles et al., 2020). Greater interaction and communication with healthcare providers foster opportunities for vaccine recommendations, advice, addressing beliefs and concerns necessary to improve vaccination acceptance and rates (Borthwick et al., 2021; Lawrence et al., 2020; Lorenz et al., 2013; Xiong et al., 2010).

A study by Miles et al. (2020) found lack of access and doctor recommendations were some of the main barriers to vaccination among participants with severe mental illness in the US. In fact, the study reported that individuals with mental illness are compliant with receiving vaccines when adequate promotion and easy access to information and services are made available. Similarly, a major systematic review among the general adult population indicated easy access to healthcare significantly promoted flu vaccine uptake (Yeung et al., 2016). Interestingly, in my study, a majority (96.5%) of the mental health sample reported having primary health care access and a majority also denied that vaccine unavailability, not knowing where to access vaccines, and lack of doctor recommendations were their reasons for non-vaccination. However, my study may have inadequately captured various hard to reach groups such as individuals with severe chronic mental illnesses, those living in poverty, homelessness, and many other socio-economically disadvantaged populations that experience increased health inequities.

Nevertheless, Canada experiences its own distinct struggles such as a shortage of healthcare professionals, long wait times, untimely access to physicians, and impaired access to primary care and mental health services that could inevitably impact flu vaccination (Canadian Medical Association, 2019; CAMH, 2016; Clarke, 2016; Tollinsky, 2021). Individuals with mental illness often experience additional interrelated issues that may further interfere with accessing healthcare and receiving a flu vaccine such as lack of providers who are able and comfortable to care for the mental health population, poverty, stigma and discrimination (Miles et al., 2020). It is therefore vital to not underrate the unique challenges that mental illness presents, and to consider the broader social and structural factors within and outside of the healthcare system that influence the health behaviours and outcomes of individuals with mental illness (Coombs et al., 2021).

Health Regions

In terms of health regions, my study found significant differences in flu vaccination receipt between **AB** and **BC**. Results suggest that individuals belonging to health regions in AB were more likely to have a flu vaccine compared to those residing within BC health regions. Although majority of the Canadian provinces and territories offer universal flu vaccine coverage, up until recently, BC was one of three provinces to only provide coverage for high-risk groups (Farmanara et al., 2018; Roy et al., 2018). Thus, the lack of public funding could explain the differences in flu vaccination between the two provinces (Farmanara et al., 2018; Roy et al., 2018). Research purports that lack of public funding may shape the belief that a flu vaccine is not important or needed (Farmanara et al., 2018; Roy et al., 2018). Additionally, healthcare professionals may only recommend flu vaccination to those for whom the vaccine is funded, stemming from either personal beliefs or time constraints (Farmanara et al., 2018; Roy et al., 2018). Interestingly, a study conducted in the US by Lorenz et al. (2013) found that even when vaccines were free of charge for individuals with mental illness such as for those with health insurance, more than half remained unvaccinated. In my study, differences between BC and other provinces such as PEI and NFL were not found; thus additional underlying factors other than public funding could explain the variances in flu vaccination across the provincial health regions (BC and AB) such as health care programs, funding, and resource availability (Farmanara et al, 2018; Roy et al., 2018; Xiong et al., 2010).

What is Unknown?

The final model in this study only predicted 7.7 - 9.2 % of the variance. Although, the findings are insightful, there is still a large amount of variation that is unknown and needs to be further explored. Being restricted by the variables available in the CCHS substantially limited this exploration. Firstly, major motivational factors such as perceived beliefs, affect, and self-efficacy were not explored in this study. These would be important factors to examine, specifically among the mental health population as having a mental illness could contribute to impaired affect, motivation and capability or self-efficacy to attend or follow through preventive services and screening (Borthwick et al., 2021; Druss et al., 2008; Lord et al., 2010; Miles et al., 2020). Secondly, and most importantly there are broader and more complex factors at play that influence one's ability and motivation to engage in health behaviours which the study did not examine. A survey study in the US by Miles et al. (2020) identified additional reasons for why individuals with mental illness experienced difficulties engaging in vaccination, such as reduced vaccine awareness, accessibility, cost, lack of doctor recommendations, lack of healthcare programs, and stigma within healthcare. Exploring these factors could further explicate influenza vaccination receipt among individuals with mental illness in Canada and provide a more comprehensive understanding (CAMH, 2016) - understanding that shifts the focus from the individual to societal structures, institutions, ideologies, and inequities (Short & Mollbron, 2015).

Chapter Summary

In this study, approximately two-thirds of adults with mental illness (i.e., mood and anxiety disorders) residing in NFL, PEI, AB and BC received a flu vaccine in their lifetime. Among those who received a lifetime vaccine, 55.9% received it last during the 2017-2018 survey, compared to 59.0% of individuals without mental illness who received a lifetime flu vaccine and 59.9% for 2017-2018 season. Although individuals with mental illness exhibited greater lifetime vaccination rates, their most recent (2017-2018) rates were significantly lower compared to those without mental illness, and the rates overall were below the Canadian flu vaccination coverage target of 80%. It is evident that flu vaccination needs to be increased among the mental health population.

In this study, individuals who were older, female, with higher levels of education and household incomes, had chronic diseases and comorbidities, did not currently smoke cigarettes, engaged in reduced sedentary activities, had stronger relationships with others/community, had access to primary health care and resided within AB health regions had significantly positive associations with having a flu shot. The findings of this study are consistent with previous international research on flu vaccination among the mental health population, particularly about chronic disease and comorbidities, interpersonal and situational influences. Additionally, associations between influenza vaccination and factors such as socio-demographic and lifestyle behaviours found in this study offer novel data for the Canadian mental health population.

Further, the results of this study demonstrate that Pender's HPM can be utilized as a guide and a framework for investigating and establishing vital associations with influenza vaccination among adults with mental illness.

Overall, the study's findings have affirmed the importance of understanding and addressing potential sex differences and socioeconomic barriers, as well as promoting healthy lifestyle behaviours, boosting social connections, and ensuring equitable access to healthcare to effectively facilitate the engagement in flu vaccination for Canadian adults with mental illness. Future interventions should target these factors to increase awareness and promotion of flu vaccination among this population. More specifically, this novel data can inform current and future efforts to increase knowledge of flu related risks and complications, to identify individual and system level barriers associated with flu vaccination, and to develop comprehensive strategies that support adults with mental illness in illness prevention and achievement of optimal health (Pender, 2011). As well, mental health clinics and healthcare professionals have an especially unique role and duty in advocating, educating, and providing individuals experiencing mental illness with opportunities to participate in health promoting behaviours such as influenza vaccination. Chapter six will thoroughly present the implications of this study, outline the study's limitations, and offer recommendations for healthcare practice, policy, and future research.

CHAPTER SIX: IMPLICATIONS, RECOMMENDATIONS AND CONCLUSION

This study began by providing background information about influenza and influenza vaccination among people with mental illness, including their risk factors and challenges. The study reiterated while influenza is preventable, it is a serious illness with devastating consequences for vulnerable populations such as those with mental illness with and without comorbidities (CDC, n.d.a). However, in Canada individuals with mental illness are not considered a high-risk group for flu related complications and overall, only a few attempts have been made in research to identify vaccination rates and explain predictors of influenza vaccine uptake among the mental health population (Government of Canada, 2020b). This is concerning, as higher prevalence of chronic medical illnesses intertwined with unhealthy behaviours, symptoms of the mental illness, socioeconomic disadvantages, stigma and healthcare disparities are potentially placing individuals with mental illness at similar or even greater risk level of influenza and influenza related complications to that in groups considered high risk by the national influenza advisory committee (Borthwick et al., 2021; Government of Canada, 2020b; Lorenz et al., 2013; Miles et al., 2020; PHAC, 2016; Seminog & Goldacre, 2013). Building on the literature review and Pender's HPM, an exploratory study was conducted to analyze data from the 2017-2018 CCHS to answer the following research questions:

- What are the influenza vaccination rates among Canadian adults with mood disorders and/or anxiety disorders compared to individuals without mental illness?
- What factors consistent with the HPM (i.e., personal characteristics and experiences, behavior specific cognitions and affect, interpersonal and situational influences) are associated with influenza vaccination receipt among Canadian adults with mood disorders and/or anxiety disorders?

The results of this study revealed that while lifetime flu vaccine rates were higher for individuals with mental illness compared to those without (65.1% vs 59.0%), recent vaccine rates (for 2017-2018) were significantly lower for those with mental illness compared to those without (55.9% vs 59.9%). Thus, in Canada, a need exists to increase promotion of the seasonal influenza vaccine for this population. Furthermore, findings from the logistic regression analysis indicated that individual characteristics (i.e., age, gender, education, income, chronic diseases and comorbidities, smoking status, sedentary behaviours), interpersonal influences (i.e., relationships with others/community), and situational influences (i.e., access to primary care, health region) were associated with the uptake of flu vaccination among Canadian adults with mental illness. Gaining understanding into the receipt of preventive behaviours such as influenza vaccination and the associated factors will generate understanding and awareness, as well as allow targeted health promotion practices and interventions to be developed (Borthwick et al., 2021). Therefore, before concluding this research, the following chapter will offer recommendations for practice, policy, theory, and future research, and then outline the study limitations.

Study Implications and Recommendations

This study provided novel data and clarification of the influenza vaccine rates and factors that influence influenza vaccination among the adult mental health population within the Canadian context. The study has generated a crucial discussion on the high risk of influenza infection complications that individuals with mental illness possess, and on the promotion of influenza vaccination. This data can inform the Canadian health care practice, policy, and research to prioritize mental illness, expand the promotion of health behaviours such as flu vaccination, reduce potential morbidity and mortality rates associated with the vaccine preventable disease, address health inequities and meet the needs of people with mental illness.

Given that the explanatory variables in the final model were at the individual (micro) level, nurses can play a vital role for vaccine uptake. Based on the research findings**,** this next section will delve into discussing the importance of the findings and suggest specific strategies or key interventions with regard to practice, policy, theory, and future research.

Practice

According to Pender (2011), understanding one's personal information and experiences will assist in identifying and modifying the client's behaviours specific knowledge, cognitions, and affect, important motivational factors to successfully achieve the desired health outcomes and behaviours. In my study, individual characteristics such as age, sex, education, income, and physical comorbidities were found to have substantial influences on receiving a flu vaccine in the mental health population. Therefore, this study may inform nursing practice, a vital component of the interpersonal environment, of the specific factors that should be identified and targeted in health interventions and education. Conducting comprehensive assessments of past experiences and individual characteristics will guide nurses to assist clients in actualizing the anticipated benefits of engaging in a behavior, while carefully assessing their emotions towards the health promoting behavior (Estrada, 2016; Pender, 2011; Syx, 2008). These are necessary steps for facilitating greater perceived self-efficacy, a fundamental concept in behavioral change (Pender, 2011). Although not explored in this study, according to Pender (2011), a greater perceived self-efficacy or sense of control over one's health behaviours results in higher positive affect and lower perceived barriers, ultimately increasing the likelihood of commitment and action. Nevertheless, in relation, my study revealed important reasons for flu non-vaccination in the mental illness group, offering specific insight into past experiences, perceptions and feelings including their perceived barriers and affect that have negatively shaped commitment and engagement in flu vaccination. The reasons for non-vaccination also highlighted potential knowledge gaps and reduced prioritization of the flu vaccine. Thus, understanding these reasons can inform healthcare professionals and flu vaccination programs, and improve efforts to reduce vaccine hesitancy, fears and decisional conflict, as well as increase knowledge and promotion of the flu vaccine in the Canadian mental health population (Borthwick et al., 2021; Farmanara et al., 2018; Lorenz et al., 2013; PHAC, 2020). Additionally, lifestyle behaviours such as smoking and sedentary behaviours were found to be important in flu vaccination; thus negative health behaviours should be identified and addressed by healthcare professionals to develop positive lifestyle behaviours and attitudes toward health promotion and prevention strategies such as influenza vaccination (Barut et al., 2022).

In this study, individuals with strong interpersonal influences such as having people to depend on, relationships that provide a sense of emotional security and wellbeing, trustworthy people for advice, to talk to about important decisions and count on in an emergency were more likely to receive a vaccine (Statistics Canada, 2020a). Therefore, nurses should create and implement specific educational programs and strategies that include the client’s other social supports and influences (Dombrowski et al., 2014; Pender, 2011). In doing so, nurses can further strengthen self-efficacy and ultimately create positive conditions that facilitate optimal health and well-being (Pender, 2011). When individuals have supportive and emotionally encouraging family, friends, and communities, including those who actively place expectations and role model positive health behaviours, the likelihood of engaging in health promoting behaviours is enhanced (Pender, 2011). Thereby, individuals with reduced interpersonal influences could face limited assistance, emphasis, and expectations from others to vaccinate, potentially resulting in lower cooperation and commitment, and negative attitudes toward preventive health visits and services including vaccination (Schmid et al., 2017; Shahroodi et al., 2020). Lastly, the perceived social benefit of vaccination may be higher among those with strong connections and sense of belonging (Schmid et al., 2017). Mental health clinicians, particularly in clubhouse programs can play an important role in providing support and encouragement to promote flu vaccination uptake in the mental health population. Overall, building existing and new social support networks for individuals with mental illness needs to be prioritized and emphasized within nursing practice, community mental health and health programs as social ties and networks can lead to better health and act as a safeguard against health issues, such as by potentially determining the intent of individuals with mental illness to vaccinate (Borthwick et al., 2021; Government of Canada, 2013; Pender, 2011).

My findings revealed that slightly over one third of individuals with mental illness in Canada have never received a vaccine and among those who received a vaccine in their lifetime, one third received it over two years ago. The top three reasons are: respondent did not think it was necessary, does not believe in benefits and lack of time. Thus, this study suggests that commitment and engagement in flu vaccination should be prioritized and promoted within healthcare for those with mental illness, to vaccinate and to remain continually protected against the virus. It is, therefore, necessary to educate and encourage all clinicians including medical and mental health providers to regularly discuss with clients about vaccine misinformation, safety concerns and the importance of disease prevention and health promotion (Borthwick et al., 2021; Lorenz et al., 2013). As well, psychiatric clinicians including nurses should expand their knowledge and role to include promoting preventive vaccinations and healthy behaviours (Lorenz et al., 2013; Miles et al., 2020). This may include training mental health providers to administer annual flu vaccines (Warren et al., 2020). Engagement with mental health clients should be respectful, supportive, and open, such as when discussing physical health comorbidities, the risks of flu and strategies for illness prevention (Borthwick et al., 2021; Warren et al., 2020). Utilizing decision aids can be an effective approach to facilitate informed and shared decision making about vaccination receipt (Borthwick et al., 2021). As well, motivational interviewing may be an appropriate communication style that respects patient centred care and patient autonomy for addressing vaccination barriers, resistance, motivations and eliciting change talk (Borthwick et al., 2021).

Furthermore, according to a US study by Miles et al. (2020), non-psychiatric clinicians or those with minimal experience working with the mental health population should receive support and mentorship from the mental health professionals. Miles et al. (2020) indicated that once staff from the community health department collaborated and received education about mental illness from the community mental health clinic, they found working with the mental health population and delivering immunization services to be personally rewarding. This speaks to the importance of promoting an integrative and collaborative healthcare system. For the majority of those staff, serious concerns, stigma, and misconceptions about mental illness were also alleviated. Although not explored in this study, stigma within healthcare in Canada is a significant issue that needs to be addressed as it is a barrier to providing high quality and comprehensive care for the mental health population (CAMH, 2016; Miles et al., 2020).

Overall, clinicians should receive on-going training and education on working with and treating individuals with mental illness, to comprehensively understand the complex factors such as social determinants of health, symptoms of the mental illness, stigma and discrimination that reduce the ability to deliver or engage in preventive services, and to advocate for positive health outcomes (CAMH, 2016; Miles et al., 2020; Warren et al., 2020). With this understanding, healthcare professionals will be better equipped to educate and promote flu vaccination, thereby decreasing morbidity and mortality rates related to seasonal influenza among individuals with mental illness (Lorenz et al., 2013). Leadership such as managers and senior leaders can play a role in advocating for vaccines (Villeneuve, 2017) by providing the necessary tools and resources to facilitate clinician training and on-going education, as well as by actively engaging in committees, initiatives and campaigns that increase influenza vaccine awareness and access for the mental health population (Warren et al., 2020; Villeneuve, 2017).

Policy/System Level

"Just because a vaccine is available…doesn't mean that it is easy to access, or that one is even aware of its existence" (CanAge, 2022, p. 11). The results of my study showcase that access to primary care such as having a regular care provider is influential in promoting flu vaccination for the Canadian mental health population: guaranteeing appropriate access and interaction with the healthcare system may effectively address health needs and provide essential preventive care services including the flu vaccine (T. Lawrence et al., 2020; Miles et al, 2020; Schmid et al., 2017; Yeung et al., 2016). This information may guide future strategies to address the system level barriers and foster positive healthcare interaction for people with mental illness (CMHA, 2018; Moroz et al., 2020). Strategies that will specifically target this population and enable people with mental illness to access timely, quality, and appropriate healthcare services will increase their likelihood of being offered flu vaccines and engaging routinely in health promoting behaviours (CMHA, 2018; Miles et al., 2020; Moroz et al., 2020).

A US study by Miles et al. (2020) found that individuals with mental illness are receptive to preventive care and immunizations when they have access to information and vaccine programs within their communities, and when vaccination programs are implemented in "nontraditional" community sites. In their study, researchers developed a mobile immunization intervention that was integrative, cost efficient and patient centred, at various high utilization community locations such as clubhouse (Miles et al., 2020). This resulted in a profound effect on the desires of individuals with mental illness to access and receive immunizations including flu vaccines (Miles et al., 2020). This affirms in the importance of receiving integrated, coordinated, comprehensive and patient centred care to potentially reduce discrepancies in healthcare and vaccine access, and improve the quality of preventive care for people with mental illness. Thus, it is imperative to design and implement comprehensive community vaccine education and awareness programs that address the barriers to influenza vaccination and specifically target individuals with mental illness (Miles et al., 2020; Warren et al., 2021).

Correspondingly, the CAMH (2016) has outlined key principles and strategies based on a social justice framework to enhance primary care access for individuals with mental illness in Canada. These strategies could in principle be applied in this study to facilitate primary care access (and potentially community mental health care access) for the subsequent promotion of flu vaccines. These could include designing flexible community health services that adequately address the complex barriers experienced by individuals with mental illness, including extending operating hours, offering home visits, and quiet spaces in waiting rooms, utilizing appointment reminders, annual follow up checks, and registries to track preventive care and disease prevention management for complex mental health clients (CAMH, 2016). In fact, a study by Lorenz et al. (2013) suggested using a computerised reminder system to inform clinicians when clients with mental illness are due for their flu vaccines. Providing transportation to vaccination clinics and pharmacies, as well as mobile and pop-up sites may also be useful in increasing flu vaccine access (CanAge, 2022; Warren et al., 2020).

On a broader level, the CAMH recommended expanding focus on integrating mental health with physical health services to provide appropriate healthcare access and comprehensive care for the Canadian mental health population including preventive services. As such, advocating for vaccine programs within mental health care and aligning vaccinations with other preventive health services such as metabolic monitoring and smoking cessation for individuals with mental illness are key examples of facilitating integration (Warren et al., 2020). Lastly, governments should continue assisting and funding integrative and innovative health projects to ensure people with mental illness receive "the health care to which they are entitled," and this should include influenza vaccination (CAMH, 2016, p. 15). As mentioned previously, it has been argued in the literature that people with mental illness should be entitled to even greater use of healthcare services than the general population to match their higher level and more complex needs (Lawrence & Kisely, 2010). Thus, while exploring and addressing potential discrepancies in influenza vaccines between people with mental illness and without mental illness is of great importance, encouraging and facilitating higher flu vaccination for the mental health population should be of greater priority (Government of UK, 2018; Lawrence & Kisely, 2010).

Of importance, individuals with mental illness are not currently considered a high-risk group for influenza related complications in Canada. This study however highlighted multiple interrelated factors that significantly increase the risk of acquiring and dying from influenza related complications, as well as impact engagement in influenza vaccination. As previously mentioned, the absence of a high-risk status may subsequently result in under vaccination, lack of awareness and dismissal of its importance for this population by their healthcare providers, communities, and governments. Thus, governments should consider the mental health population as a group for whom the flu vaccination is particularly recommended and increase the prioritization of individuals with mental illness within preventive care, adult vaccination programs and policies across the nation. Prioritizing individuals with mental illness within healthcare, government policies and research is crucial, since worldwide and in Canada, mental illness is on the rise (CAMH, 2022). Furthermore, the effects of the global pandemic have not only impacted physical health but further triggered mental health conditions and exacerbated existing mental illnesses (Statistics Canada, 2021a).

Collaboration between governments, healthcare and community stakeholders must take place to increase public information, awareness, and knowledge mobilization about flu vaccinations for high-risk groups including adults with mental illness (CanAge, 2022). Some approaches could be designing website information for the mental health population, their families and health care professionals, creating a public awareness campaign, and putting this knowledge in flu and mental health guides (CanAge, 2022). Government decisions should be based on a thorough understanding of the factors that impact flu vaccination and the significance of promoting regular flu vaccination to reduce morbidity and mortality, minimize the burden on the health care system, and most importantly to save the lives of people with mental illness (CAMH, 2016; Lorenz et al., 2013; Miles et al., 2020; Warren et al., 2020). Above all, the collaboration must involve working meaningfully with the mental health population to increase flu vaccination and serve their needs (Borthwick et al., 2021; CAMH, 2016; Warren et al., 2020); to involve the mental health population in developing health policies and programs that directly impact them (CAMH, 2016; Warren et al., 2020); to ultimately become full partners in their care and be empowered with knowledge on health, health promoting behaviours, health care rights, and advocacy (Borthwick et al., 2021; CAMH, 2016; Warren et al., 2020).

Theory

The results of this study showcase that concepts of Pender's HPM may be utilized in nursing practice as a framework to identify and predict important factors such as individuals sociodemographic and non-sociodemographic characteristics associated with the mental health population engaging in influenza vaccination (Chen & Hsieh, 2021). Future research would benefit from analyzing the central components of the HPM not examined in this study such as the cognitive and behavioural specific perceptions (i.e., perceived barriers and benefits, self-efficacy and affect) to explore additional pertinent factors that influence flu vaccination in the Canadian mental health population. According to a systematic review, insights into these motivational variables will provide predictive power and a better understanding of why certain individuals hesitate to vaccinate "while others do not" (Schmid et al., 2017, p. 18). In addition to the HPM, broader frameworks and theories that attend to the importance of economic, political, and socioecological context, including stigma and discrimination within the health promotion and prevention paradigm, should be applied, especially when the focus is on at-risk populations such as individuals with mental illness (Raingruber, 2017).

Future Research

In this study, sociodemographic factors such as age, sex, education, and income played a critical role in receiving influenza vaccine among Canadian adults with mental illness. More research is necessary to examine their differences and the contribution of these factors (93% unexplained variance) in explaining influenza vaccination, and understand their underlying mechanisms. The social determinants of health must be considered within current and future vaccine interventions for the mental health population. As well, further research on the connection between smoking and sedentary lifestyle may require additional exploration in terms of predicting influenza vaccine uptake. The importance of interpersonal influences in health promotion was highlighted in this study and thus should be explored further in future research, particularly the support and input of healthcare professions such as nurses (Borthwick et al., 2021). Other factors more specific to the mental health population should be further explored such as influenza/influenza vaccine knowledge and awareness, prior vaccine experiences, behavior specific cognitions and affect, health care programs/services (i.e., integrated, coordinated, comprehensive, population based), and interactions with the healthcare system. These factors were not available in the CCHS; however, in the literature they held a strong influence on influenza vaccination and overall preventive services for the mental health population.

Researchers could benefit from developing or utilizing surveys measuring a wider selection of variables to explore the broader factors of health promotion on flu vaccination. As well, conducting mixed methods and multistage sampling may enrich the data and offer comprehensive understanding into what influences flu vaccination (Cheng & Phillips, 2014). Longitudinal studies may further reduce issues with temporality (Caruana et al., 2015). Particularly, conducting mixed methods research will allow researchers to engage in qualitative work and deepen the exploration of flu vaccination, by providing important clarification or complementary data on the lived experiences, perspectives, concepts and interactions, data that may not be entirely captured using quantitative methods alone (Borthwick et al., 2021; Polit & Beck, 2020). Additionally, applying an intersectional lens within nursing research, which qualitative work is well suited for, will encourage nurses to look beyond individual level factors and behaviours, and instead consider critically and comprehensively the ways that for instance race, age, gender, socioeconomic status, marginalization, colonization, and globalization are interconnected and together interact to influence people's health, ability to access and receive healthcare services (e.g. flu vaccination) (Van Herk et al., 2011). Accounting for these multiple social identities and broader contexts, while paying attention to various power dynamics that contribute to inequities in health, healthcare access and outcomes will ultimately promote social justice and reduction in health disparities for marginalized groups including people with mental illness (Van Herk et al., 2011). Furthermore, to increase awareness and understanding of flu vaccination among the mental health population, more research should be conducted within outpatient and inpatient mental health settings including those institutionalized and hard to reach, as well as individuals diagnosed with other primary mental health disorders such as schizophrenia and schizoaffective disorder. Lastly, additional provinces and territories should be included in future research for further insight and comparisons.

Knowledge Translation

Knowledge translation is an important aspect of research, involving the promotion and adoption of research findings by various stakeholders including clients, healthcare professionals, leaders, and policy makers (Curran et al., 2011; Khoddam et al., 2014). Therefore, to facilitate knowledge translation, I plan to disseminate the research findings through publications, and various conferences (e.g., TWU CREATE). This will help increase access to evidence, spread awareness and insight, and build opportunities to engage in dialogue with researchers, academics, health experts and the mental health population (Curran et al., 2011; Khoddam et al., 2014). These steps are necessary to create change that will benefit the mental health population in Canada.

Study Strengths and Limitations

It is important to illuminate the strengths as well as acknowledge the limitations of this study that could impact the research findings and conclusions. This section outlines the strengths and limitations in more detail, the majority associated with conducting a secondary data analysis and utilizing the CCHS for data analysis. Strengths and limitations pertaining to study methods and generalizability of findings will also be discussed.

CCHS and Secondary Data Analysis

There were several noteworthy strengths of this study. One in particular is the thorough data collection process used for the CCHS. Throughout the collection process, the CCHS puts in place rigorous control and monitoring measures, and corrective action to reduce non-sampling errors (Statistics Canada, 2019). The measures include enhanced collections tools for personnel and interviewers, on-site observations of the interviews, response rate evaluation, and evaluation of reported and non-reported data (Statistics Canada, 2019). In addition, the CCHS undertakes three imperative data validation steps to thoroughly examine the data and effectively detect any anomalies and errors such as running a validation program, and the work of analysists who actively engage with the CCHS data (Statistics Canada, 2019). In terms of non-response - a significant cause of non-sampling errors in many surveys- appropriate adjustments are applied in CCHS for household and person level non-response to "compensate for the effect of" non-response, often by applying the adjustment factor to the weights of those who responded (Statistics Canada, 2019, p. 28). In the CCHS 2017-2018, the combined response rate by health region and frame was 60.8% (Statistics Canada, 2019).

The most notable limitations of this study pertain to secondary data analysis and the cross-sectional design of the CCHS dataset. In terms of the former, while conducting secondary data analysis of pre-existing data has its advantages such as allowing one to spend greater time analysing and interpreting data, the most notable disadvantages include little familiarity with the data, lack of control over the framing of the survey questions and quality of the data, as well as the absence of key variables (Cheng & Phillips, 2014). As such, the ability to select and explore relevant variables in the CCHS and fully address the research questions were limited. Additionally, due to a lack of input in the survey design and questions, it was impossible to seek clarification, elaboration, or further details from respondents during the process (Cheng & Phillips, 2014). This would have assisted in addressing ambiguity and increasing understanding. Further, utilizing the SPSS Public Use Microdata file rather than raw data limited the analysis of the **cultural/racial background** variable as it only contained two response options (1) “white” and (2) “not white.” Conducting a mixed methods study using quantitative and qualitative techniques in the future may enhance the richness and meaning of data. Furthermore, the measure of flu vaccine rates was self-reported in the CCHS, therefore recall bias and social desirability bias may exist and impact the study (Polit & Beck, 2020).

Regarding the cross-sectional nature of the CCHS dataset, although relationships were detected between the independent variables and the outcome variable in this study, these correlations “do not imply causation” (Ratner & Sawatzky, 2009; Vaus, 2002). Firstly, the temporal relationship between the independent and dependent variables is not always clear in research, an issue that is especially apparent in cross-sectional studies (Ratner & Sawatzky, 2009; Sedgwick, 2014). Since cross sectional studies are conducted at one point in time, the respondents’ engagement in flu vaccination is not followed or tracked over time (Ratner & Sawatzky, 2009; Sedgwick, 2014). Thus, determining which factor is the exposure variable or came before may be difficult (Sedgwick, 2014). In this study, using lifetime flu vaccine rates as the dependent/outcome variable introduces issues with temporality. For instance, receiving a flu vaccine over two years ago may have preceded certain independent variables such as health lifestyle behaviours and health perceptions. However, our sub analysis results showcased that for almost 70% of the sample, the flu vaccinations occurred less than two years ago. In the future, conducting a longitudinal study may be useful to reduce issues with temporality including effectively determining variable trends and tracking changes over time (Sedgwick, 2014). Given that additional data from 2018 onwards does exist, it is feasible to replicate this study to determine whether the existing explanatory model holds true.

Secondly, there are potential cofounders not examined in the study that could have accounted for the relationships between engagement in flu vaccination and the independent variables (Ratner & Sawatzky, 2009). The lower variance in this study could mean that there are many additional factors and constructs that need be explored to increase insight, to explain the influence of flu vaccination among the mental health population. Of note, this study was restricted by the variables available in the CCHS and only examined a subset of the population which played a role in the variance explained. Nevertheless, future research would benefit from further exploring the interplay between perceptions, beliefs, interpersonal, organizational, political, and environmental components. Examining their interactions may offer deeper understanding of the mechanisms involved behind engagement in flu vaccination for individuals with mental illness

Study Methods

In terms of limitations specific to study methods and analysis, firstly not all logistic regression assumptions were met. The presence of outliers and a non-linear association between **relationship with others/community** and **flu vaccine** in the imputed data may have a negative effect on the equations and predictions of the regression, therefore, the results of this analysis must be interpreted with caution. Of note, less than 5% of total potential outliers were identified in the entire study, and in the original data, all continuous independent variables were linearly associated with the logit transformation of the dependent variable. Other limitations pertained to missing data and multiple imputation. According to the study's missing values analysis, 88% (22) of variables had missing data and 20.17% (896) of total cases were incomplete. Missing data can skew the research analysis results and reduce the statistical power. Therefore, to minimize the impact of missing data on findings, multiple imputation was performed to replace the missingness and enhance the accuracy of the analysis. However, nine categorical independent variables were collapsed to facilitate multiple imputation, resulting in the loss of meaningful data (Ratner & Sawatzky, 2009). Nevertheless, regardless of the limitations of multiple imputation, the decision was seen as beneficial to mitigate bias attributed to missing data. Furthermore, in SPPS it was not always possible to obtain pooled results for the logistic regression analysis. To address this, ranges and results for each iteration were provided.

Generalizability

This study is overall generalizable due to the sample size and the CCHS, a highly representative survey of the Canadian population. However, future research will benefit from investigation of influenza vaccination in other provinces and territories to increase data and applicability. In this study, only four provinces were chosen because of the availability of certain variables in select provinces. Furthermore, due to limitations of the CCHS, data of Canadians living on reserves and full-time members of the Canadian Forces were excluded, as were individuals that would have a mental illness and not have a fixed address (e.g., live on the street), or those institutionalized. Of importance, in 2011, out of 360,620 individuals living on Canadian reserves, nearly 90% were First Nations (Parrot & McCue, 2016). Thus, this exclusion results in the failure to consider and capture the many voices and perspectives of Aboriginal peoples in Canada, a population that experiences significant health and healthcare disparities compared to non-Aboriginal individuals, including a high prevalence of mental illness such as major depressive disorder (Reading & Wien, 2009). Similarly, excluding full time members of the Canadian Forces, approximately 68,000 individuals, results in important data gaps and underrepresentation of a group whose rates of anxiety disorders (e.g., generalized anxiety disorder, post-traumatic stress disorder, panic disorder) and depression are substantially higher compared to the Canadian general population (Government of Canada, 2020a; Pearson et al., 2014). As well, this study was applicable primarily to individuals with mood and/or anxiety disorders. Examining these mental illnesses separately, as well as other mental illnesses such as schizophrenia, schizoaffective, and eating disorders, including individuals with substance use disorders will expand understanding and consideration.

Conclusion

Influenza is a preventable, yet a highly dangerous infection particularly for vulnerable populations such as individuals with mental illness (Borthwick et al., 2021; CDC, n.d.1; Lord et al., 2010; Lorenz et al., 2013; Miles et al., 2020). Under Canadian guidelines a flu vaccine is recommended for high-risk groups such as seniors, children, pregnant women, and individuals with chronic medical conditions Government of Canada, 2020b). Individuals with mental illness however are not considered a high-risk group for flu related complications. This is despite a high prevalence of poor physical health and an impaired immune function (Lord et al., 2010; Lorenz et al., 2013; Miles et al., 2020; PHAC, 2016). Other factors such as symptoms of the mental illness, stigma and discrimination place individuals with mental illness at a greater health risk and inequity (CAMH, 2016; Lord et al., 2010; Lorenz et al., 2013; Miles et al., 2020; PHAC, 2016). These risks increase the chances of experiencing flu related complications (CDC, n.d.a; Lord et al., 2010; Lorenz et al., 2013; Miles et al., 2020). Furthermore, while poor health outcomes and reduced uptake of preventive services including flu vaccination among individuals with mental illness have been reported in research, current understanding about the rates and determinants of flu vaccination behaviour in this population is limited. Therefore, this research sought to lay the groundwork, particularly within the Canadian context for understanding and improving flu vaccination among this under researched population, specifically by exploring the flu vaccination rates and the factors associated with flu vaccination among Canadian adults with mental illness.

Overall, this study suggests that while individuals with mental illness do engage in flu vaccination, there is a need to increase flu vaccination and promote annual vaccinations. This warrants attention from healthcare professionals - vital interpersonal influences shaping vaccination knowledge and decisions (Pender, 2011). To adequately promote flu vaccination, healthcare providers, governments and other stakeholders must recognize and consider the overarching complex needs, factors and barriers that individuals with mental illness experience such as symptoms of the mental illness, the relationship between mental and **physical health**, the determinants of health (i.e., **gender**, **education**, **income**, **healthy behaviours**, **interpersonal influences**, **access to primary care**, and **health region**), as well as stigma and discrimination in their decisions and interventions (CAMH, 2016; Miles et al., 2020; Warren et al., 2021). Prioritizing individuals with mental illness within research, healthcare and policies is of particular importance now as mental illness is a global health issue, on the rise, and has further been exacerbated by a global pandemic (CAMH, 2016, 2022). In summary, conducting research and promoting knowledge on the importance of flu vaccination is one piece of the puzzle in improving population health and reducing the burden on the mental health population.

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APPENDIX A

Final Keywords and Headings Searched in Electronic Databases

Table A1

CINAHL Complete Database

Concept 1	AND	Concept 2
(MH "Mental Disorders") OR (MH "Mental Disorders, Chronic")		(MH "Influenza Vaccine") OR (MH "Influenza, Seasonal") OR (MH "Influenza, Human") OR (MH "Influenza") OR (MH "Preventive Health Care")

Table A2

MEDLINE Full Text Database

Concept 1	AND	Concept 2
(MH "Mental Disorders") OR (MH "Mentally Ill Persons") OR "chronic mental disorders" OR "psychiatric patients" OR "psychiatric clients" OR "mental illness*"		(MH "Influenza Vaccines") OR (MH "Influenza, Human") OR (MH "Preventive Health Services") OR “seasonal flu vaccin*” OR “adult flu vaccin*” OR “flu shot*” OR “flu vaccin*” OR “flu jab*” OR “flu clinic*” OR “flu shot* clinic* OR “flu program*” OR “flu vaccine* status” OR “influenza immuniz *clinic*” OR “influenza immunis* clinic*” OR “flu shot* coverage” OR “flu vaccin* coverage” OR “annual flu vaccin*” OR “influenza immuniz* service*” OR “influenza immunis* service*” OR “flu vaccin* recommend*” OR “flu vaccin* requirement*” OR “flu prevention” OR “influenza prevention”

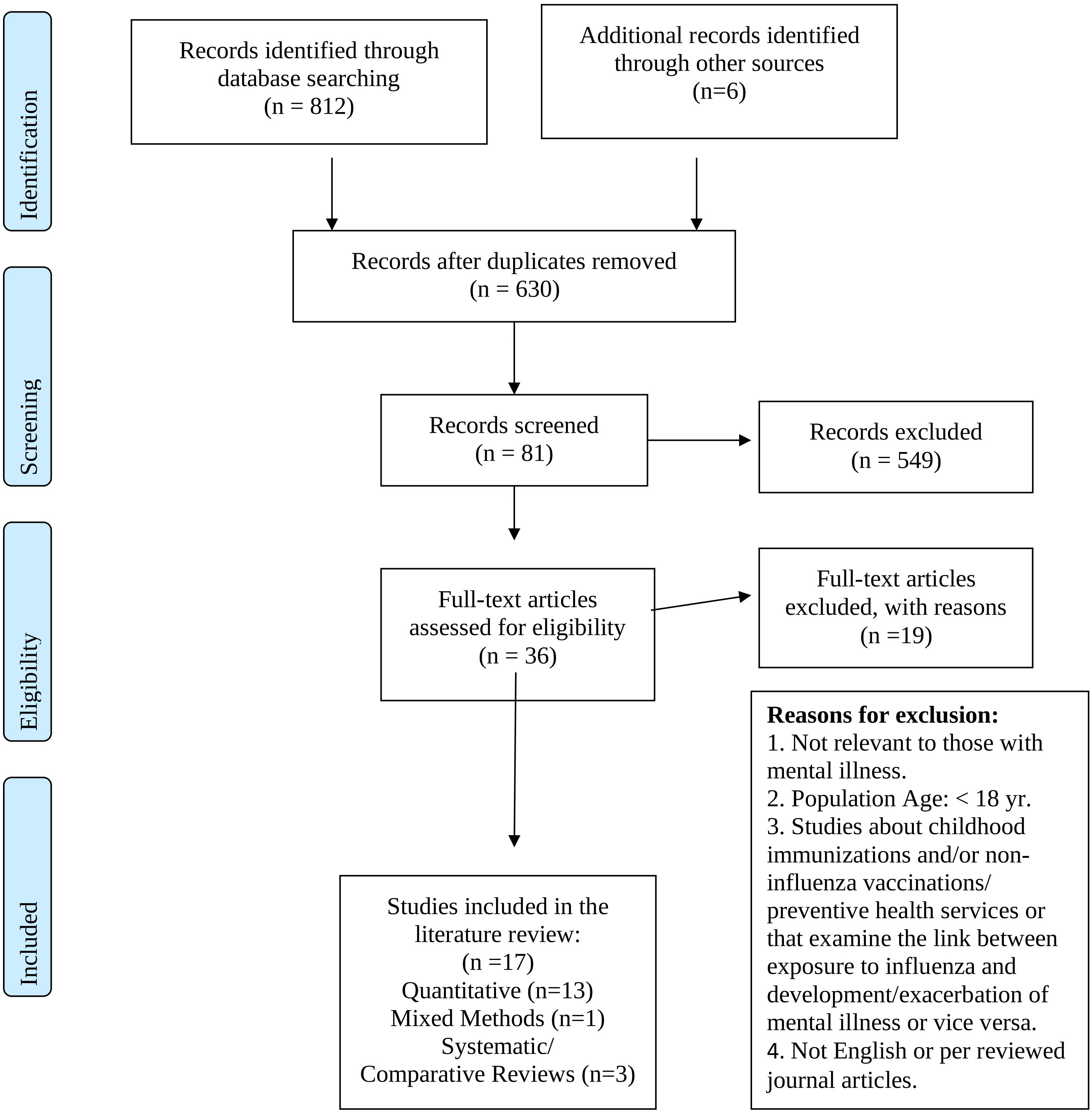
Table A3

APA PsychInfo Database

Concept 1	AND	Concept 2
DE "Affective Disorders" OR DE "Anxiety Disorders" OR DE "Bipolar Disorder" OR DE "Chronic Mental Illness" OR DE "Dissociative Disorders" OR DE "Psychosis" OR DE "Serious Mental Illness" OR DE "Stress and Trauma Related Disorders" OR DE "Substance Related and Addictive Disorders" OR DE "Homeless Mentally Ill" OR DE "Mental Status" OR DE "Psychiatric Patients" OR DE "Mental Disorders"		DE "Influenza" OR DE "Preventive Health Services" OR “influenza vaccin*” OR “influenza shot*” OR “seasonal flu vaccin*” OR “seasonal influenza vaccin*” OR “adult influenza vaccin*” OR “flu shot*” OR “flu vaccin*” OR “flu jab*” OR “flu clinic*” OR “flu shot* clinic* OR “flu program*” OR “influenza immuniz *clinic*” OR “influenza immunis* clinic*” OR “flu shot* coverage” OR “flu vaccin* coverage” OR “influenza vaccin* coverage” OR “annual flu vaccin*” OR “influenza immuniz* service*” OR “influenza immunis* service*” OR “flu vaccin* recommend*” OR “flu vaccin* requirement*” OR “flu virus” OR “flu season” OR “influenza season” OR “flu prevention” OR “influenza prevention”

APPENDIX B

Flow Diagram of Search Strategy for Literature Review



From Moher D, Liberati A, Tetzlaff J, Altman DG. (2009).

APPENDIX C

Search and Screening Inclusion/Exclusion Criteria

Inclusion	Exclusion
1. Adults with mental illness. Types of Mental Illness: Mood/Affective Disorders- e.g. depression, bipolar, cyclothymic. Anxiety Disorders- e.g. generalized anxiety disorder, panic, post-traumatic stress disorder, social anxiety, dissociative disorder, specific phobias. Psychotic Disorders-e.g. schizophrenia, schizoaffective. May have concurrent disorders e.g. addiction disorders. Other: Homeless with mental illness. 2. Population Age: (mixed samples) A<u>t least 50%</u> of the sample population must be ≥18 yr. 3. Setting: Adults with mental illness who reside either in community, long term care/assisted living, outpatients or hospitalized patients. 4. Influenza vaccines as either primary or <u>at least one</u> of the measures/outcome variables in the study (in the methods/intervention section, not only in title, abstract, introduction/background/discussion sections). *Note** Initially may include titles/abstracts with preventive health services as an outcome (without mentioning influenza vaccine), however, will need to screen full texts to determine if influenza vaccine was included in the study to be relevant.	1. Adults not with mental illness. Adults diagnosed with neurological disorders, neurodevelopmental disorders, intellectual disabilities, eating disorders, personality disorders, perinatal mental health problems, postnatal depression. Prevention/screening/treatment of mental illness or suicide. 2. Population Age: < 18 yr. (or <u>more than 50%</u> are < 18 yr.). 3. Childhood immunizations and non-influenza vaccinations/preventive health services. Studies that examine the link between exposure to influenza and development/exacerbation of mental illness or vice versa. 4. Non-English 5. Not peer reviewed journal articles, including thesis/dissertation, discussion, editorial, or commentary papers.

Inclusion	Exclusion
May include studies that explore integrated interventions/models/programs in relation to influenza vaccinations and mentally ill populations. 5. Publications must be in English, from any country. *Note** Preferably studies from Canada and other countries with similar health care and economy as Canada. Will include studies from non-English countries if meet the remaining criteria. 6. Quantitative, qualitative, mixed methods studies or systematic reviews. *Note** May include program evaluation and KT projects. 7. Must be journal articles.	

APPENDIX D

Literature Review Matrix

Author Title Journal	Year Place	Study Purpose	Study Design	Theory/ Frame- work	Sample Setting	Independent Variables	Control Variables	Dependent Variables	Methods of Data Analysis	Main Findings:	Other Findings (i.e., flu vaccine rates)	Other
Druss, B.G., Robert M. Rohrbaugh, R.M., Levinson, C.M., Rosenheck, R.A. "Integrated Medical Care for Patients With Serious Psychiatric Illness." Journal of Arch General Psychiatry	2001 USA	To evaluate the impact of different types of primary care programs (integrated vs. usual source of care) on health processes and outcomes for veterans with mental illness	Experimental-A randomized trial (non-blinded) study.	Not Stated.	N=120 P=Adults (mean ages 45.7 & 44.8) S= Enrolled in 'Veterans Affairs' (VA) mental health clinic. Mental illnesses: Schizophrenia PTSD Affective d/o Substance use Severe-psychiatric illness.	**Program Type:** Integrated vs. Usual Care	N/A	**Influenza Vaccine** [Quality of preventive care]	Bivariate tests to compare baseline char. bet. the 2 groups. Mean diff. 2 tailed, alpha level <0.05. Pre-test & post-test (6 & 12 months). *Note** "Outcome variable analyzed as comparison bet. groups	**Baseline:** No significant differences found between groups (demographic, health status or diagnostic) *except for prevalence of cardiovascular disease*. **Pre-test:** Only 44.2% in any setting received >1 preventive services, X (avg.) =1.2 for all. *Note** No pre-test data available on flu vaccines alone.	N/A	N/A

Author Title Journal	Year Place	Study Purpose	Study Design	Theory/ Frame- work	Sample Setting	Independent Variables	Control Variables	Dependent Variables	Methods of Data Analysis	Main Findings:	Other Findings (i.e., flu vaccine rates)	Other
									during the year after randomization" (p. 863).	**Post-test (12 mo.)**: Integrated Care: 32.2% (n=19/59) received flu shot vs. Usual Care: 11.5% (n=7/61) received flu shot **Overall:** Mean diff=7.6, P=0.006.		
Druss, B.G, Rask, K., & Katon, W.J. "Major Depression, Depression Treatment and Quality of Medical Care." General Hospital of Psychiatry	2008 USA	To explore the relationship between major depression diagnosis, treatment for major depression, and receipt of primary medical care compared to those with no major depression.	Secondary data analysis.	Not Stated.	N=30, 801 P=Adults (> 50) S= National Health Interview Survey.	**Major Depression Diagnosis & Treatment**	Age Gender Income Race Insurance Chronic-general medical conditions.	**Flu Vaccine** [primary medical care-comprehensiveness] Other: Access. Coordination. Continuity.	Logistic regression models: Adjusted odds ratios (aOR), 95% confidence intervals (CI).	**Flu Vaccine:** With major depression more likely to not have a flu vaccine than no major depression: aOR=1.24 (CI=1.18-1.30). **Stratified by whether receiving mental health services:** Untreated depression (not receiving any care) more likely	N/A	N/A

Author Title Journal	Year Place	Study Purpose	Study Design	Theory/ Frame- work	Sample Setting	Independent Variables	Control Variables	Dependent Variables	Methods of Data Analysis	Main Findings:	Other Findings (i.e., flu vaccine rates)	Other
										to not have a flu vaccine than no major depression: aOR=1.51 (CI=1.40-1.62) + No significant associations with flu vaccine between those with depression receiving care (in specialty MH care & primary care) and those with no major depression.		
Druss, B.G., Von Esenwein, S.A., Compton, M.T., Rask, K.J., Zhao, L., Parker, R.M. "A Randomized Trial of Medical Care	2010 USA	To evaluate whether a population based approach medical care will improve primary care outcomes and health related quality of life for people	Experimental-A randomized trial study.	Not Stated.	N=407 P=Adults (>18) S= Urban community mental health clinic. Mental illness: Psychosis Schizophrenia Bipolar d/o PTSD	**Medical Care Type:** Medical care management intervention group vs. Usual care group	N/A	**Flu Vaccinations** [primary care quality] Other: Hepatitis B, measles, mumps, rubella; pneum. bacterial infection;	Bivariate tests to compare the 2 groups at baseline & follow-up. Random regress. for statistical sig in changes bet. 2 groups	**All Vaccines** **Baseline:** No significant differences found between demographic & diagnostic characteristics of the sample. Intervention G: N=186/205 Mean=3.1	N/A	N/A

Author Title Journal	Year Place	Study Purpose	Study Design	Theory/ Frame-work	Sample Setting	Independent Variables	Control Variables	Dependent Variables	Methods of Data Analysis	Main Findings:	Other Findings (i.e., flu vaccine rates)	Other
Management for Community Mental Health Settings: The Primary Care Access, Referral, and Evaluation (PCARE) Study." American Journal of Psychiatry.		with mental illness.			Depression			tetanus-diphtheria, varicella. *Note** All vaccines are grouped together re: outcome variable.	over time. Pre-post-tests: 6 & 12 mo. Mean (X), Standard deviation **(**SD**)**, p levels,	SD =9.5 vs. Usual Care: N=187/202 X=4.3 SD= 12.6 Bet. groups: P=0.46. **Post 12 mo.:** Intervention G: N=189/205 Mean=24.7 SD=24.6 vs. Usual Care: N=172/202 X=3.8 SD =9.7 Bet. Groups P<0.001.		
Lord, O., Malone, D., & Mitchell, A. "Receipt of Preventive Medical Care	2010 Euro. + US	"To examine whether the quality of preventive care received by patients with mental health	A Comparative analysis.	N/A	N=26 articles in total, 6= vaccinations care.	**Mental Illness**	N/A	**Flu Vaccine Rates**	Summary of findings, using %, confidence intervals (CI) & odds ratios (OD).	**3 studies found neutral associations:** 1. European interview study-trend toward higher flu vaccine rates for those	N/A	N/A

Author Title Journal	Year Place	Study Purpose	Study Design	Theory/ Frame- work	Sample Setting	Independent Variables	Control Variables	Dependent Variables	Methods of Data Analysis	Main Findings:	Other Findings (i.e., flu vaccine rates)	Other
and Medical Screening for Patients with Mental Illness." Journal of General Hospital Psychiatry.		conditions differs from that received by individuals who have no comparable mental disorder" (p. 520).								with depressive symptoms but not significant. 2. Postal survey- no sign. differences between depression and no depression on flu vaccine rates. 3. UK study- no sig. differences between those with depression and without depression in flu vaccinations for men or women >74 yr. **3 studies found negative associations:** 1. US study- depression more likely to not have a flu vaccine compared to no		

Author Title Journal	Year Place	Study Purpose	Study Design	Theory/ Frame-work	Sample Setting	Independent Variables	Control Variables	Dependent Variables	Methods of Data Analysis	Main Findings:	Other Findings (i.e., flu vaccine rates)	Other
										depression: aOR=1.24 (CI= 1.18-1.30) & untreated depression compared to no depression: aOR=1.51 (CI=1.4-1.62). *Note** Results apply to >50 yr. 2. Self- reported survey- those positive for distress less likely to have flu vaccine OR=0.7 (CI=0.55-088) (among elderly). 3. US Veterans health care study- mental disorder less likely to have ever had a flu vaccine in the past year		

Author Title Journal	Year Place	Study Purpose	Study Design	Theory/ Frame- work	Sample Setting	Independent Variables	Control Variables	Dependent Variables	Methods of Data Analysis	Main Findings:	Other Findings (i.e., flu vaccine rates)	Other
										aOR=0.9 CI=0.87-0.94, (for >65 yr.).		
Xiong, G.L., Iosif, A.M., & Hales, R.E. "Preventive Medical Services Use Among Community Mental Health Patients with Severe Mental Illness: The Influence of Gender and Insurance Coverage." Primary Care Companion to the Journal of Clinical Psychiatry	2010 USA	To determine factors that predict the use of preventive health services among people with mental illness.	Cross-sectional study.	Not Stated.	N=234 P=Adults (>18) S=4 mental health service clinics.	**Psychiatric Diagnosis:** 1. Psychotic 2. Bipolar 3. Major Depression **Gender** **Age** **Education** **Race/ Ethnicity** **Health Insurance**	N/A	**Flu Vaccine** [preventive health service utilization score] Other: Mammogram Papanicolaou (Pap) test Prostate Specific Antigen (PSA) test, Digital Rectal Exam, Fecal Occult Blood Test, Flexible Sigmoid-oscopy, Colonoscopy, Cholesterol Test, Hypertension Awareness & Treat., Diabetes Awareness &	Group diff. (X^2 tests, ANOVA or 2 sample t-tests). Linear regress. (mean, standard deviation **(SD),** estimated difference **(ED),** standard error **(SE),** p values). *Note** Results apply to all preventive services (aggregate).	**Overall Preventive Service Utilization:** Gender: (females) ↑ utilization than men Mean=51.15 SD=24.41 ED = 9.54 SE=3.95 $P < .01$ Health insurance: ↑ utilization than the uninsured participants Mean=49.78 SD=24.08 ED=17.48 SE=4.36 $P < .001$ **Non-significant predictors:** Mental illness diagnosis.	Females have ↑ vaccine rates than males in all psychiatric disorders groups: Psychotic (i.e. 48% vs. 26%) & MDD (26% vs. 12%).	N/A

Author Title Journal	Year Place	Study Purpose	Study Design	Theory/ Frame- work	Sample Setting	Independent Variables	Control Variables	Dependent Variables	Methods of Data Analysis	Main Findings:	Other Findings (i.e., flu vaccine rates)	Other
								Treat., & Oral Health Care.		Education. Age. Race/ethnicity.		
Lorenz, R.A., Norris, M.M., Norton, L.C., & Westrick, S.C. "Factors Associated with Influenza Vaccination Decisions Among Patients with Mental Illness." Inter-national Journal of Psychiatry in Medicine.	2013 USA	To determine factors that predict decisions to receive flu vaccines among people with mental illness.	Cross-sectional study.	Not Stated.	N=298 P=Adults (>19) S= Community based outpatient psychiatry clinic. Majority with primary diagnosis of schizophrenia or depression.	**Gender** **Ethnicity** **Education** **Living-arrangement** **Insurance** **Disability** **Psych diag.** **Previous vaccine status** **Providers recommend.** **Perceptions of flu vaccine**	N/A	**Flu Vaccine Status**	T-tests & Chi-square. Logistic Regress. Sig. p level of <0.05. Mean, mean diff., standard deviation (**SD**), *B* (**un-standard coefficient**), odds ratios (**OR**), 95% confidence interval (**CI**), *F* stat. diff.	**Associations:** > high school: mostly in un-vaccinated group vs. =/<high school Mean=7.7 Df=2 P<0.05. Previous vaccine status: majority in vaccinated group vs. no previous vaccine status Mean=95.3 Df=1 P<0.001. Recommend. from provider: majority in vaccinated group vs. no recommend. Mean=34.9	Vaccine status for those with mental illness (sample): in 2010-2011: 28.4% received flu vaccines & in 2011-2012: 24.2% had been vaccinated and 43.7% had no plans to get vaccinated. vs Compared to the national rate of 40.9% in 2010-2011.	N/A

Author Title Journal	Year Place	Study Purpose	Study Design	Theory/ Frame- work	Sample Setting	Independent Variables	Control Variables	Dependent Variables	Methods of Data Analysis	Main Findings:	Other Findings (i.e., flu vaccine rates)	Other
										Df= 1 P<0.001. No health insurance: majority in un-vaccinated group vs. those insured Mean=16.2 Df = 3 P<0.001. Perceptions- “Vaccine is effective:” Un-vaccinated Mean=3.19 SD 1.04 vs. Vaccinated Mean=3.63 SD=1.34 F=9.82 P<0.001. “Can get flu from vaccine:” Un-vaccinated Mean=3.04		

Author Title Journal	Year Place	Study Purpose	Study Design	Theory/ Frame- work	Sample Setting	Independent Variables	Control Variables	Dependent Variables	Methods of Data Analysis	Main Findings:	Other Findings (i.e., flu vaccine rates)	Other
										SD =1.25 vs. Vaccinated Mean=2.38 SD= 1.19 F=19.90 P<0.001. **Non- statistically significant relationships with flu vaccine status:** Gender. Race/ethnicity. Living-arrangement. Disability status. Psychiatric diagnosis. Perceptions: “can get flu vaccine without the shot,” “vaccines cause mental illness,” & “vaccines can worsen my mental illness.”		

Author Title Journal	Year Place	Study Purpose	Study Design	Theory/ Frame-work	Sample Setting	Independent Variables	Control Variables	Dependent Variables	Methods of Data Analysis	Main Findings:	Other Findings (i.e., flu vaccine rates)	Other
										Logistic Regression: Education: > than high school *B*= -1.23 OR= 0.29 95% CI (0.09-0.96) P < 0.05 (less likely to receive flu vaccines than high school or less than high school education). Recommend. from providers: *B*=1.42 OR=4.12 95% CI (2.17-7.82) P <0.001 (more likely to receive flu vaccines than those without recommend. from		

Author Title Journal	Year Place	Study Purpose	Study Design	Theory/ Frame-work	Sample Setting	Independent Variables	Control Variables	Dependent Variables	Methods of Data Analysis	Main Findings:	Other Findings (i.e., flu vaccine rates)	Other
										providers). Perceived effectiveness of vaccine in preventing the flu: *B*=0.28 OR=1.33 95% CI (1.00-1.75) P <0.05 (more likely to receive vaccines). Perceptions that they can get the flu from the vaccine: *B*= -0.45 OR=0.64 95% CI (0.49-0.82) P<0.001 (less likely to be vaccinated). Insurance status: *B*=1.36		

Author Title Journal	Year Place	Study Purpose	Study Design	Theory/ Frame- work	Sample Setting	Independent Variables	Control Variables	Dependent Variables	Methods of Data Analysis	Main Findings:	Other Findings (i.e., flu vaccine rates)	Other
										OR=3.91 95% CI (1.48-10.36) P<0.001 (more likely to get vaccinated with private insurance than self-payers). **Non- statistically significant predictors**: Age. High school-education.		
Xiong, Iosif, Suo, McCarron, Koike, Onate, & Carter. "Under-standing Preventive Health Screening Services Use in Persons with Serious	2015 USA	To identify demographic and clinical factors that predict preventive cancer and non-cancer services, including a comparison between integrated and non-integrated	Cross-sectional study.	Not Stated.	N=350 P=Adults (>18) S=3 outpatient mental health services/ programs (APSS, WRC, IBHPC). Mental illness: Bipolar. Depression.	**Age** **Gender** **Clinic-type** **Psych. diag.** **Education** **Health-insurance** **Anti-psych medications**	N/A.	**Influenza vaccine** **[**Non-cancer preventive services index**]** Other: Hepatitis C Virus (HCV), and Human Immunodeficie ncy Virus (HIV) tests.	2 sample t-tests, ANOVA, X^2 tests for group diff. Linear-Regression model. b (**un-standard**). Standard error (**SE**). P levels.	**Non-Cancer Preventive Services Index:** **Univariate analysis:** *Note** Here, clinic type variables were not accounted for. Clinic type APSS (not integrated):	N=175/ 350 (50%) received a flu shot in the past year.	N/A

Author Title Journal	Year Place	Study Purpose	Study Design	Theory/ Frame- work	Sample Setting	Independent Variables	Control Variables	Dependent Variables	Methods of Data Analysis	Main Findings:	Other Findings (i.e., flu vaccine rates)	Other
Mental Illness: How Does Integrated Behavioural Health Primary Care Compare?" International Journal of Psychiatry in Medicine.		outpatient mental health clinics with preventive service utilization for people with mental illness.			Schizophrenia/ psychotic. Other.	**# of anti-psych medications** **Marital status** **Race/ ethnicity** **Having a primary care provider (PCP)**		*Note** Flu vaccine is part of an index-results apply only to that index.		*b*= -20.70 SE=2.70 P<0.001 (less likely to utilize non-cancer preventive services compared to IBHPC (integrated). Health insurance: *b*=27.24 SE=4.77 p<0.001 (more likely to use the services compared to no health insurance). On antipsychotic: *b*= -5.12 SE=2.46 p=0.04 (less likely to use services compared to not being on antipsychotic medications).		

Author Title Journal	Year Place	Study Purpose	Study Design	Theory/ Frame-work	Sample Setting	Independent Variables	Control Variables	Dependent Variables	Methods of Data Analysis	Main Findings:	Other Findings (i.e., flu vaccine rates)	Other
										Race: Asian *b*= -16.91 SE=4.21 $p<0.001$ (less likely to use services compared to Caucasian). Having a PCO: *b*=18.60 SE=3.44 $p<0.001$ **Non-significant factors:** Age, gender, clinic type: WRC, mental illness diagnosis, education, number of meds, race: African American, Hispanic or other. **Multi-linear Regression:** *Note** Here, clinic type was accounted		

Author Title Journal	Year Place	Study Purpose	Study Design	Theory/ Frame-work	Sample Setting	Independent Variables	Control Variables	Dependent Variables	Methods of Data Analysis	Main Findings:	Other Findings (i.e., flu vaccine rates)	Other
										for. Gender: female *b*= +4.41 SE=2.23 P<0.05 (more likely to use non-cancer preventive services than male). Clinic type: APSS *b*= -16.34 SE=2.74 P<0.001 (less likely to use preventive services than in IBHPC/ integrated). Race: Hispanic/ Latino *b*= +8.84 SE=3.53 P=0.01		

Author Title Journal	Year Place	Study Purpose	Study Design	Theory/ Frame- work	Sample Setting	Independent Variables	Control Variables	Dependent Variables	Methods of Data Analysis	Main Findings:	Other Findings (i.e., flu vaccine rates)	Other
										(more likely to use non-cancer preventive services than Caucasian). Asian *b*= -9.21 SE=3.90 P=0.02 (less likely to use non-cancer preventive services than Caucasian). Having a PCP: *b*= +14.38 SE=3.17 P<0.001 (more likely to use non-cancer preventive services than those without a PCP). **Non-statistically significant predictors:** Clinic type (WRC).		

Author Title Journal	Year Place	Study Purpose	Study Design	Theory/ Frame- work	Sample Setting	Independent Variables	Control Variables	Dependent Variables	Methods of Data Analysis	Main Findings:	Other Findings (i.e., flu vaccine rates)	Other
										Race: African American & other. Health Ins.		
Young, S., Dosani, N., Whisler, A., & Hwang, S. “Influenza Vaccination Rates Among Homeless Adults with Mental Illness in Toronto.” Journal of Primary Care & Community Health	2015 Can.	To identify influenza vaccine rates among homeless adults with mental illness, in Toronto area.	A retrospective study.	Not Stated.	N=75 P=Homeless adults with mental illness. S=Enrolled at the Toronto site of the At Home/ Chez Soi Study.	**Homeless people with mental illness**	N/A	**Flu vaccine rates** (in the past 1 year).	N/A	See next section.	**Flu vaccines** Only N=5 or 6.7% of participants received flu shots (as per documentations in the charts reviewed) vs. 28.9% among all Canadians in 2012.	N/A

Author Title Journal	Year Place	Study Purpose	Study Design	Theory/ Frame- work	Sample Setting	Independent Variables	Control Variables	Dependent Variables	Methods of Data Analysis	Main Findings:	Other Findings (i.e., flu vaccine rates)	Other
Bowdoin, J.J., Rodriguez-Monguio, R., Puleo, E., Keller, D., & Roche, J. "Associations between the patient-centered medical home and preventive care and healthcare quality for non-elderly adults with mental illness: A surveillance study analysis."	2016 USA	To determine whether patient-centered medical homes (PCMH) positively influence preventive care and healthcare quality for adults with mental illness.	A surveillance study analysis.	Not Stated.	N=6,908 P=Adults (18-64). S= Participants from the 2007-2012 Medical Expenditure Panel survey. Mental Illness: Adjustment-d/o. Anxiety. Delirium. Dementia. Amnesiac. Impulse-control. Mood d/o. Personality-d/o. Schizophrenia	**Provider Type:** PCMH vs. Non-PCMH usual source of care (USC) vs. No USC	None for flu vaccines.	**Flu Shot** [receipt of preventive care] Other: Foot & eye exams, smoking & smoking cessation advice, cervical, breast & colorectal cancer screenings, healthcare rating, follow-up post hospitalizations for mental illness.	Simple + multiple log. regress. % diff. P levels. Adj. odds ratio (**aOR**). 95% confidence intervals **(CI).**	**Comparisons between provider types**: *Note** Yes=received a flu shot No=did not receive a flu shot. 1. **Non-PCMH USC**: Yes=53.0% No=47.0% vs **PCMH:** Yes=58.4% No=41.6% P=0.004 in at least 1 year. **Not statistically significant** in both years.	N/A	N/A

Author Title Journal	Year Place	Study Purpose	Study Design	Theory/ Frame-work	Sample Setting	Independent Variables	Control Variables	Dependent Variables	Methods of Data Analysis	Main Findings:	Other Findings (i.e., flu vaccine rates)	Other
BMC Health Services Research.										2. **No USC** Yes=25.2% No=74.8% vs. **Non-PCMH USC:** Yes=53.0% No=47.0% P=0.000 for at least 1 year. Both years: **No USC**: Yes=15.7% No=84.3% vs. **Non-PCMH USC**: Yes=36.1% No=63.9% P=0.000 3. **No USC:** Yes=25.2% No=74.8%) vs **PCMH:** Yes=58.4% No=41/6%		

Author Title Journal	Year Place	Study Purpose	Study Design	Theory/ Frame-work	Sample Setting	Independent Variables	Control Variables	Dependent Variables	Methods of Data Analysis	Main Findings:	Other Findings (i.e., flu vaccine rates)	Other
										P=0.000 for at least 1 year. Both years: **No USC:** Yes=15.7% No=84.3% vs. **PCMH:** yes=40.2% No=59.8% P=0.000. **Multivariate Models**: 1. Participants who had **a non-PCMH USC** had significantly higher odds of meeting the following preventive care and healthcare quality measures compared to participants who did **NO USC**:		

Author Title Journal	Year Place	Study Purpose	Study Design	Theory/ Frame-work	Sample Setting	Independent Variables	Control Variables	Dependent Variables	Methods of Data Analysis	Main Findings:	Other Findings (i.e., flu vaccine rates)	Other
										flu shot in at least 1 year with aOR=1.88 95 % CI (1.46, 2.43) & both years with aOR= 1.83 95 % CI (1.54, 2.18) P<0.001 for 1 & both years. 2. Participants who received care consistent with the **PCMH** had significantly higher odds of meeting the following preventive care and healthcare quality measures compared to participants in **NO USC**: flu shot in at least 1 year with		

Author Title Journal	Year Place	Study Purpose	Study Design	Theory/ Frame- work	Sample Setting	Independent Variables	Control Variables	Dependent Variables	Methods of Data Analysis	Main Findings:	Other Findings (i.e., flu vaccine rates)	Other
										aOR=3.00 95 % CI (2.24- 4.04) & both years with aOR=2.28 95 % CI (1.57-3.31) P<0.001 for 1 & both years. **No sig. diff. bet**: **PCMH** & **Non-PCMH USC** for any measures.		
Yeung, M.P.S., Lam, F.L.Y., & Coker, R. "Factors associated with the uptake of seasonal influenza vaccination in adults: a	2016 Cros s- natio nal.	To identify factors associated with seasonal flu vaccinations uptake among adults**.**	Systematic Review.	None to guide this review. *Note** Several models/ theories were briefly identified as the most	N=23 articles P=Adults (18- 64). S=General population *Note** People with mental illness are technically part of the general population.	**Demo- graphic:** Age Education Marital- status. **Influenza & Influenza Vaccine Knowledge Health Needs:**	N/A	**Influenza Vaccine Uptake**	Adj. odds Ratios (**OR**), (range of mean OR).	**Demographic:** Age: Higher age OR=1.06-23.7 Education: Inconsistent/ OR=1.54-2.25. Married: OR=2.71. **Not consistent or significant**	N/A	N/A

Author Title Journal	Year Place	Study Purpose	Study Design	Theory/ Frame- work	Sample Setting	Independent Variables	Control Variables	Dependent Variables	Methods of Data Analysis	Main Findings:	Other Findings (i.e., flu vaccine rates)	Other
systematic review." Journal of Public Health				common ones in the studies reviewed: The Health Behavior Model The Protection Motivation Theory Theory of Reasoned Action Utilities Theory PRECEDE model.		Chronic-disease Medical-visits Dependents. **Health Behavior:** Smoking Alcohol Exercise Previous-vaccine status. **Vaccine & Influenza Belief & perceptions** **Healthcare System:** Access Satisfaction Vaccine cost **Advice & Social Support External-Environment**				**predictors**: Gender Income Employment Household-size Race **Knowledge:** Better knowledge of influenza and vaccinations: OR=1.6-3.3 (weak associations). Better knowledge of effective measures to prevent influenza: OR=1.59-3.06. Knowledge that vaccines are required annually: OR=1.59. Knowledge that vaccines are being recommended to		

Author Title Journal	Year Place	Study Purpose	Study Design	Theory/ Frame-work	Sample Setting	Independent Variables	Control Variables	Dependent Variables	Methods of Data Analysis	Main Findings:	Other Findings (i.e., flu vaccine rates)	Other
										some high-risk groups: OR=1.30. Other general info about influenza transmission and treatment: OR=1.25 * all more likely than those without adequate knowledge to get vaccinated. **Health Needs:** Presence of chronic disease: OR=1.38-13.7. Recent medical doctor visits: Insignificant/ OR=1.55–2.0 Living with-children or elders: Insignificant/ OR=1.37		

Author Title Journal	Year Place	Study Purpose	Study Design	Theory/ Frame-work	Sample Setting	Independent Variables	Control Variables	Dependent Variables	Methods of Data Analysis	Main Findings:	Other Findings (i.e., flu vaccine rates)	Other
										Not significant: Health-status. **Health Behavior:** Previous vaccination status: OR =4.06-5.18. Smoking: Insignificant/ OR=0.79. No data found for: drinking or frequent exercise. **Belief & Perceptions:** Perceptions of vaccine efficacy: OR =2.7-10.55. Perceived vaccine safety & adverse events after vaccination: OR=10.5.		

Author Title Journal	Year Place	Study Purpose	Study Design	Theory/ Frame-work	Sample Setting	Independent Variables	Control Variables	Dependent Variables	Methods of Data Analysis	Main Findings:	Other Findings (i.e., flu vaccine rates)	Other
										Fear of adverse reaction: OR=0.21. Perceived chances of contracting influenza: OR =1.62-5.40. Perceived health impact of having influenza: OR=2.21. **Not significant**.: Fear of injection. **Healthcare System:** Free vaccinations: OR=4.5-7.8 (strongly associated). Easy access to healthcare: OR=1.8		

Author Title Journal	Year Place	Study Purpose	Study Design	Theory/ Frame-work	Sample Setting	Independent Variables	Control Variables	Dependent Variables	Methods of Data Analysis	Main Findings:	Other Findings (i.e., flu vaccine rates)	Other
										Satisfactions with healthcare service: OR=1.23. **Inconsistent predictor**: Intervention to remind clients to vaccinate. **Advice & Social Support:** Doctor's advice: OR =4.03-7.82. Health professional advice: OR =1.23-13.0. Advice from relatives or close friends: OR=17.74 Relatives or friends receiving influenza vaccine in the previous year:		

Author Title Journal	Year Place	Study Purpose	Study Design	Theory/ Frame- work	Sample Setting	Independent Variables	Control Variables	Dependent Variables	Methods of Data Analysis	Main Findings:	Other Findings (i.e., flu vaccine rates)	Other
										OR=6.44 (In a Japanese study). **External Env.:** Past experiences of infectious diseases/ pandemics: insignificant (in China)/ moderate negative association with later seasonal flu vaccinations (in France).		
Schmid, P., Rauber, D., Betsch, C., Lidolt, G., & Denker. M.L. "Barriers of Influenza Vaccination Intention and Behavior -A Systematic Review of	2017 Cros s- natio nal	To identify micro and macro level barriers to influenza vaccination uptake among adults.	A systematic review.	Extended version of the Theory of Planned Behavior (TPB): A psycho- logical theory r/t vaccine hesitancy.	N=470 articles. P= General public & high- risk groups (i.e., pregnant, chronically ill, elderly, healthcare providers & children). *Note**	**Psychologica l:** Influenza & vaccine risk perception. Social benefit. Subjective norm. Perceived behavioral control. Attitude. Past behavior.	N/A	**Flu Vaccine Intention & Behavior**	Summary data of barriers & facilitators.	**Psychological Barriers:** Influenza Risk Perception: Low risk of influenza a **barrier** for most high-risk groups and the public (i.e., perceived severity, likelihood of getting it, low susceptibility,		

Author Title Journal	Year Place	Study Purpose	Study Design	Theory/ Frame-work	Sample Setting	Independent Variables	Control Variables	Dependent Variables	Methods of Data Analysis	Main Findings:	Other Findings (i.e., flu vaccine rates)	Other
Influenza Vaccine Hesitancy, 2005-2016.” PLoS ONE					People with mental illness are technically part of the general population.	Experience. Knowledge. **Physical:** Lifestyle behaviors. Physical activity. BMI. Perceived health. **Context:** Access to vaccines. Healthcare interaction. Cues to action. System factors. **Socio-demo:** Living arrange. Age. Gender. Race. Marital status.				low worry about disease, low anticipated regret if do not vaccinate). Influenza vaccine risk perception: High perception of vaccine adverse events & safety concerns ↓ vaccine uptake. Social benefit: Low social benefit or perception of low risk of influenza to others ↓ vaccine uptake. Subjective norm: Low pressure from significant others to get vaccinated ↓ vaccine uptake vs. high social pressure.		

Author Title Journal	Year Place	Study Purpose	Study Design	Theory/ Frame- work	Sample Setting	Independent Variables	Control Variables	Dependent Variables	Methods of Data Analysis	Main Findings:	Other Findings (i.e., flu vaccine rates)	Other
										Perceived behavioral control: Low self-efficacy a **barrier** to vaccine uptake. Attitude: Neg. attitude towards vaccines a major **barrier** & not believing in effectiveness of the vaccine. Lack of trust in healthcare: **Inhibits** vaccine uptake. Past behavior: Receiving influenza vaccines in the previous seasons ↑ vaccine uptake (strong predictor). Experience:		

Author Title Journal	Year Place	Study Purpose	Study Design	Theory/ Frame- work	Sample Setting	Independent Variables	Control Variables	Dependent Variables	Methods of Data Analysis	Main Findings:	Other Findings (i.e., flu vaccine rates)	Other
										If did not suffer from influenza less likely to get vaccinated. Knowledge: Lack of general knowledge about influenza & vaccine a **sig. barriers.** Belief in the misconception about the vaccine: **A barrier.** **Physical Barriers:** Unhealthy lifestyles: Alcohol & smoking **neg.** impact vaccine uptake (mixed results with others reporting ↑ uptake).		

Author Title Journal	Year Place	Study Purpose	Study Design	Theory/ Frame-work	Sample Setting	Independent Variables	Control Variables	Dependent Variables	Methods of Data Analysis	Main Findings:	Other Findings (i.e., flu vaccine rates)	Other
										Quitting smoking is **+ associated** with uptake. Physical activity: Low levels are a **barrier** in some studies & a **promoter** in others. Perceived health: Status "good" found to be a **barrier** in some studies & a **promoter** in others. Lower BMI: **A barrier.** Absence of preexisting medical conditions: **A barrier**. **Contextual Barriers:**		

Author Title Journal	Year Place	Study Purpose	Study Design	Theory/ Frame-work	Sample Setting	Independent Variables	Control Variables	Dependent Variables	Methods of Data Analysis	Main Findings:	Other Findings (i.e., flu vaccine rates)	Other
										Access: General access to vaccines & supplies not a **significant barrier.** Inconvenience to getting the vaccines: (I.e., transportation to clinics, physical disability, or expense of vaccines) a **barrier**. Expense: Vaccines funded by gov't ↑ vaccine uptake. Interaction with healthcare system: Lower interaction i.e., less medical visits or hospitalization ↓ **uptake.**		

Author Title Journal	Year Place	Study Purpose	Study Design	Theory/ Frame-work	Sample Setting	Independent Variables	Control Variables	Dependent Variables	Methods of Data Analysis	Main Findings:	Other Findings (i.e., flu vaccine rates)	Other
										Not having a regular source of care: (I.e., primary care physician) ↓ vaccine uptake**.** Cues to action: Not receiving direct recommendations from medical professionals or relatives to get vaccinated ↓ the chances of uptake. System factors: Size of a healthcare facility plays i.e., increased size reported both as a **barrier and a promoter.** Living in socioeconomically deprived area or		

Author Title Journal	Year Place	Study Purpose	Study Design	Theory/ Frame-work	Sample Setting	Independent Variables	Control Variables	Dependent Variables	Methods of Data Analysis	Main Findings:	Other Findings (i.e., flu vaccine rates)	Other
										visiting a clinic in such areas ↓the uptake vs. wealthier areas. **Socio-demo. Barriers:** Age: Higher age reported as both a **barrier & a promoter.** Gender: Mixed results (i.e., being a female) Race/ethnicity: Caucasian reported as a **barrier & a promoter**. Living alone & unmarried: ↓ vaccine uptake-? due to mediating effects of access & cues to action		

Author Title Journal	Year Place	Study Purpose	Study Design	Theory/ Frame- work	Sample Setting	Independent Variables	Control Variables	Dependent Variables	Methods of Data Analysis	Main Findings:	Other Findings (i.e., flu vaccine rates)	Other
										(i.e., those living alone may have reduced assistance, irregular preventive health visits and less support from family). Others report an **inverse relationship** bet. unmarried & vaccine uptake (i.e., being single allows one to exert control over their health and decisions).		
Cabassa, L., Manrique, Y., Meyreles, Q., Camacho, D., Capitelli, L., Younge, R., Dragatsi, D., Alvarez, J., &	2018 USA	“To examine the acceptability and feasibility of delivering Bridges to Better Health and Wellness (B2BHW), a cultural	A pilot interventio n study, single group design.	Not Stated.	N=34. P=Hispanic, (> 18), mostly female and average age of 54. S=Outpatient mental health clinic, without primary care.	**Healthcare Manager Intervention (Better to Bridges Health and Wellness)** -Consisted of two master’s level social	N/A	**Flu Vaccination** [Preventive primary care outcomes] Other: Preventive care (i.e., blood pressure, physical exam,	Linear mixed methods analysis to assess the intervention outcomes over time, at baseline, 6 & 12-month	**Vaccinations:** **At baseline-** Mean=15.72 SE=3.92 **At 12 month-** Mean=42.09 SE=6.51	N/A	No compa rison group.

Author Title Journal	Year Place	Study Purpose	Study Design	Theory/ Frame- work	Sample Setting	Independent Variables	Control Variables	Dependent Variables	Methods of Data Analysis	Main Findings:	Other Findings (i.e., flu vaccine rates)	Other
Fernandez, R.L. "Bridges to Better Health and Wellness; An Adapted Health Care Manager Intervention for Hispanics with Serious Mental Illness." Journal of Administrati on Policy Mental Health.		adaptation of PCARE for Hispanics with SMI, and to explore its initial impact on patient activation, self-efficacy, patient-rated quality of care, receipt of preventive primary care services, and quality of life" (p. 3).			Mental illness: Schizophrenia. Affective/ bipolar d/o. Major depression. With at least 1 CVD risk.	workers focusing on physical health and coordinating primary care with mental health.		smoking status). Feasibility. Acceptability. Patient-centered & quality of life outcomes.	post intervention Tests: mean, standard error **(SE)** and estimated difference (**ED),** effect size, and p values. Health care manger assignment was adjusted. *Preventive primary care services were aggregated. Results apply to "all vaccinations ."	Estimated difference (after adjusting for healthcare manager assignment) =26.39 SE=6.34 P value=0.00 Effect size=0.61		

Author Title Journal	Year Place	Study Purpose	Study Design	Theory/ Frame-work	Sample Setting	Independent Variables	Control Variables	Dependent Variables	Methods of Data Analysis	Main Findings:	Other Findings (i.e., flu vaccine rates)	Other
Kendall C. Browne, Katherine D. Hoerster, Rebecca Piegari, John C. Fortney, Karin N. Nelson, Edward P, Stephan D. Fihn, Alaina M. Mori, Ranak B. Trivedi. "Clinical Care Quality Among **Veterans Health Administration** Patients with Mental Illness Following Medical Home Implementation."	2019 USA	"To evaluate the quality of preventive care and chronic-disease management care among VHA primary care–enrolled patients with and without mental illness following the nation-wide implementation of PACT" (p. 817).	Observation. cohort study	Not Stated	N=210,864-236,421 P=Veterans (>50). S=Primary care patients in VHA facilities. Mental illness: Any mental illness. Depression. PTSD. Anxiety. Serious mental illness.	Nation-wide **Patient-Aligned Care Team (PACT)** program implementation.	N/A	**Flu Vaccine** [quality of preventive care] Other: Pnumovax-vaccine. Cancer screening. Tobacco screening. Chronic disease mgmt. (i.e. diabetes mellitus, hypertension, ischemic heart disease, chronic heart failure).	Descriptive in %. No multi-variate models used/No control for program & patient char.	See next section	> proportion of veterans (ages 50–64) received flu shots with mental illness: 70.5% - 75.2% from 2010-2112 vs. veterans without mental illness: 64.7%-65.2% from 2010-2012.	N/A

Author Title Journal	Year Place	Study Purpose	Study Design	Theory/ Frame- work	Sample Setting	Independent Variables	Control Variables	Dependent Variables	Methods of Data Analysis	Main Findings:	Other Findings (i.e., flu vaccine rates)	Other
Journal of Psychiatric Services.												
Yarborough, B.J.H., Perrin, N.A., Stumbo, S.P., Muench, J., & green, C.A. "Preventive Service Use Among People with and Without Serious Mental Illness." American Journal of Preventive Medicine.	2018 USA	"To examine disparities in preventive care that might account for poor health outcomes" (p. 1).	Retrospecti ve cohort study.	Not stated.	N=803, 276 P=Adults (>19). S=Attending 2 primary care/health clinics (KPNW & CHC).	**Mental Illness Diagnosis:** Schizophrenia . Bipolar/ affective d/o. Psychosis. Anxiety. Unipolar Depression. Vs. Reference group (no diagnosis of these mental illnesses).	Patient Characterist ics: Age. Gender. Race. Ethnicity. Comorbidit ies. Health Insurance. Health Services Use: # of primary care visits and non- primary care visits.	**Annual Flu Vaccine Incompletion Rate** [Overall care gap rate/incompleti on rate of 12 preventive care services] Other: Pneumococcal vaccines, obesity screenings, hypertension, tobacco status, diabetes, colorectal screening, etc. *Note** Outcome	Analysis of variance, chi square tests. Mean. Standard Deviation (**SD**). b coefficient. 95% confidence interval (**CI**). Post-hoc analyses. Linear binomial models.	**Overall Care Gap Rates-** **KPNW:** *Note** Adjusted for patient characteristics & health services use. Bipolar/ affective psychosis: b= -0.090 95% CI (-0.127 to -0.054). Major Depressive Disorder: b= -0.090 95% CI (-0.105 to -0.074). Both had	N/A	N/A

Author Title Journal	Year Place	Study Purpose	Study Design	Theory/ Frame-work	Sample Setting	Independent Variables	Control Variables	Dependent Variables	Methods of Data Analysis	Main Findings:	Other Findings (i.e., flu vaccine rates)	Other
								measure is aggregated.	Sig. p level <0.05. *Note** Separate analysis for each clinic.	significantly lower care gap rates (incompletion rates of preventive care measures including annual flu vaccine) compared to the reference group, in the **KPNW** program, p<0.001. **Not significant:** schizophrenia and anxiety. **CHC:** *Note** Adjusted for patient characteristics & health services use. Schizophrenia b= - 0.158 95% CI (-0.176 to -0.141).		

Author Title Journal	Year Place	Study Purpose	Study Design	Theory/ Frame- work	Sample Setting	Independent Variables	Control Variables	Dependent Variables	Methods of Data Analysis	Main Findings:	Other Findings (i.e., flu vaccine rates)	Other
										Bipolar: b= -0.114 95% CI (-0.126 to -0.102). Anxiety: b= - 0.037 95% CI (-0.047 to -.0.026). Major Depressive Disorder: b= -0.096 95% CI (-0.103 to -0.090). All had significantly lower care gap rates compared to the reference group in the CHC program, p<0.011.		
Borthwick, C., O'Connor, R., & Kennedy, L.	2021 UK	To determine what demo-graphic and psychologica l factors predict flu	Mixed Methods: Quantitativ e: cross-sectional & prospective	Social cognition models: Health Belief	N=57 P=Adult patients (19-67).	**Age** **Length of hospital stay**	N/A	**Flu Vaccine Behavior** **&** **Flu Vaccine Intent**	Quantitative Correlation. Linear multiple & binomial	**Vaccine Intent:** **Un-adjusted multiple regression-** Past behavior:	N/A	N/A

Author Title Journal	Year Place	Study Purpose	Study Design	Theory/ Frame-work	Sample Setting	Independent Variables	Control Variables	Dependent Variables	Methods of Data Analysis	Main Findings:	Other Findings (i.e., flu vaccine rates)	Other
"Predicting and understanding seasonal influenza vaccination behaviour among forensic mental health inpatients." Journal of Psychology & Health.		vaccine behaviors & intentions.	+ Qualitative.	Model (HBM) & Theory of Planned Behavior (TPB).	S=Secure forensic psychiatric hospital. Mental illnesses: Schizophrenia (49.1%). Bipolar (5.3%). Generalized anxiety (1.8%). Other.	**At-risk group** **Psych. Constructs (HBM & TPB): Past behavior** **Health motivation** **Flu experience** **Flu symptoms** **Flu knowledge** **Flu vaccine knowledge** **Perceived susceptibility to flu (HBM)**			logistic regress. B=standardized coefficient *B*=un-standard coefficient. T & P levels. Qualitative: Interpretive phenomenology analysis.	B=0.052 t=6.380 P<0.001. Vaccine knowledge: B=0.614 t=5.746 p<0.001. HBM benefits: B=0.474 t=3.997 p<0.001. HBM cues: B=0.790 t=9.568 p<0.001. TPB attitude: B=0.552 t=4.913 p<0.001. TPB norm B=0.297 t=2.310, p=0.005. **Non-significant predictors:** Age. Lengths of hospital stay. At-risk group. Health motivation.		

Author Title Journal	Year Place	Study Purpose	Study Design	Theory/ Frame-work	Sample Setting	Independent Variables	Control Variables	Dependent Variables	Methods of Data Analysis	Main Findings:	Other Findings (i.e., flu vaccine rates)	Other
						Perceived severity of flu (HBM) **Vaccine benefits (HBM)** **Vaccine costs (HBM)** **Cues to action (HBM)** **Attitudes towards vaccination (TPB)** **Perceived subjective norm (TPB)** **Perceived behavioral control (TPB)** **Vaccine self-efficacy**				Flu experience & symptoms. Flu knowledge. HBM susceptibility & severity. HBM costs. TPB PBC. Vaccine self-efficacy. **Adjusted multivariate regression-** Past behavior: B=0.317 t=4.049 $p<0.001$. Vaccine knowledge: B= - 0.056 t=3.037 p=0.004. HBM cues to action: B=0.258 t=5.243 $p<0.001$. **Overall:** R^2=75.7% explained, F (6,56) =		

Author Title Journal	Year Place	Study Purpose	Study Design	Theory/ Frame-work	Sample Setting	Independent Variables	Control Variables	Dependent Variables	Methods of Data Analysis	Main Findings:	Other Findings (i.e., flu vaccine rates)	Other
										30.023, p< .001. **Not significant predictors** in adjusted model: HBM benefits. TBP norm. TBP attitude. **Vaccine Behavior: Un-adjusted logistic regression-** Past behavior: *B*=3.401 SE=1.105 P=0.002. Vaccine knowledge: *B*=2.370 SE=0.859 P=0.006. HBM benefits: *B*=1.621 SE=0.588 P=0.006.		

Author Title Journal	Year Place	Study Purpose	Study Design	Theory/ Frame-work	Sample Setting	Independent Variables	Control Variables	Dependent Variables	Methods of Data Analysis	Main Findings:	Other Findings (i.e., flu vaccine rates)	Other
										HBM cues: *B*=2.854 SE=0.860 P=0.001. **Not significant:** Age. Lengths of hospital stay. At risk group. Health motivation. Flu experience, symptoms, and knowledge. HBM susceptibility & severity. HBM costs. TPB attitude. TPB norm. TPB PBC. Vaccine self-efficacy. **Adjusted multi-variate regression:** HBM cues to action: *B*=2.055 SE=1.000		

Author Title Journal	Year Place	Study Purpose	Study Design	Theory/ Frame-work	Sample Setting	Independent Variables	Control Variables	Dependent Variables	Methods of Data Analysis	Main Findings:	Other Findings (i.e., flu vaccine rates)	Other
										P=0.040 Exp (B)=7.809 95% CI (1.100-55.443). R^2=67.9% explained, X^2 (4) = 30.829 p< .001. **Not significant predictors** in adjusted model**:** Past behavior. Vaccine Knowledge. HBM benefits. HBM Susceptibility. HBM Severity. HBM Costs. Vaccine self-efficacy. **Qualitative:** **Major Themes-** A. Managing Decisional Conflict-		

Author Title Journal	Year Place	Study Purpose	Study Design	Theory/ Frame-work	Sample Setting	Independent Variables	Control Variables	Dependent Variables	Methods of Data Analysis	Main Findings:	Other Findings (i.e., flu vaccine rates)	Other
										1. Confirmation bias: Decisions to vaccinate are based on past experiences with it (+ exp. more likely to vaccinate vs. neg. exp.). 2. Rational vs. emotional decision making: Some deliberate while others instantaneously decide to vaccinate (some engaged in internal dialogue, used gambling metaphors). Some were fearful about getting the flu while others about the consequences of vaccine.		

Author Title Journal	Year Place	Study Purpose	Study Design	Theory/ Frame-work	Sample Setting	Independent Variables	Control Variables	Dependent Variables	Methods of Data Analysis	Main Findings:	Other Findings (i.e., flu vaccine rates)	Other
										3. General attitudes towards health: (Healthy/ absence of disease=less likely to get vaccine, less motivated to engage in preventive behaviors, little consideration for future health protection vs unwell=will consider it). Personality traits ("in my nature to decline" if no immediate impact on life, "stubborn" "too independent"). B. Interaction with Immune Function- 1. Perceived vulnerability to the flu: (I.e., due to age or asthma,		

Author Title Journal	Year Place	Study Purpose	Study Design	Theory/ Frame-work	Sample Setting	Independent Variables	Control Variables	Dependent Variables	Methods of Data Analysis	Main Findings:	Other Findings (i.e., flu vaccine rates)	Other
										being advised/encouraged by health providers) vs. invincibility (sense of resistance to the flu, confidence in immune system to fight it off, never having the flu). 2. Perceived vaccine effectiveness: Uncertainty (“partially effective”, trust in vaccine safety, low susceptibility to the flu). 3. Strengthening vs. weakening of the immune system: Some believe vaccine supports the immune system, others felt it is		

Author Title Journal	Year Place	Study Purpose	Study Design	Theory/ Frame-work	Sample Setting	Independent Variables	Control Variables	Dependent Variables	Methods of Data Analysis	Main Findings:	Other Findings (i.e., flu vaccine rates)	Other
										better to fight the virus off. Lack of knowledge/certainty resulted in misbeliefs: view vaccines as eventual immunity or antibiotic resistance. C. The Role of Others- 1. Information gathering: Lacking personal experience & relying on informal sources (grapevine) & formal sources (news) influence decisions to vaccinate. Some selectively chose info that suited their prior opinions & intentions.		

Author Title Journal	Year Place	Study Purpose	Study Design	Theory/ Frame- work	Sample Setting	Independent Variables	Control Variables	Dependent Variables	Methods of Data Analysis	Main Findings:	Other Findings (i.e., flu vaccine rates)	Other
										2. Influence of health professional in decision making: Major influence to vaccinate. Trust in providers determines intent. Nurses' advice viewed either as "caring" or "authoritative" (pp. 8-20).		
Lawrence, T., Zubatsky, M., & Meyer, D. "The association between mental health diagnoses and influenza vaccine receipt among older primary care patients."	2020 USA	To determine whether an association exists between having a mental illness diagnosis and receipt of flu vaccines in older adults and whether the association is confounded by	A "cross-sectional analysis of a retrospective cohort data" (p. 1083).	Not stated.	N=4,102 P=Older adults (65-80) S=Primary care clinic. Mental illness: Depression or anxiety (6.7%). Depression (5%). Anxiety (2.8%).	**Depression** **Anxiety**	Age Gender Race SES Index Marital Status Comorbidity Index Comorbidity Non-index:	**Flu Vaccine Status**	Bivariate analysis: Chi-square & independent t-tests. Logistic regression models. Adj. & un-adj. odds ratios **(OR)**. 95% Confidence intervals (**CI**).	Older adults with either **depression** ($p<0.001$) or **anxiety** ($p<0.001$) or **any mental illness** ($p<0.001$) were more likely to be vaccinated than those without any mental illness. **Significant relationships between covariates and flu vaccine**	24.5% of sample received at least one flu vaccine bet. 2014-2016.	N/A

Author Title Journal	Year Place	Study Purpose	Study Design	Theory/ Frame- work	Sample Setting	Independent Variables	Control Variables	Dependent Variables	Methods of Data Analysis	Main Findings:	Other Findings (i.e., flu vaccine rates)	Other
Journal of Psychology, Health & Medicine.		controlling for demo. and clinical factors.					(Pneumonia. Influenza, Respiratory disease. Prior flu vaccine. Anti-depressant & benzo-diazepine meds Substance use: (Alcohol, Illicit drug, Smoking). Health care utilization: (# of primary care visits/month).		Sig. at $p<0.05$.	**status:** *Note** Mostly in the vaccinated group On antidepressant: $p<0.001$ or benzodiazepine: $p<0.001$ meds. Influenza diagnosis: $p=0.001$. Pneumonia Diagnosis: $p=0.007$. A respiratory d/o: ($p<0.001$. Higher comorbidity score: $p<0.001$. Higher healthcare utilization: $p<0.001$.		

Author Title Journal	Year Place	Study Purpose	Study Design	Theory/ Frame-work	Sample Setting	Independent Variables	Control Variables	Dependent Variables	Methods of Data Analysis	Main Findings:	Other Findings (i.e., flu vaccine rates)	Other
										Prior vaccine status: $p<0.001$. Lowest SES mostly unvaccinated: $p=0.001$. **Non-significant associations:** Gender. Age. Race. Marital status. Smoking. Drug or alcohol abuse. **Un-adjusted multivariate model**: Anxiety or Depression: OR=4.00 95% CI (3.11-5.13) (more likely to be vaccinated than		

Author Title Journal	Year Place	Study Purpose	Study Design	Theory/ Frame- work	Sample Setting	Independent Variables	Control Variables	Dependent Variables	Methods of Data Analysis	Main Findings:	Other Findings (i.e., flu vaccine rates)	Other
										without anxiety or depression). **Adjusted multivariate model:** Anxiety or Depression: OR=1.47 95% CI (1.06-2.03) (more likely to be vaccinated after adjusting for covariates). **Covariates**: *Note** Covariates were included based on their significant bivariate relationships with flu vaccine receipt. Upper middle SES: aOR=1.37 95% CI (1.10-1.71).		

Author Title Journal	Year Place	Study Purpose	Study Design	Theory/ Frame-work	Sample Setting	Independent Variables	Control Variables	Dependent Variables	Methods of Data Analysis	Main Findings:	Other Findings (i.e., flu vaccine rates)	Other
										Higher health care utilization: aOR= 4.62 95% CI (3.86-5.53). Being prescribed an anti-depressant: aOR= 1.94 95% CI (1.49-2.51). Having received a prior flu vaccine: aOR = 3.36 95% CI (2.84-3.97). Higher comorbidity index: aOR = .95 95% CI (.92-.99) (less likely to have received a flu vaccine).		

Author Title Journal	Year Place	Study Purpose	Study Design	Theory/ Frame-work	Sample Setting	Independent Variables	Control Variables	Dependent Variables	Methods of Data Analysis	Main Findings:	Other Findings (i.e., flu vaccine rates)	Other
										Non-significant covariates in this model: SES: lower & highest. Influenza. Pneumonia. Respiratory d/o. Benzodiazepine. **Logistic Regression *stratified by presence & absence of physical comorbidity:** **Any physical comorbidity:** **+** association of depression or anxiety among older patients with **any physical comorbidity** OR= 3.93 95% CI (2.92-5.28) &		

Author Title Journal	Year Place	Study Purpose	Study Design	Theory/ Frame-work	Sample Setting	Independent Variables	Control Variables	Dependent Variables	Methods of Data Analysis	Main Findings:	Other Findings (i.e., flu vaccine rates)	Other
										aOR= 1.77 95% CI (1.22-2.57). **Without physical comorbidity:** + association of anxiety or depression with flu vaccine receipt OR= 3.58 95% CI (2.22-5.77) **Not sig.** when adjusted: aOR= 0.88 95% CI (.45-1.70). **Significant covariates with physical comorbidities**: SES: upper middle class: aOR=1.38 (1.06-1.79).		

Author Title Journal	Year Place	Study Purpose	Study Design	Theory/ Frame-work	Sample Setting	Independent Variables	Control Variables	Dependent Variables	Methods of Data Analysis	Main Findings:	Other Findings (i.e., flu vaccine rates)	Other
										Antidepressants: aOR= 2.03 (1.51-2.74). Prior vaccine: aOR= 3.10 (2.53-3.81). High utilization: aOR=4.23 (3.38-5.29). **Not significant**: SES: lower & highest. Benzodiazepine. **Significant covariates without physical comorbidities:** SES: lower middle class: aOR-1.77 (1.16-2.68) & upper middle: aOR=1.54 (1.02-2.33).		

Author Title Journal	Year Place	Study Purpose	Study Design	Theory/ Frame- work	Sample Setting	Independent Variables	Control Variables	Dependent Variables	Methods of Data Analysis	Main Findings:	Other Findings (i.e., flu vaccine rates)	Other
										Antidepressant: aOR=1.73 (1.02-2.93). Prior vaccine aOR= 3.80 (2.85-5.07). **Not significant**: SES: highest. Benzodiazepine.		
Miles, L.W., Williams, N., Luthy, K.E., & Eden, L. "Adult Vaccination Rates in the Mentally Ill Population: An Outpatient Improvement Project." Journal of the American Psychiatric	2020 USA	To improve adult vaccination rates & intentions for people with severe mental illness by developing & implementing an outpatient quality improvement project. Also, to identify barriers and	Survey & vaccination improvement quality program.	Not Stated.	N=329 P=Adults (18-65) S= Community mental health clinics & mobile vaccination clinics. Mental illness**:** Depression (58%). Anxiety (55.2%). Bipolar (36.1%).	**Vaccine Program/ Clinic**	N/A	**Rates of Flu Vaccines** Other: pneumococcal, Tdap, MMR booster, herpes zoster, hepatitis A, & hepatitis B. **Project Satisfaction Scores** **Intent to Vaccinate.**	Pre-& post survey data analysis: descript. stats, Kappa measures. Compare sample data to CDC rates.	**Phase I Pre-survey** (N=392): **Vaccination Barriers:** 1. Lack of awareness & knowledge (42%). 2. Accessibility (16%). 3. Personal cost (13%). 5. Fear about vaccinations (10%). 6. Not recommended by doctor (1.5%).	**Pre-clinic flu vaccine rates**: (N=392) 47.4% vs. **Post-clinic flu vaccine rates**: (N=272) 50.4% vs. CDC 2007 general population 45.5%. *Note**	N/A

Author Title Journal	Year Place	Study Purpose	Study Design	Theory/ Frame- work	Sample Setting	Independent Variables	Control Variables	Dependent Variables	Methods of Data Analysis	Main Findings:	Other Findings (i.e., flu vaccine rates)	Other
Nurses Association.		perceptions about vaccinations.			Schizophrenia (16.3%). PTSD (4.6%). Medical**:** Smokers (39%) Lung disease (17%) Diabetes (13%) Heart disease (7.6%) Liver disease (4.6%) & kidney disease (3.3%).					*84% believed that vaccines are safe, effective % important. **Phase II Project Implementation:** Approx. 2.5 vaccines delivered/day during the first 2 years of the project, with flu vaccines being the most common. Post 2nd year, the vaccine rates dropped to 1.24 vaccines/day. **Phase III Post-Survey** (N=85): **Changes in attitudes & behaviors:**	Vaccine rates are lower for this population in comparison with the general population, except for flu vaccines: "could have been due to a misunderstanding of the survey that was looking for rates of influenza for that specific flu season and not immunizations from previous years" (p. 177).	

Author Title Journal	Year Place	Study Purpose	Study Design	Theory/ Frame- work	Sample Setting	Independent Variables	Control Variables	Dependent Variables	Methods of Data Analysis	Main Findings:	Other Findings (i.e., flu vaccine rates)	Other
										Interest to receive future vaccinations ↑ from 58.4% to 93.8%. Beliefs about effectiveness & safety of vaccinations ↑ from 82% to 94%, kappa -0.14 and P=0.863 (sig.) Beliefs about vaccine importance ↑ from 84% to 96%, Kappa 0.001 and P-0.934 (sig.). **Satisfaction**: 93.6% overall satisfied with the vaccine program.		

Author Title Journal	Year Place	Study Purpose	Study Design	Theory/ Frame- work	Sample Setting	Independent Variables	Control Variables	Dependent Variables	Methods of Data Analysis	Main Findings:	Other Findings (i.e., flu vaccine rates)	Other
										*Note** Self- reported data/not generalizable.		

APPENDIX E

Literature Review Variables and Key Findings

Variable Category	Variable Type	Analysis Findings	Setting Country Population	Reference
A. Individual Characteristics and Experiences: Personal Factors	Age	Age is not a significant predictor of overall preventive service utilization (inc. flu vaccine).	Mental Health Clinics USA Adults	Xiong et al. (2010)
		Age is not a significant predictor of flu vaccine status.	Mental Health Clinic USA Adults	Lorenz et al. (2013)
		Age is not significantly associated with total non-cancer compliance index. (In univariate analysis, clinic type was not controlled for).	Mental Health Services USA. Adults	Xiong et al. (2015)
		Higher age is a significant predictor of influenza vaccine uptake, OR=1.06-23.7.	General Population Cross-national Adults	Yeung et al. (2016)[1]
		Higher age is reported as either a barrier or a promoter in several studies.	General Population & High- Risk Groups Cross-national	Schmid et al. (2017)[1]
		Age is not significantly associated with flu vaccine intent and behavior.	Forensic Hospital UK Adults	Borthwick et al. (2021)
		Age (covariate) is not significantly associated with flu vaccine status.	Primary Care USA Elderly	Lawrence et al. (2020)[2]

Variable Category	Variable Type	Analysis Findings	Setting Country Population	Reference
	Gender	Females have ↑ overall preventive service utilization than men Mean=51.15 SD =24.41 ED = 9.54 SE =3.95 *P* < .01 Females have ↑ vaccine rates than males in all psychiatric disorders groups: Psychotic (48% vs. 26%) & MDD (26% vs. 12%).	Mental Health Clinics USA Adults	Xiong et al. (2010)
		Gender is not a significant predictor of flu vaccine status.	Mental Health Clinic. USA Adults	Lorenz et al. (2013)
		Gender is a significant predictor. Females are ↑ likely to use non-cancer preventive services than men *B*= +4.41 SE=2.23 P<0.05.	Mental Health Services USA Adults	Xiong et al. (2015)
		Gender is not a significant predictor of flu vaccine uptake.	General Population Cross-national Adults	Yeung et al. (2016)[1]
		Gender has mixed results with flu vaccine intent and behaviour.	General Population & High- Risk Groups Cross-national	Schmid et al. (2017)[1]
		Gender (covariate) is not significantly associated with flu vaccine status.	Primary Care USA Elderly	Lawrence et al. (2020)[2]
	Race/Ethnicity	Race/ethnicity is not a significant predictor of overall preventive service utilization.	Mental Health Clinics USA	Xiong et al. (2010)

Variable Category	Variable Type	Analysis Findings	Setting Country Population	Reference
			Adults	
		Race/ethnicity is not significantly associated with flu vaccine status.	Mental Health Clinic USA Adults	Lorenz et al. (2013)
		Hispanic/Latino more likely to use non-cancer preventive services than Caucasian: *B*= +8.84, SE=3.53, P=0.0. Asian less likely to use non-cancer preventive services than Caucasian: *B*= -9.21, SE=3.90, P=0.02. Not significant predictors: African American and other.	Mental Health Services USA Adults	Xiong et al. (2015)
		Race is not a significant/consistent predictor of flu vaccine uptake.	General Population Cross-national Adults	Yeung et al. (2016)[1]
		Caucasian reported as either a significant barrier or a promoter of flu vaccine intent and behaviour.	General Population & High- Risk Groups Cross-national	Schmid et al. (2017)[1]
		Race (covariate) is not significantly associated with flu vaccine status.	Primary Care USA Elderly	Lawrence et al. (2020)[2]

Variable Category	Variable Type	Analysis Findings	Setting Country Population	Reference
	Education	Education is not a significant predictor of overall preventive service utilization.	Mental Health Clinics USA Adults	Xiong et al. (2010)
		> high school mostly in un-vaccinated group vs. =/<high school X^2 =7.7, Df =2, P<0.05. > than high school less likely to receive flu vaccines than high school or less than high school education. *B*= -1.23, OR= 0.29, 95% CI (0.09-0.96), P < 0.05. High school education is not a significant predictor of flu vaccine status.	Mental Health Clinic USA Adults	Lorenz et al. (2013)
		Education is not significantly associated with total non-cancer compliance index. (In univariate analysis, clinic type was not controlled for).	Mental Health Services USA Adults	Xiong et al. (2015)
		Education is inconsistently significant with flu vaccine uptake. OR=1.54-2.25.	General Population Cross-national Adults	Yeung et al. (2016)[1]
	Income	Income is not consistent or significant predictor.	General Population Cross-national Adults	Yeung et al. (2016)[1]

Variable Category	Variable Type	Analysis Findings	Setting Country Population	Reference
		SES index (covariate) with flu vaccine status: Association-Lowest SES mostly in unvaccinated group (p=0.001). Regression models: Upper middle SES aOR=1.37, 95% CI (1.10, 1.71). Lower and middle SES **not significant predictors**. Significant SES with comorbidities: Upper middle class (SES) aOR=1.38 (1.06-1.79). Lowest and highest SES **not significant.** Significant covariate without comorbidities: Lower middle class aOR-1.77 (1.16-2.68) and upper middle aOR=1.54 (1.02-2.33). Not significant: highest SES.	Primary Care USA Elderly	Lawrence et al. (2020)[2]
	Health Insurance	Health insurance has ↑ utilization than the uninsured participants for overall preventive service utilization. Mean=49.78 SD=24.08 ED =17.48 SE=4.36 *P* < .001.	Mental Health Clinics USA Adults	Xiong et al. (2010)
		No health insurance majority in un-vaccinated group vs. those insured for flu vaccine status. X^2 =16.2, Df= 3, P<0.001. Predictor-Insurance status more likely to get vaccinated with private insurance than self-payers: *B*=1.36, OR=3.91, 95% CI (1.48-10.36), p<0.001.	Mental Health Clinic USA Adults	Lorenz et al. (2013)

Variable Category	Variable Type	Analysis Findings	Setting Country Population	Reference
		Health insurance was significant in univariate analysis: *b*=27.24, SE=4.77, p<0.001 *(in univariate analysis, clinic type was not controlled for). Not a significant predictor in multivariate model for non-cancer preventive service index.	Mental Health Services USA Adults	Xiong et al. (2015)
	Marital Status	Married/unmarried is not significantly associated with total non-cancer compliance index. *(In univariate analysis, clinic type was not controlled for).	Mental Health Services USA Adults	Xiong et al. (2015)
		Married a significant predictor OR=2.71 for flu vaccine uptake.	General Population Cross-national Adults	Yeung et al. (2016)[1]
		Unmarried-↓ **flu** vaccine uptake. Others report an **inverse relationship** bet. unmarried & vaccine uptake (i.e. being single allows one to exert control over their health and decisions).	General Population & High- Risk Groups Cross-national	Schmid et al. (2017)[1]
		Marital status no significant association with flu vaccine status.	Primary Care USA Elderly	Lawrence et al. (2020)[2]
	Living arrangement	Living arrangement is not significantly associated with flu vaccine status.	Mental Health Clinic USA Adults	Lorenz et al. (2013)
		Living with children or elders is either insignificant or OR=1.37 Household size not a consistent or significant predictor of flu vaccine uptake.	General Population Worldwide Adults	Yeung et al. (2016)[1]
		Living alone ↓ **flu** vaccine uptake-? due to mediating effects of access & cues to action (i.e. those living alone may have reduced assistance, irregular preventive health visits and less support from family).	General Population & High- Risk Groups	Schmid et al. (2017)[1]

Variable Category	Variable Type	Analysis Findings	Setting Country Population	Reference
			Cross-national	
	Medical conditions and comorbidities	Presence of chronic disease associated with flu vaccine uptake OR=1.38-13.7.	General Population Cross-national Adults	Yeung et al. (2016)[1]
		Absence of pre-existing medical conditions a barrier to flu vaccines.	General Population & High- Risk Groups Cross-national	Schmid et al. (2017)[1]
		Having physical comorbidities made the association bet. mental illness and flu vaccine uptake positive & sig.: OR=3.93 & aOR=1.77. Without physical comorbidities: + association of anxiety or depression with flu vaccine receipt: OR= 3.58, 95% CI (2.22, 5.77). Not sig. when adjusted: aOR= 0.88, 95% CI (.45, 1.70). Patients in the vaccine group more likely to have influenza (p=0.001), pneumonia (p=0.007) and respiratory disorder (p<0.001). Not sig. predictors in adjusted final model.	Primary Care USA Elderly	Lawrence et al. (2020)[2]
		Qualitative- Having an illness like asthma was a factor in the perceived vulnerability to the flu and therefore the need to vaccinate.	Forensic Hospital UK Adults	Borthwick et al. (2021)
	Health Lifestyle Behaviours	Smoking, drinking, and frequent exercise is inconsistent/insignificant.	General Population Cross-national Adults	Yeung et al. (2016)[1]
		Unhealthy lifestyle (i.e., smoking & alcohol consumption) has mixed results- neg. impacting flu vaccine uptake & + impacting in other studies.	General Population & High- Risk Groups Cross-national	Schmid et al. (2017)[1]

Variable Category	Variable Type	Analysis Findings	Setting Country Population	Reference
		Quitting smoking is + associated with flu vaccine uptake. Low physical activity a barrier in some studies & a promoter in others.		
		Smoking, drug, and alcohol abuse not significantly associated with flu vaccine status.	Primary Care USA Elderly	Lawrence et al. (2020)[2]
		Health motivation (I eat a well-balanced diet, I exercise regularly, I attend health checks and screening appointment with GP, I look for health information, I follow advice from care team as I believe this will benefit my health) not significant predictors in adjusted and un-adjusted models for flu vaccine behavior and intent.	Forensic Hospital UK Adults	Borthwick et al. (2021)
	Medications	On antipsychotic med negatively associated with total non-cancer compliance index: b= -5.12, SE=2.46, p<0.001. *(In univariate analysis, clinic type was not controlled for). Not significant in multivariate analysis. Number of medications is not significantly associated with total non-cancer compliance index. *(In univariate analysis, clinic type was not controlled for).	Mental Health Services USA Adults	Xiong et al. (2015)
		Significant relationships between medications (covariates) and flu vaccine status: On antidepressant (p<0.001) or benzodiazepine (p<0.001) meds. Being prescribed antidepressant a sig. predictor of flu vaccine aOR=1.94 but not benzodiazepine. Significant with comorbidities: Antidepressants aOR= 2.03 (1.51-2.74). Not significant: Benzodiazepine. Significant covariates without comorbidities: Antidepressant aOR=1.73 (1.02-2.93). Not significant: Benzodiazepine.	Primary Care USA Elderly	Lawrence et al. (2020)[2]

Variable Category	Variable Type	Analysis Findings	Setting Country Population	Reference
	Mental Illness	With major depression more likely to not have a flu vaccine than no depression: aOR=1.24 (1.18-1.30). **Stratified by whether receiving mental health service:** Untreated depression more likely to not have a flu vaccine than no depression: aOR=1.51 (1.40-1.62). Those with depression receiving care in specialty MH care and primary care than with no depression not sig. associated with flu vaccine.	National Survey USA Adults (>50)	Druss et al. (2008)
		3 studies found neutral associations: 1. European interview study-trend toward higher flu vaccine rates for those with depressive symptoms but not significant. 2. Postal survey-no sign. differences between depression and no depression on flu vaccine rates. 3. UK study-no sig. differences between those with depression and without depression in flu vaccinations for men or women >74 yr. **3 studies found negative associations:** 1. US study-depression more likely to not have a flu vaccine aOR=1.24, 1.18-1.30 & untreated depression aOR=1.51, 1.4-1.62, all >50 yr. 2. Self- reported survey-positive for distress less likely to have flu vaccine OR=0.7% 0.55-088 (elderly). 3. US Veterans health care study-mental disorder less likely to have ever had a flu vaccine in the past year aOR=0.9, 0.87-0.94, for >65 yr.	Europe & US Mental Health Adults	Lord et al. (2010)[3]
		For people with mental illness-vaccine status in 2010-2011: 28.4% received flu vaccines & vaccine status in 2011-2012: 24.2% had been vaccinated and 43.7% had no plans to get vaccinated. Compared to the national rate of 40.9% in 2010-2011.	Mental health US Adults	Lorenz et al. (2013)
		Only N=5 or 6.7% of participants (homeless with mental illness) received flu shots (as per documentations in the charts reviewed) vs. 28.9% among all Canadians in 2012.	Homeless (with mental illness) Toronto, Canada	Young et al. (2015)[1]

Variable Category	Variable Type	Analysis Findings	Setting Country Population	Reference
		In the adjusted models (controlled for patient characteristics and health services use): KPNW: Individuals with a diagnosis of bipolar/affective disorder: b= -0.090, 95% CI -0.127 to -0.054 & major depressive disorder: b= -0.090, 95% CI -0.105 to -0.074, had significantly lower care gap rates (incompletion rates of 12 preventive care measures including annual flu vaccine **compared to those without these diagnoses in the KPNW** program, p<0.001 for all. Schizophrenia and anxiety were **not significant.** CHC: Individuals with schizophrenia: b= - 0.158, 95% CI -0.176 to -0.141, bipolar: b= -0.114, 95% CI -0.126 to -0.102, anxiety: b= - 0.037, 95% CI -0.047 to -.0.026 & major depressive disorder: b= -0.096, 96% CI -0.103 to -0.090 all had significantly lower care gap rates compared to the reference group in the **CHC program**, p<0.011 for all.	Health Center/Primary clinic USA Adults (>19)	Yarborough et al. (2018)
		Older adults with either depression (p<0.001) or anxiety (p<0.001) or any mental illness (p<0.001) were more likely to be vaccinated than those without any mental illness. Depression or anxiety sig. predictors of flu vaccine uptake in un-adj. model OR=4.00 & adj. model OR=1.47.	Primary Care USA Elderly	Lawrence et al. (2020)[2]
	Perceived Health Status	Self-reported health is not sign. with flu vaccine uptake.	General Population Cross-national Adults	Yeung et al. (2016)[1]
		“Good” health status was found to be a barrier in some studies and a promoter in others with flu vaccine uptake.	General Population & High- Risk Groups Cross-national	Schmid et al. (2017)[1]

Variable Category	Variable Type	Analysis Findings	Setting Country Population	Reference
		Qualitative- General attitudes towards health: the "absence of disease" or feeling "healthy" made participants less likely to get flu vaccines, less motivated to engage in preventive behaviors, with little consideration for future health protection vs those who felt unwell-were more willing to consider vaccination.	Forensic Psychiatric Hospital UK Adults	Borthwick et al. (2021)
Past Behaviour/Experiences	Previous Vaccination Status/Experience	Mostly in the vaccinated group (flu), mean=95.3 (df 1), P<0.001 vs. no previous status.	Mental Health Clinic USA Adults	Lorenz et al. (2013)
		Previous status associated with flu vaccine uptake, OR=4.06-5.18.	General Population Cross-national Adults	Yeung et al. (2016)[1]
		Receiving a flu vaccine in past season a strong predictor, ↑ vaccine uptake. Less likely to vaccinate if no past experience with getting/suffering from the flu.	General Population & High- Risk Groups Cross-national	Schmid et al. (2017)[1]
		Having flu vaccine last year, a sig. predictor of flu vaccine intent in adj. model: B (Standard Coefficient) =0.317, P<0.001 & flu vaccine behavior in un-adj. model: B (un-standard coef.) =3.401, p=0.002, not sign. in adjusted model. Qualitative- Decisions to vaccinate were often based on past experiences with it (+ exp.= more likely to vaccinate vs. neg. exp. =less likely to vaccinate). Lacking personal experience & relying on informal sources (grapevine) & formal sources (news) influence decisions to vaccinate. Some selectively chose info that suited their prior opinions & intentions.	Forensic Hospital UK Adults	Borthwick et al. (2021)

Variable Category	Variable Type	Analysis Findings	Setting Country Population	Reference
		Those with a flu vaccine more likely to have received a prior vaccine (covariate) ($p<0.001$). Sig. predictor of flu vaccine status aOR=3.36, 95% CI (2.84-3.97). **With Comorbidities**: aOR=3.10, 95% CI (2.53-3.81). **Without Comorbidities**: aOR=3.80, 95% CI (2.85-5.07).	Primary Care USA Elderly	Lawrence et al. (2020)[2]
	Knowledge	Better knowledge of effective measures to prevent influenza is associated with flu vaccine uptake, OR-1.59-3.06. Knowledge that vaccines are required annually associated with flu vaccine uptake, OR=1.59. Knowledge that vaccines are recommended to high-risk groups Associated with flu vaccine uptake, OR=1.30. General knowledge about influenza transmission & treatment Associated with flu vaccine uptake, OR=1.25. Knowledge of influenza & influenza vaccination- better knowledge is weakly associated with flu vaccine uptake, OR=1.6-3.3.	General Population Cross-national Adults	Yeung et al. (2016)[1]
		Lack of knowledge a sig. barrier to flu vaccines.	General Population & High- Risk Groups Cross-national	Schmid et al. (2017)[1]
		Lack of vaccine awareness & knowledge were common barriers (42%) to all vaccinations (inc. flu vaccine).	Mental Health Clinic/Vaccine Program USA Adults	Miles et al. (2020)

Variable Category	Variable Type	Analysis Findings	Setting Country Population	Reference
		Qualitative: Lack of knowledge/ certainty resulted in misbeliefs (i.e., viewed vaccines as giving eventual immunity or like an antibiotic resistance). Quantitative: Flu knowledge is not significantly associated with flu vaccine intent or behavior.	Forensic Hospital UK Adults	Borthwick et al. (2021)
B. Behaviour Specific Cognitions and Affect: Personal Influences	Perceived Benefits	"Flu vaccine is effective against the flu"- unvaccinated: mean=3.19 (SD 1.04) vs. vaccinated: mean=3.63 (SD 1.34), F=9.82, P<0.001. More likely to vaccinate B= 0.28, OR-1.33, 95% CI (1.00-1.75), P <0.05.	Mental Health Clinic USA Adults	Lorenz et al. (2013)
		Vaccine is effective against the flu is associated with flu vaccine uptake, OR=2.7-10.55. Perceived vaccine safety and low adverse events after vaccination is associated with flu vaccine uptake, OR=10.5.	General Population Cross-national Adults	Yeung et al. (2016)[1]
		Qualitative: Some believed vaccines support the immune system-influenced flu vaccine intent and behavior. Quantitative: Vaccine benefits- Sig. predictor of flu vaccine behavior in un-adj. model B (un-standard coef.) =1.621, P=0.006, not in adjusted model & flu vaccine intent in un adj. model. B (stand coef.) =0.474, p<0.00, not sig. in adjusted model.	Forensic Hospital UK Adults	Borthwick et al. (2021)
		84% of the sample believed flu vaccines are safe, effective & important.	Mental Health Clinic/Vaccine Program USA Adults	Miles et al. (2020)
	Perceived Barriers	"Can get the flu from the vaccine"-unvaccinated: mean=3.04 (SD 1.25) vs. vaccinated: mean=2.38 (SD 1.19), F=19.90, P<0.001. Less likely to vaccinate: B= -0.45, OR 0.64, 95% CI (0.49-0.82), P<0.001 vs. reference group.	Mental Health Clinic, USA. Adults.	Lorenz et al. (2013)

Variable Category	Variable Type	Analysis Findings	Setting Country Population	Reference
		Not believing in the effectiveness of the vaccine a major barrier for flu vaccine uptake. High risk perception of flu vaccine adverse events & safety concerns ↓ flu vaccine uptake. Negative attitude towards vaccine is a major barrier. Perceived low social benefit or perception of low risk of influenza to others was found to ↓ the vaccine uptake. Belief in vaccine misconceptions is a barrier to flu vaccine intent & behavior. Vaccine expenses a barrier to flu vaccine uptake.	General Population & High- Risk Groups Cross-national	Schmid et al. (2017)[1]
		Attitudes toward vaccination a sig. predictor in un-adj. model of vaccine intent, B=0.552, p<0.001 and not in the adjusted model. Not sig. predictor for flu vaccine behavior in un- adjusted model. Believing the flu vaccine does not prevent the flu, not effective, can get sick from the vaccine is a sig. predictor of flu vaccine intent, B (Standard Coef.) = - 0.056, p=0.004 & of flu vaccine behavior in un-adj. model, B (un-standard coef.) = 2.370, p=0.006. Costs of vaccination (flu vaccine is not convenient, interferes with daily activities) is not sig. predictor with flu vaccine intent in unadjusted model nor for flu vaccine behavior.	Forensic Hospital UK Adults	Borthwick et al. (2021)
		Personal costs a barrier to all vaccinations (13%).	Mental Health Clinic/Vaccine Program USA	Miles et al. (2020)

Variable Category	Variable Type	Analysis Findings	Setting Country Population	Reference
			Adults	
	Perceived Self-efficacy	Low self-efficacy is a **barrier** to vaccine uptake.	General Population & High- Risk Groups Cross-national	Schmid et al. (2017)[1]
		Vaccine self-efficacy (I am confident that I could get the flu vaccine if I wanted to, even if I faced barriers) is not sig. predictor in unadjusted models for flu vaccine behavior and intent (not included in adjusted models).	Forensic Hospital UK Adults	Borthwick et al. (2021)
	Perceived Affect	Fear of adverse reaction from the vaccine is associated with flu vaccine uptake, OR=0.21. Fear of injection is not significant with flu vaccine uptake.	General Population Cross-national Adults	Yeung et al. (2016)[1]
		Qualitative- Some were fearful about the consequences of vaccine which impacted flu vaccine intent & behavior. Costs of vaccination (painful, afraid of needles) is not sig. predictor with flu vaccine intent in unadjusted model nor for flu vaccine behavior.	Forensic Hospital UK Adults	Borthwick et al. (2021)
		Fear about vaccinations a barrier to all vaccinations (10% of sample).	Mental Health Clinic/Vaccine Program USA Adults	Miles et al. (2020)
C. Interpersonal Influences	Recommendations, Social Supports, Role Models.	Provider recommendations to get vaccinated: Majority in vaccinated group (flu), mean=34.9 (df 1), P<0.001 vs. no recommendations. More likely to vaccinate B=1.42 or 4.12 (OR, 95% CI 2.17-7.82), P <0.001.	Mental Health Clinic USA Adults	Lorenz et al. (2013)

Variable Category	Variable Type	Analysis Findings	Setting Country Population	Reference
		Relative/close friend recommendation to vaccinate (cues to action) is associated with flu vaccine uptake, OR=17.74. Relatives/close friends receiving flu vaccine in past year. Doctor advice associated with flu vaccine uptake, OR=4.03-7.87. Healthcare professional advice associated with flu vaccine uptake, OR=1.23-13.0.	General Population Cross-national Adults	Yeung et al. (2016)[1]
		Not receiving direct recommendations from medical professionals reduced flu vaccine uptake. Not receiving direct recommendations from relatives reduced flu vaccine uptake. Low pressure from significant others to get vaccinated ↓ vaccine uptake than when social pressure was high.	General Population & High- Risk Groups Cross-national	Schmid et al. (2017)[1]
		Flu vaccine is not recommended by a doctor a barrier to all vaccinations (1.5%).	Mental Health Clinic/Vaccine Program USA Adults	Miles et al. (2020)
		Cues to action from doctors & nurses sig. predictor of flu vaccine intent: in adjusted model, B (standard coef.) =0.0258, $p<0.001$ and unadjusted model=B=-0.790, $p<0.001$ & with flu vaccine behavior: B (not standard coef.) = 2.055, p=0.040 in adjusted model and unadjusted model B=2.854, p=.001. Qualitative: Advise/encouragement to vaccinate by health providers was a factor in the perceived vulnerability to the flu.	Forensic Hospital UK Adults	Borthwick et al. (2021)

Variable Category	Variable Type	Analysis Findings	Setting Country Population	Reference
		Subjective norm is a sig. predictor of flu vaccine intent in un-adj. model, B=0.297, p=0.005, not significant in adjusted model. Not sig. in un-adjusted model for flu vaccine behavior.		
D. Situational Influences	Program Type/Service	Integrated 32.2% vs. Usual 11.5%, p=0.006 (flu vaccine).	Mental Health Clinic USA Veterans	Druss et al. (2001)
		Medical Care Management vs. Usual Care: Post 12 mo. mean=24.7 in MCM vs. mean=3.8 in UC, p<0.001 (all vaccines).	Mental Health Clinic USA Adults	Druss et al. (2010)
		Non-integrated less likely to use non-cancer preventive services (inc. flu vaccine): B= -16.34, SE= 2.74, P<0.001 than integrated.	Mental Health USA Adults	Xiong et al. (2015)
		Integrated (PCMH) vs. Usual Care (Non-PCMH) vs. No Usual Care: 1. Usual Care more likely to receive flu shots than No Usual Care, 1 year with AOR 1.88; (95 % CI 1.46, 2.43) & 2 years with AOR 1.83; (95 % CI 1.54, 2.18), P<0.001 for 1 and 2 years. 2. Integrated Care more likely to receive flu shots than No Usual Care, 1 year with AOR 3.00; (95 % CI 2.24, 4.04) & 2 years with AOR 2.28; (95 % CI 1.57, 3.31), P<0.001 for 1 & 2 years. No sig. diff. bet: PCMH & Non-PCMH USC for any measures. Group Comparisons: 1 year: No USC=25.2% vaccinated (flu); Non-PCMH USC=53% vaccinated;	Mental Health USA Adults	Bowdoin et al. (2016)

Variable Category	Variable Type	Analysis Findings	Setting Country Population	Reference
		PCMH=58.4% vaccinated. Sig. differences bet. each group. 2 years: No USC=15.7% vaccinated; Non-PCMH USC=36.1% vaccinated; PCMH=40.2% vaccinated. Sig. diff. between all except bet. Usual Care & PCMH.		
		Vaccinations: At baseline-Mean=15.72, SE=3.92 At 12 months-Mean=42.09, SE=6.51 Estimated difference (after adjusting for healthcare manager assignment): Mean=26.39, SE=6.34, P value=0.00, Effect size=0.61	Mental Health USA Adults	Cabassa et al. (2018)
		Patient Aligned Care Program (PACP): Higher proportion of veterans (ages 50–64) received influenza immunization with mental illness (70.5%-75.2% across all 3 years) compared to veterans without mental illness.	Mental Health USA Veterans	Browne et al. (2019)
		Vaccine Clinic Implementation Program: Flu vaccines increased from 47.4% to 50.4% post project implementation. -Interest to receive future vaccinations ↑ from 58.4% to 93.8%. -Beliefs about effectiveness and safety of vaccinations ↑ from 82% to 94%, kappa -0.14 and P=0.863 (sig.).	Mental Health Clinics USA Adults	Miles et al. (2020)
	Having a Primary Care Provider (PCP)	More likely to use preventive care services (inc. flu vaccine) B= +14.38, SE= 3.17, P<0.001 than no PCP.	Mental Health Clinic USA Adults	Xiong et al. (2015)

Variable Category	Variable Type	Analysis Findings	Setting Country Population	Reference
		Not having a regular source of care i.e., primary care physician reduced flu vaccine uptake.	General Population & High- Risk Groups Cross-national	Schmid et al. (2017)[1]
	Health Care Interaction	Recent medical doctor visits associated with flu vaccine uptake, OR=1.55-2.0 (mixed sig.).	General Population Cross-national Adults	Yeung et al. (2016)[1]
		Lower interaction (i.e., fewer medical visits or hospitalizations) reduces flu vaccine uptake.	General Population & High- Risk Groups Cross-national	Schmid et al. (2017)[1]
		Significant relationship between Healthcare Utilization (covariate) and flu vaccine status p<0.001 (more likely to have received flu vaccines). In adjusted model (anxiety and depression are controlled for & other covariates) higher Healthcare Utilization is a sig. predictor of flu vaccine status aOR= 4.62, 95% CI (3.86, 5.53). **With Comorbidities**: High utilization aOR=4.23 (3.38-5.29). **Without Comorbidities**: High utilization aOR=5.16 (3.83-6.95).	Primary Care USA Elderly	Lawrence et al. (2020)[2]
	Access/Transportation	Easy access to healthcare associated with flu vaccine uptake, OR=1.8.	General Population Cross-national Adults	Yeung et al. (2016)[1]
		Transportation issues to vaccines a barrier to flu vaccine uptake.	General Population & High- Risk Groups Cross-national	Schmid et al. (2017)[1]
		Issue with accessibility was a barrier to all vaccines (16% of the sample).	Mental Health Clinics	Miles et al. (2020)

Variable Category	Variable Type	Analysis Findings	Setting Country Population	Reference
			USA Adults	
E. Other Factors for Consideration	Influenza Risk Perception	Perceived chances of contracting influenza associated with flu vaccine uptake, OR=1.62-5.40. Perceived health impact of having influenza is associated with flu vaccine uptake OR=2.21	General Population Cross-national Adults	Yeung et al. (2016)[1]
		Low risk perception of influenza (i.e., severity, likelihood of contracting the flu, low susceptibility, low worry & anticipation) a barrier to flu vaccine intent/behavior.	General Population & High- Risk Groups Cross-national	Schmid et al. (2017)[1]
		Qualitative- Beliefs that "it's better to fight the virus off, sense of resistance to the flu, confidence in immune system to fight it off "impacted flu vaccine intent/behavior. Quantitative- Perceived severity and susceptibility to the flu is not sig. predictors of flu vaccine intention and behavior.	Forensic Hospital UK Adults	Borthwick et al. (2021)

Note. [1]Systematic reviews among the general adult or high-risk populations, not specific to mental health. [2]Study primarily consisting of elderly primary care patients, examining the relationship between mental illness and flu vaccine status. [3]Comparative analysis review.

APPENDIX F

Table F1

Independent and Dependent Variables- (Mapped According to the Literature Review and Pender's HPM), and Independent Variables for the Study that were Recoded or Combined for Study Purposes

Literature Review/HPM Concepts or Variables	2017-2018 CCHS Variables: Name & Code	Question/Description	Original Response Options	Transformed Categories of Predictor Variables (Collapsed/Recoded)	Transformed Predictor Variables (Combined/Indexed)
	Dependent Variable/s:				
Flu Vaccine Uptake/Status/Receipt	**Flu Shot**				
	Had a seasonal flu shot (excluding H1N1) – lifetime-FLU_005	Have you ever had a seasonal flu shot, excluding the H1N1 flu shot?	1=Yes, 2=No		
	Independent Variables:				
Individual Characteristics					
Sociodemographic					
Age	Age-DHHGAGE	What is your age?	01=12-14, 02=15-17, 03=18-19, 04=20-24, 05=25-29, 06=30-34, 07=35-39, 08=40-44, 09=45-49, 10=50-54, 11=55-59, 12=60-64, 13=65-69, 14=70-74, 15=75-79, 16=80 +	1=Age 18-39, 2=Age 40-59, 3=Age 60 +	
Gender	Sex-DHH_SEX	Is [respondent name] male or female?	1=Male, 2=Female		

Literature Review/HPM Concepts or Variables	2017-2018 CCHS Variables: Name & Code	Question/Description	Original Response Options	Transformed Categories of Predictor Variables (Collapsed/Recoded)	Transformed Predictor Variables (Combined/Indexed)
Race/ethnicity	Cultural/racial background-SDCDGCGT Derived from 13 different sociodemographic variables	This variable has been grouped as a form of disclosure control.	1=White, 2=Non-white 6=Valid skip-not applicable to those who identified as Aboriginal elsewhere in the survey.	(A) Valid skip recoded from value 6 (missing) to 3 (non-missing) and combined with category 2. (B) 1=White, 2=Non-white (combination of category 2 & 3)	
Education	Highest level of education – respondent-EHG2DVR3	This variable indicates the highest level of education attained by the respondent.	1= Less than secondary school graduation, 2= Secondary school graduation, no post-secondary education, 3= Post-secondary certificate diploma or univ degree		
Income	Total household income - all sources-INCDGHH	N/A	1= No income or less than $20,000, 2= $20,000 to $39,999, 3= $40,000 to $59,999, 4= $60,000 to $79,999, 5= $80,000 or more	1=No income or less than $20,000, 2=$20,000 to $79,999, 3=$80,000 or more	
Marital Status	Marital status-DHHGMS	What is your marital status? Are you...?	1=Married, 2=Common-law, 3=Widowed/Divorced/Separated, 4=Single	1=Married/Common law, 2=Widowed/divorced/separated, 3=Single	

Literature Review/HPM Concepts or Variables	2017-2018 CCHS Variables: Name & Code	Question/Description	Original Response Options	Transformed Categories of Predictor Variables (Collapsed/Recoded)	Transformed Predictor Variables (Combined/Indexed)
Living Arrangement	Living / family arrangement of selected respondent- DHHDGLVG	The necessary data is collected using a set of relationship codes that define a link between the selected respondent and each person in a household. All relationships with the selected respondent within each sample (relationship of selected respondent to each other person within the household) are used in creating this variable.	01= Unattached individual living alone, 02= Unattached individual living with others, 03=Individual living with spouse/partner, 04= Parent living with spouse/partner and child(ren), 05= Single parent living with children, 06= Child living with a single parent with or without siblings, 07= Child living with two parents with or without siblings, 08=Other	1=Unattached individual living alone/living with others, 2=Individual living with spouse/partner, or parent living with spouse/partner and child(ren), or single parent living with children, 3=Child living with a single parent with or without siblings, or child living with two parents with or without siblings, or other	
Chronic Conditions and Comorbidities	**Chronic Conditions:**	*We are interested in "long-term conditions" which are expected to last or have already lasted 6*			

Literature Review/HPM Concepts or Variables	2017-2018 CCHS Variables: Name & Code	Question/Description	Original Response Options	Transformed Categories of Predictor Variables (Collapsed/Recoded)	Transformed Predictor Variables (Combined/Indexed)
		months or more and that have been diagnosed by a health professional:			
	Has asthma- CCC_015	Do you have asthma?	1=Yes, 2=No		
	Has arthritis (e.g. osteoarthritis, rheumatoid arthritis, gout)- CCC_050	Do you have arthritis, for example osteoarthritis, rheumatoid arthritis, gout or any other type, excluding fibromyalgia?	1=Yes, 2=No		
	Has high blood pressure- CCC_065	Do you have high blood pressure?	1=Yes, 2=No		**“CVD3-cardiovascular disease:”** 1=Yes (includes individuals who said *yes* to either high blood pressure, blood cholesterol/lipids, or heart disease, or who said *yes* to a combination of the two, or who said *yes* to all 3 conditions), 2=No (includes individuals who said *no* to all 3 conditions)
	Has high blood cholesterol / lipids- CCC_075	Do you have high blood cholesterol or lipids?	1=Yes, 2=No		

Literature Review/HPM Concepts or Variables	**2017-2018 CCHS Variables: Name & Code**	**Question/Description**	**Original Response Options**	**Transformed Categories of Predictor Variables (Collapsed/Recoded)**	**Transformed Predictor Variables (Combined/Indexed)**
	Has heart disease- CCC_085	Do you have heart disease?	1=Yes, 2=No		
	Has diabetes- CCC_095	Do you have diabetes?	1=Yes, 2=No		
Health Lifestyle Behaviours	**Smoking:**				
	Smoking status (type 2) - traditional definition- SMKDVSTY	This variable indicates the type of smoker the respondent is, based on his/her smoking habits. This variable includes lifetime cigarette consumption Derived from 4 different smoking variables	01=Current daily smoker, 02=Current occasional smoker, 03=Former daily smoker (non-smoker now), 04=Former occasional smoker (non-smoker), 05=Experiment smoker (at least 1 cig, non-smoker now), 06=Lifetime abstainer (never smoked a whole cig)	1=Current smoker (daily or occasional), 2=Former smoker (daily or occasional), 3=Experimental smoker (at least 1 cig, non-smoker now), or lifetime abstainer (never smoked a whole cig)	
	Alcohol:				
	Type of drinker - 12 months- ALCDVTTM	Was created to allow the classification of all respondents according to their drinking habits in the past 12 months. Based on the top 3 variables.	1=Regular drinker, 2=Occasional drinker, 3=Did not drink in the last 12 months		
	Physical Activities (18 and older):	*The following questions are about*			

Literature Review/HPM Concepts or Variables	2017-2018 CCHS Variables: Name & Code	Question/Description	Original Response Options	Transformed Categories of Predictor Variables (Collapsed/Recoded)	Transformed Predictor Variables (Combined/Indexed)
		various types of physical activities done in the last 7 days. I want you to only think of activities ^YOU2 did for a minimum of 10 continuous minutes. *OR* *In the last 7 days, did YOU do sports, fitness or recreational physical activities, organized or non-organized, that lasted a minimum of 10 continuous minutes?*			
	Physical activity indicator- PAADVACV	This derived variable indicates whether a respondent is physically active according to the Canadian Physical Activity Guidelines (CPAG). Physically active is defined by the Canadian Physical Activity Guidelines as	1= Physically active at / above recommended level from CPAG, 2= Physically active below recommended level from CPAG, 3= No physical activity minutes reported		

Literature Review/HPM Concepts or Variables	2017-2018 CCHS Variables: Name & Code	Question/Description	Original Response Options	Transformed Categories of Predictor Variables (Collapsed/Recoded)	Transformed Predictor Variables (Combined/Indexed)
		having at least 150 minutes of moderate- to vigorous-intensity aerobic physical activity per week, in bouts of 10 minutes or more. Based on 'age' and 'number of minutes of moderate to vigorous physical activities - last 7 days' variables.			
	Number of days - physically active - 7 d- PAADVDYS Based on age variable and 7 days of physical activity variables	Based on 7 variables, including age and related physically activity variables.	Number of days respondent was active – 7 D (00-07)		
	Sedentary Behaviours*:*				
	Time sitting / lying watching screen - school / workday - 7d- SBE_005	On a school or work day, how much of your free time did you spend watching television or a screen on any	01= 2 hours or less per day, 02= More than 2 hours but less than 4 hours, 03=4 hours to less than 6 hours, 04=6 hours to less than 8 hours,	(A) Valid skip recoded from value 96 (missing) to 07 (non-missing).	

Literature Review/HPM Concepts or Variables	2017-2018 CCHS Variables: Name & Code	Question/Description	Original Response Options	Transformed Categories of Predictor Variables (Collapsed/Recoded)	Transformed Predictor Variables (Combined/Indexed)
		electronic device while sitting or lying down?	05= 8 hours or more per day, 06=Was not at work or school-in the past 7 days 96-=Valid skip: not applicable to those who did not work in the past 12 months or currently attend school	(B) 1=Less than 8 hours, 2=8 hours or more per day, 3= Was not at work or school-for seven or more days (combination of values 06 and 07)	
	Time sitting / lying watching screen - not school / workday - 7d-SBE_010	[On a day that was not a school or workday, how / how much of your free time did you spend watching television or a screen on any electronic device while sitting or lying down?	1= 2 hours or less per day, 2= More than 2 hours but less than 4 hours, 3= 4 hours to less than 6 hours, 4= 6 hours to less than 8 hours, 5=8 hours or more per day	1=Less than 4 hours, 2=4 hours to less than 8 hours, 3=8 hours or more per day	
	Height and Weight:				
	BMI classification 18 and + (self-reported) - Intl standard-HWTDGISW	This variable assigns adult respondents aged 18 and over (except pregnant women) to one of the following categories, according to their Body Mass Index (BMI): underweight; acceptable weight;	1=Underweight, 2=Normal weight, 3=Overweight, 4=Obese-Class I, II, III	1=Underweight, 2=Normal weight, 3=Overweight, or Obese-Class I, II, III	

Literature Review/HPM Concepts or Variables	2017-2018 CCHS Variables: Name & Code	Question/Description	Original Response Options	Transformed Categories of Predictor Variables (Collapsed/Recoded)	Transformed Predictor Variables (Combined/Indexed)
		overweight; and obese class I, II, or III. The BMI categories are adopted from a body weight classification system recommended by Health Canada and the World Health Organization (WHO) which has been widely used internationally. Based on DHH_AGE, HWTDGBMI, MAC_025.			
Perceived Health Status	**General Health:**				
	Perceived health- GEN_005	In general, would you say your health is...? By health, we mean not only the absence of disease or injury but also physical, mental and social well-being.	1=Excellent, 2=Very good, 3=Good, 4=Fair, 5=Poor	1=Excellent, or Very good, 2=Good, or Fair, 3=Poor	
	Perceived mental health- GENDVMHI	In general, would you say your mental health is...?	0=Poor, 1=Fair, 2=Good,	1=Poor, 2=Fair, or Good, 3=Very good, or Excellent	

Literature Review/HPM Concepts or Variables	2017-2018 CCHS Variables: Name & Code	Question/Description	Original Response Options	Transformed Categories of Predictor Variables (Collapsed/Recoded)	Transformed Predictor Variables (Combined/Indexed)
			3=Very good, 4=Excellent		
Interpersonal Influences					
Relationships, recommendations and social supports.	**Social Provisions:**	*The next questions are about your current relationships with friends, family members, co-workers, community members, and so on. Please indicate to what extent each statement describes your current relationships with other people.*			
	Relationships - talents and abilities are admired- SPS_045	There are people who admire my talents and abilities.	1=Strongly agree, 2=Agree, 3=Disagree, 4=Strongly disagree		**"Relationships- relationships with others/community:"** New index variable comprises of all 10 original variables. Index variable ranging from a scale of (1) strongest indication of relationships to (4) weakest indication.
	Relationships - people to depend on for help- SPS_005	There are people I can depend on to help me if I really need it.	1=Strongly agree, 2=Agree, 3=Disagree, 4=Strongly disagree		
	Relationships - people who enjoy same social activities- SPS_010	There are people who enjoy the same social activities I do.	1=Strongly agree, 2=Agree, 3=Disagree, 4=Strongly disagree		

Literature Review/HPM Concepts or Variables	2017-2018 CCHS Variables: Name & Code	Question/Description	Original Response Options	Transformed Categories of Predictor Variables (Collapsed/Recoded)	Transformed Predictor Variables (Combined/Indexed)
	Relationships - sense of emotional security and wellbeing- SPS_015	I have close relationships that provide me with a sense of emotional security and wellbeing	1=Strongly agree, 2=Agree, 3=Disagree, 4=Strongly disagree		
	Relationships - someone to talk to	There is someone I could talk to about	1=Strongly agree, 2=Agree,		
	about important decisions- SPS_020	important decisions in my life.	3=Disagree, 4=Strongly disagree		
	Relationships - trustworthy person for advice- SPS_030	There is a trustworthy person I could turn to for advice if I were having problems.	1=Strongly agree, 2=Agree, 3=Disagree, 4=Strongly disagree		
	Relationships - part of a group who share attitudes and beliefs- SPS_035	I feel part of a group of people who share my attitudes and beliefs.	1=Strongly agree, 2=Agree, 3=Disagree, 4=Strongly disagree		
	Relationships - strong emotional bond with a least one person- SPS_040	I feel a strong emotional bond with at least one other person	1=Strongly agree, 2=Agree, 3=Disagree, 4=Strongly disagree		
	Relationships - people to count on in an emergency- SPS_050	There are people I can count on in an emergency.	1=Strongly agree, 2=Agree, 3=Disagree, 4=Strongly disagree		
	General Health:				
	Sense of belonging to local community- GEN_030	How would you describe your sense of belonging to your local	1=Very strong, 2=Somewhat strong, 3=Somewhat weak, 4=Very weak		See above comments

Literature Review/HPM Concepts or Variables	2017-2018 CCHS Variables: Name & Code	Question/Description	Original Response Options	Transformed Categories of Predictor Variables (Collapsed/Recoded)	Transformed Predictor Variables (Combined/Indexed)
		community? Would you say it is...?			
Situational Influences					
Healthcare Access/Utilization	**Primary Health Care**	*It is often the first point of entry to the Canadian health system. It incorporates diagnosis, treatment and management of health problems.*			
	Usual place for immediate care for minor problem-PHC_005	Is there a place that you usually go to when you need immediate care for a minor health problem?	1=Yes, 2=No		**"PrimaryCare3-Has Access to Primary Health Care:"**
	Has a regular health care provider-PHC_020	Do you have a regular health care provider? By this, we mean one health professional that you regularly see or talk to when you need care or advice for your health.	1=Yes, 2=No		1=Yes (includes individuals who said *yes* to either having a regular health care provider or usual place for immediate care, or *yes* to having both), 2=No (individuals who said *no* to both variables).
Other Related Factors					
	Geographical/Health Region:				

Literature Review/HPM Concepts or Variables	2017-2018 CCHS Variables: Name & Code	Question/Description	Original Response Options	Transformed Categories of Predictor Variables (Collapsed/Recoded)	Transformed Predictor Variables (Combined/Indexed)
	Health Region-GEODGHR4	The Postal Code Conversion File (PCCF) was used in the derivation of the geographic variables. Most of the geographic variables use the geography from the 2016 Census. Some variables use the 2011 Census. This variable is a 5-digit number that identifies the sub-provincial health areas. It is based on the 4-digit health regions specified by the Provincial Ministries of Health. Based on the variable GEODVHR4: is the health region based on GEODVPC (postal code) and is derived using the information available on the survey frame at the time of	25 categories of health regions only across **NFL, PEI, AB, and BC** (study's sample): 10911=Eastern regional, 10912=Central regional, 10913=Group: (GEODVHR4= (1013. 1014), 11900=Prince Edward Island, 48931=South zone, 48932=Calgary zone, 48933=Central zone, 48934=Edmonton zone, 48935=North zone, 59911=East Kootenay HSDA 59912=Kootenay-Boundary HSDA, 59913=Okanagan HSDA, 59914=Thompson/Cariboo HSDA, 59921=Fraser east HSDA, 59922=Fraser north HSDA, 59923=Fraser south HSDA, 59931=Richmond HSDA, 59932=Vancouver HSDA, 59933=North shore/coast Garibaldi HSDA, 59941=South Vancouver Island HSDA,	1=Newfoundland and Labrador Health Regions, 2=Prince Edward Island Health Region, 3=Alberta Health Regions, 4=British Columbia Health Regions	

Literature Review/HPM Concepts or Variables	2017-2018 CCHS Variables: Name & Code	Question/Description	Original Response Options	Transformed Categories of Predictor Variables (Collapsed/Recoded)	Transformed Predictor Variables (Combined/Indexed)
		sampling and the geographic information provided by the respondent.	59942=Central Vancouver Island HSDA, 59943=North Vancouver Island HSDA, 59951=Northwest HSDA, 59952=Northern Interior HSDA, 59953=Northeast HSDA		
	Food Security:				
	Worried food would run out - 12 mo.- FSC_010	The first statement is: [You / and other household members] worried that food would run out before you got money to buy more. Was that often true, sometimes true, or never true in the past 12 months?	1=Often true, 2=Sometimes true, 3=Never true		**"FoodSecurity3:"** Index variable comprising of the 2 original variables. Index variable ranging from a scale of (1) highly insecure to (3) highly secure.
	Food didn't last and no money to buy more - 12 mo.- FSC_015	The food that [you / and other household members] bought just didn't last, and there wasn't any money to get more. Was that often true, sometimes true, or never true in the past 12 months?	1=Often true, 2=Sometimes true, 3=Never true		

Note. Valid skip=V.S. HPM=Health Promotion Model. Information obtained from: Statistics Canada. (2020). *CCHS annual component 2017-2018: Data dictionary*; and Statistics Canada. (2020). *CCHS annual component 2017-2018: Derived variable specification*.

Table F2

CCHS 2017-2018 Variables Used to Identify the Study Population of Interest

2017-2018 CCHS Variables: Name & Code	Questions/Description	Response	Comments/Other
Chronic Conditions	*We are interested in "long-term conditions" which are expected to last or have already lasted 6 months or more and that have been diagnosed by a health professional:*		
[1]Has a mood disorder (depression, bipolar, mania, dysthymia)-CCC_195	Do you have a mood disorder such as depression, bipolar disorder, mania or dysthymia?	**1=Yes**, 2=No	Asked respondents who answered *Yes* to chronic conditions (inclusion flag)
[1]Has an anxiety disorder (phobia, OCD, panic)-CCC_200	Do you have an anxiety disorder such as a phobia, obsessive-compulsive disorder or a panic disorder?	**1=Yes**, 2=No	Asked respondents who answered *Yes* to chronic conditions (inclusion flag)
Geographic Region			
Province of residence of respondent- GEO_PRV	N/A	**10= Newfoundland and Labrador** **11= Prince Edward Island** 12= NOVA SCOTIA 13= NEW BRUNSWICK 24= QUEBEC 35=Ontario 46=Manitoba 47= SASKATCHEWAN **48=Alberta** **59=British Columbia** 60=Yukon 61=Northwest Territories	For this study, the population will only consist of people residing in NFL, PEI, AB, and BC.

2017-2018 CCHS Variables: Name & Code	Questions/Description	Response	Comments/Other
Sociodemographic			
Age	Age-DHHGAGE	01=12-14, 02=15-17, **03=18-19, 04=20-24, 05=25-29, 06=30-34, 07=35-39, 08=40-44, 09=45-49, 10=50-54, 11=55-59, 12=60-64, 13=65-69, 14=70-74, 15=75-79, 16=80 +**	The population in this study will only consist of people ages 18 and above.

Notes. Information obtained from: Statistics Canada. (2020). *CCHS annual component 2017-2018: Data dictionary*. [1] Study sample includes those who answered '*yes*' to having either mood or anxiety disorder, or '*yes'* to having both; does not include those who said '*no*' to both

APPENDIX G

Table G1

Omnibus Tests of Model Coefficients (Imputed Data)

Imputation #	χ^2	df	Significance
1	319.53	22	0.000
2	304.73	22	0.000
3	281.47	22	0.000
4	317.73	22	0.000
5	326.67	22	0.000
6	324.59	22	0.000
7	300.35	22	0.000
8	325.03	22	0.000
9	293.53	22	0.000
10	317.83	22	0.000
11	303.59	22	0.000
12	323.32	22	0.000
13	323.00	22	0.000
14	272.12	22	0.000
15	296.44	22	0.000
16	325.48	22	0.000
17	318.77	22	0.000
18	294.58	22	0.000
19	301.14	22	0.000
20	316.52	22	0.000

Table G2

Nagelkerke R Square Estimates (Imputed Data)

Imputation #	Nagelkerke R^2
1	0.090
2	0.086
3	0.079
4	0.089
5	0.092
6	0.091
7	0.085
8	0.091
9	0.083
10	0.090
11	0.086
12	0.091
13	0.091
14	0.077
15	0.084
16	0.092
17	0.090
18	0.083
19	0.085
20	0.089

Table G3

Hosmer and Lemeshow Test (Imputed Data)

Imputation #	χ^2	df	Significance
1	55.11	8	0.000
2	11.33	8	0.184
3	12.51	8	0.130
4	15.91	8	0.044
5	17.16	8	0.029
6	12.59	8	0.127
7	18.57	8	0.017
8	8.18	8	0.416
9	15.47	8	0.051
10	9.86	8	0.275
11	7.52	8	0.481
12	16.44	8	0.036
13	6.53	8	0.588
14	11.39	8	0.180
15	15.93	8	0.043
16	16.24	8	0.039
17	10.06	8	0.261
18	13.57	8	0.094
19	39.46	8	0.000
20	49.85	8	0.000