DEVELOPMENT OF A BEHAVIOUR CHANGE INTERVENTION TO IMPROVE SEXUAL HEALTH SERVICE USE AMONG UNIVERSITY UNDERGRADUATE STUDENTS

by

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Submitted in partial fulfilment of the requirements
for the degree of Doctor of Philosophy

at

Dalhousie University
Halifax, Nova Scotia
May 2018

DEDICATION

For my Grammie, Kathleen Murphy (1927-2018)
As one of the first women to graduate from St. Dunstan's University (BSc '49), thank you for paving the way for women in science

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ABSTRACT

Introduction: University undergraduate students are within the highest risk population for acquiring sexually transmitted infections and other negative health outcomes. Effective prevention relies on regular condom use and early detection and treatment. Despite the availability of sexual health services at university health centres, many students delay or avoid seeking care. The aim of this study was to develop intervention strategies to improve sexual health service use among university students.

Methods: This study used a three-phased, sequential explanatory mixed methods research design guided by the Behaviour Change Wheel. In phase one, a secondary analysis of online survey data from two universities in Nova Scotia was conducted to describe the rates and predictors of undergraduate students' use of sexual health services. In phase two, focus groups and interviews with students, health care providers, and administrators were conducted to identify barriers and enablers to student use of sexual health services. In phase three, stakeholder consultation meetings were held to select intervention content and potential modes of delivery.

Results: A total of 2,625 female students and 1,074 male students were included in the secondary analysis. Only 22% of female students and 8% of male students reported having ever accessed sexual health services at their university health centre. Barriers and enablers to sexual health service use included: knowledge and awareness of sexual health services, service accessibility, peer influence, campus culture, stigma, privacy and confidentiality. Key linkages between opportunity and motivation were found to influence students' access of sexual health services. Six intervention functions and 15 behaviour change techniques were identified as relevant to include in interventions to improve sexual health service use.

Conclusions: This study details the use of the Behaviour Change Wheel to develop interventions strategies aimed at improving university students' use of sexual health services. The Behaviour Change Wheel provided a useful framework for integrating multiple sources of data to inform the selection of theory- and evidence-based intervention strategies. University administrators and decision-makers can use these strategies to design, implement, and evaluate sexual health service interventions that are feasible within the context of their health centre.

LIST OF ABBREVIATIONS AND SYMBOLS USED

APEASE	Affordability, Practicability, Effectiveness/cost-effectiveness, Acceptability, Safety/side effects, and Equity
BCT	Behaviour Change Technique
BCTTv1	Behaviour Change Technique Taxonomy version 1
BCW	Behaviour Change Wheel
CFIR	Consolidated Framework for Implementation Research
CI	Confidence Interval
CO	Beliefs about Consequences
COM-B	Capability, Opportunity, Motivation – Behaviour Model
E	Environmental Context and Resources
EM	Emotion
FG	Focus Group
HBM	Health Belief Model
HCP	Health Care Provider
HIV/AIDS	Human Immunodeficiency Virus/Acquired Immune Deficiency Syndrome
K	Knowledge
LGBTQ	Lesbian, Gay, Bisexual, Transgender, Queer
MAD	Memory, Attention, and Decision-Making Processes
NICE	National Institute for Health and Care Excellence
OP	Optimism
OR	Odds Ratio
Pap	Papanicolaou
PHAC	Public Health Agency of Canada
RA	Research Assistant
SD	Standard Deviation
SEM	Socio-Ecological Model
SI	Social Influences
SPSS	Statistical Package for the Social Sciences
STIs	Sexually Transmitted Infections
TDF	Theoretical Domains Framework
TPB	Theory of Planned Behaviour
UHS	Undergraduate Health Survey
α	Alpha
n	Number of respondents or participants
p	Probability

ACKNOWLEDGEMENTS

My PhD journey would not have been possible without the inspiration and support from so many important people in my life.

Thank you to the many role models at the University of Prince Edward Island and Dalhousie University that I have had the privilege of learning from over the past 9 years. In particular, thank you Dr. Janet Bryanton, for introducing me to the world of nursing research.

To my supervisors, Dr. Janet Curran and Dr. Audrey Steenbeek – You have helped to shape me into a confident and independent nurse scientist. Thank you for challenging me, believing in me, and providing me with many diverse learning opportunities.

Thank you to my committee members, Dr. Donald Langille and Dr. Ruth Martin-Misener for challenging my thinking and helping me to create a final product that I am proud of.

I have had the privilege of completing my PhD with two brilliant friends, Britney Benoit and Jenny Rand. I could always count on you two for understanding exactly what I was going through.

To Dr. Andrea Bishop – mentor, role model, travel buddy and friend. Thank you for your incredible mentorship and friendship over the past 4 years. I am certain we will always find a way to collaborate together in the years to come.

Growing up in a family of accountants was not always easy. But thank you to my three brothers, Matthew, Stephen, and Ryan for celebrating every success with me, even if you did not know what it meant. Ryan, thank you for all the Sunday suppers and for understanding when I had to cancel card games to work on my dissertation.

To my parents, Mike and Mary Jane – my motivation and work ethic come from you. Your unwavering support and encouragement have helped me reach this goal. Thank you for instilling in me the value of education and the importance of family. Dad, I only wish I can have as much of an impact on the next generation of nurses as you have had on your students.

Lastly, to Nelson – you have been by my side every step of the way. From the day I was accepted into the PhD program until the day I defended; from Halifax to Toronto and back again. Thank you for celebrating every high and supporting me through every low. Thank you for making me laugh every day during this four-year journey. I am so grateful for your unconditional love and support.

CHAPTER 1 INTRODUCTION

The transition from adolescence to young adulthood is an exciting time for young adults. This distinct developmental stage is known as emerging adulthood, or the age of possibilities, that fosters opportunities, personal growth, and new life experiences (Arnett, 2000; Hicks & Heastie, 2008). It is a period of self-focus, in which young adults try to decide what they want to do, where they want to go, and who they want to be with (Arnett, 2000). This transition can be a challenging and complex time for young adults as they encounter periods of instability. They may start to feel 'in between' as they begin to pull away from the struggles of adolescence and accept responsibility for themselves (Arnett, 2000; Nelson, Story, Larson, Neumark-Sztainer, & Lytle, 2008).

In addition to these life changes, some young adults are also starting university, which bears its own unique challenges (Public Health Agency of Canada [PHAC], 2011). Many university undergraduate students leave home for the first time, develop increased autonomy in decision-making, and uncover their self-identity as a student. They may encounter social and relational challenges (i.e., making new friends, adjusting to new living arrangements) (Hicks & Heastie, 2008), increased stress and pressure related to academic performance (Arnett, Žukauskienė, & Sugimura, 2014; Hicks & Heastie, 2008), and difficulties maintaining healthy dietary and physical activity practices (Demory-Luce et al., 2004; Gordon-Larsen, Nelson, & Popkin, 2004; Lien, Lytle, & Klepp, 2001; Nelson et al., 2008). University students may also start to explore love and human relationships and experiment with sexual behaviours (Arnett, 2000; Cooper, 2002; Stinson, 2010). Coupled with the complexities of emerging adulthood, the challenges associated with the university undergraduate experience can impact students' mental,

physical, and sexual health and well-being. As a result, emerging adulthood is an important period for establishing long-term health behaviour patterns (Nelson et al., 2008).

1.1 Undergraduate Students and their Sexual Health

Sexual activity often begins in adolescence and continues through emerging adulthood. As such, it is normal for young adults to explore their sexual identity and sexual relationships throughout the university journey. The Canadian average age of first sexual intercourse reported by youth is 16-17 years old (PHAC, 2011). Sexual activity increases with age: 68% of 18-to 19-year olds and 86% of 20- to 24-year olds report having sexual intercourse at least once (PHAC, 2011). The prevalence is similar among college students in the United States where national surveys have found 75% of college students reported ever having had oral, vaginal, or anal sex (Buhi, Marhefka, & Hoban, 2010).

Relationships in emerging adulthood differ from adolescent sexual relationships due to age-specific cognitive and affective changes (Alexander, Jemmott, Teitelman, & D'Antonio, 2015). While young adults have greater emotional regulation than adolescents, they are often less capable of monitoring their own sexual behaviour in comparison to mature adults (Tanner & Arnett, 2009). Consequently, they may engage in risky sexual experiences and start to develop attitudes and beliefs regarding mature intimacy (Alexander et al., 2015). University students must also learn to navigate the environment of the university experience. Environmental factors, including alcohol and other drug use, peer pressure, decreased parental supervision, and increased personal freedom, create additional challenges to a university student's sexual journey (Arnett,

2000; Fromme, Corbin, & Kruse, 2008; Stinson, 2010). Within this context, the complexities of being both a young adult and university student merge to impact students' sexual development and sexual behaviours.

While navigating the emerging adulthood stage and the university experience, some students begin to experiment with risky sexual behaviours, including casual sex, unprotected sexual intercourse, and sexual intercourse with multiple sexual partners (Arnett, 2000; Byno, Mullis, & Mullis, 2009; Fromme et al., 2008). Studies have found on average 55-78% of university/college students have engaged in casual sex/'hooking-up' (sexual intercourse outside of a committed relationship) (Fielder, Walsh, Carey, & Carey, 2014; LaBrie, Hummer, Ghaidarov, Lac, & Kenney, 2014). As defined by Downing-Matibag and Geisinger (2009), "Hooking up with friends, strangers, and acquaintances is a popular way for college students to experience sexual intimacy without investing in relationships" (p. 1196). Hooking-up often occurs in tandem with the use of alcohol and other drugs. LaBrie et al. (2014) found 67.5% of male college students and 64.9% of female college students consumed alcohol prior to hooking up in the past year. Condom use among university/college students has been found to decrease with alcohol consumption (Chanakira et al., 2015). In a national sample of 653 Canadian university students, less than half (47.2%) reported condom use at last sexual encounter (Milhausen et al., 2013). Young adults of university age also engage in sexual acts with multiple partners: One third of sexually active 15 to 24-year olds in Canada reported having had sexual intercourse with more than one partner in the previous 12 months. More males (39%), aged 15-24, than females (25%) reported having sexual intercourse with more than one partner (PHAC, 2011; Rotermann, 2012).

Engaging in safe and consensual sexual behaviour in emerging adulthood can lead to several positive health outcomes for university students. Sexual activity can enhance excitement, pleasure, and sexual satisfaction (Higgins, Mullinax, Trussell, Davidson, & Moore, 2011; Holmberg, Blair, & Phillips, 2010; Morgan, 2014). Sexual activity can also lead to positive psychological and emotional outcomes, including: enhanced self-esteem; higher levels of self-efficacy in sexual decision-making; increased respect for self and others; non-exploitive, healthy sexual relationships; and informed reproductive choices (Lefkowitz & Vasilenko, 2014; Maas & Lefkowitz, 2015; Morgan, 2014).

Despite many physical and emotional benefits, high-risk sexual behaviours can place young adults at risk for undesired health consequences, such as sexually transmitted infections (STIs), unplanned pregnancy, and psychological distress and regret (PHAC, 2017). There is an increasing trend of negative sexual health outcomes among young adults in Canada: Rates of chlamydia and gonorrhoea are highest in Canadians under the age of 30 (PHAC, 2017). In 2014, young women aged 20 to 24 years had the highest rate of chlamydia infection with 2,151 reported cases per 100,000 population (PHAC, 2017). Young men aged 20 to 24 years had the highest chlamydia infection rates among males with 1,125 cases per 100,000 population. Between 2005 and 2014, the rate of reported chlamydia infection increased by 43% among Canadians aged 20-24. These outcomes are of significant concern: If left untreated, chlamydia and gonorrhea can lead to serious health consequences, especially in women, including pelvic inflammatory disease, ectopic pregnancy, and infertility (PHAC, 2011). Furthermore, studies have shown young adults who have been sexually pressured and who have exerted sexual pressure report more psychological distress, regret, sexual guilt, and reduced life satisfaction. Women are

particularly vulnerable to sexual coercion: O'Sullivan, Byers, Brotto, and Majerovich (2015) found 29.6% of young Canadians (38% female and 19% male) reported a history of sexual coercion.

1.2 Sexual Health Services

Effective prevention of STIs and other negative health consequences relies on regular condom use and early detection and treatment (Steen, Wi, Kamali, & Ndowa, 2009). As such, the provision of primary health care, including sexual health services, is critical for young adults. In Canada, primary health care services provide community-based care by promoting healthy lifestyles and preventing disease and injury, while recognizing the importance of the social determinants of health (Health Council of Canada, 2005). This holistic approach to health care delivery integrates all aspects of the individual, family, community, and/or population into care (Health Council of Canada, 2005). Sexual health services within the primary health care system include: prevention, care, and treatment of STIs, HIV/AIDS, reproductive tract infections, reproductive cancers; gynaecological exams; Papanicolaou (Pap) testing; pregnancy testing; and provision of contraception information.

Sexual health service utilization helps to decrease the risk of disease consequences, including the transmission of infection to others, and promotes healthy sexual behaviours (Rogstad, Ahmed-Jushuf, & Robinson, 2002). National guidelines are in place for routine screening of young adults for preventable sexual health outcomes. Canadian guidelines on STIs recommend screening all sexually active females under 25 years of age and males with risk factors, such as sexual contact with person(s) with known STI, a new sexual partner, or more than two sexual partners in the past year (Canadian Paediatric

Society, 2017; PHAC, 2009). Canadian guidelines also recommend that health care providers take an active approach and routinely offer HIV testing as part of routine care (PHAC, 2013). Recent updates to Canadian guidelines for cervical cancer screening do not recommend routine Pap tests for women until the age of 25, which differs from the previous recommendation of initiating routine screening at 21 years of age (Canadian Task Force on Preventive Health Care, 2013).

University health centres offer a range of targeted sexual health services for students to promote precautionary sexual health behaviours and prevent negative sexual health outcomes (Eisenberg, Lechner, Frerich, Lust, & Garcia, 2012). University sexual health services are seen as ideal 'health care homes' for students, as they provide timely, accessible, and convenient services for many students who are away from their primary care provider (Eisenberg et al., 2012). Studies have found that individuals who are actively engaged in their health and using primary health care services report better health outcomes (Hibbard & Greene, 2013; Shi & Shi, 2012). However, young adults, including university students, often delay or avoid seeking sexual health care (Bersamin, Fisher, Marcell, & Finan, 2017; Malek, Chang, Clark, & Cook, 2013; Moore, 2013). In the United States, only 27% of university students report having ever accessed sexual health services (Bersamin et al., 2017). Females report consistently higher rates of general health service use (Gahagan, Jason, & Leduc, 2012; Manos, Cui, MacDonald, Parker, & Dummer, 2014) and sexual health service use compared to males (Barth, Cook, Downs, Switzer, & Fischhoff, 2002; Trieu, Bratton, & Hopp Marshak, 2011).

The reasons for students' low rates of sexual health service use are not well understood. University students are known to be in a complex 'in between'

developmental stage where individual, interpersonal, and situational factors may impact their use of sexual health services. For instance, young adults are no longer adolescents and do not have to accept health treatments arranged by their parents. Treating young adults as adolescents underestimates their capacity for self-direction, self-reflection, and autonomous health decision-making regarding the use of sexual health services (Arnett, Žukauskienė, & Sugimura, 2014). Their independent use of health services is a sign of mature executive functioning, including judgment, impulse control, self-monitoring, and planning (Pharo, Sim, Graham, Gross, & Hayne, 2011). However, many young adults have not fully developed this level of executive functioning. Studies report low levels of perceived risk for negative sexual health consequences among young adults, which has been found to influence their decision to seek sexual health services (Barth et al., 2002; Moore, 2013). In addition to individual factors, a number of interpersonal and system-level factors also influence university students' use of sexual health services, including social stigma, accessibility of services, health care provider characteristics, and lack of parental supervision and guidance (Bersamin et al., 2017). To date, researchers have explored factors that influence the use of sexual health services primarily from the perspective of students. However, further research is needed to understand how university students' developmental stage, the university context, and health service characteristics merge to influence university students' use of sexual health services.

1.3 BEHAVIOUR CHANGE

Changing university students' behaviour for accessing sexual health services remains a complex challenge (Fromme et al., 2008; Malek et al., 2013; Moore, 2013), as previous studies report mixed intervention effectiveness for overcoming barriers to sexual

health service use (Bowden et al., 2008; Friedman et al., 2014; Miller & Nguyen, 2014; Walker et al., 2010). One possible factor contributing to these mixed findings is the lack of theory underlying the development of strategies to improve sexual health service use (McDonagh et al., 2017). There is a growing body of evidence that recommends the use of theory in the development of interventions aimed at changing behaviour (Bartholomew & Mullen, 2011; Davis, Campbell, Hildon, Hobbs, & Michie, 2015). Behaviour change theory allows for a greater understanding of the intrinsic and extrinsic factors that influence an individual's motivations for change (Michie, 2008; Michie, Johnston, Francis, Hardeman, & Eccles, 2008). Theory also helps to understand what works and what does not work for different contexts, populations, and behaviours (Michie, Atkins, & West, 2014). Further, the National Institute for Health and Care Excellence [NICE], 2004) found that STI prevention interventions are more likely to be effective if theoretical models are used in intervention development. Despite its benefits, the design, implementation, and evaluation of many sexual health promotion interventions has not been informed by theory (Cassidy, Bishop, & Curran, 2015; McDonagh et al., 2017).

Many behavioural theories and frameworks exist to guide intervention design (Michie, van Stralen, & West, 2011). The Behaviour Change Wheel (BCW) is a synthesis of 19 existing behaviour change frameworks that offers a comprehensive and systematic guide to intervention design (Michie, Atkins, & West, 2014). The BCW includes an analysis of the nature of the behaviour, the mechanisms that need to be addressed in order to create behaviour change, and the interventions and policies required to change those mechanisms (Michie et al., 2014). Studies have used the BCW to guide intervention design in a variety of health care settings, including smoking cessation (Gould et al.,

2017), condom use (Webster et al., 2016), and sexual counselling (Mc Sharry, Murphy, & Byrne, 2016). Research initiatives aimed at improving university students' use of sexual health services may benefit from using the BCW to guide intervention design.

1.4 Research Problem, Purpose and Significance

University students are in a complex transition phase where many students begin to experiment with risk-taking behaviours. Sexual experimentation and exploration are normal developmental processes in emerging adulthood. However, students' risky sexual behaviours are of concern, as they are among the age group (20-24) at highest risk for STIs, and yet, they report low rates of sexual health service use. The underlying complexities related to this issue are not well understood. We lack a clear understanding of how individual, interpersonal, and health service-level factors interconnect to influence university students' use of sexual health services. Given the increasing trend in negative health outcomes among university students, research initiatives are needed to: (a) Develop a comprehensive understanding of students' use of sexual health services, and (b) Design behaviour change interventions aimed at improving service use and health outcomes, and ultimately, the sexual health and well-being of university students.

The purpose of this research was to use the BCW to develop intervention strategies to address university undergraduate students' use of sexual health services at two Nova Scotia universities. A three-phased, sequential explanatory mixed methods design (quan→ QUAL → QUAL) (Creswell & Plano Clark, 2011) was used to address the primary research question: *How can behaviour change theory be used to guide the development of an intervention to improve university students' use of sexual health*

services? To address this overarching question, the following investigative questions were explored:

1. What are the rates of sexual health service use and predictors of sexual health service use/non-use among undergraduate students at two Nova Scotia universities?
2. What are the perceived barriers and enablers to sexual health service use among university undergraduate students, health care providers, and university administrators?
3. In what ways do the qualitative data related to the perceived barriers and facilitators to service use help to better explain the patterns of sexual health service use among university undergraduate students at two Nova Scotia universities?
4. What intervention components and/or strategies can be used by service providers, university decision makers, policy planners, and students to facilitate the use of sexual health services?

In exploring the research questions, this study addresses a number of significant issues for university students, health care providers, university administrators, and the sexual health and behaviour change research communities. First, the quantitative and qualitative methods employed in this research provide a more comprehensive understanding of the barriers and enablers to sexual health service. Second, the study of student, health care provider, and university administrator perspectives is important to ensure the intervention strategies address barriers and enablers to sexual health service use at the individual, interpersonal, and health service levels. Third, the application of the BCW to university student sexual health service use is novel and illustrates the relationship between students' capability, opportunity, and motivation to sexual health

service use. This provided a strong foundation for identifying theory- and evidence-based components for designing interventions to improve the uptake of sexual health services among university students.

The following chapter consists of a literature review on sexual health service use among university students and intervention design. The literature review is followed by four manuscripts. *Manuscript 1* (Chapter 3) outlines the protocol for this three-phased mixed methods study. *Manuscript 2* (Chapter 4) focuses on research question #1, including the rates and predictors of sexual health service use among university students at two Nova Scotia universities. Chapter 5 outlines how the results from Phase 1 informed data collection in Phase 2. *Manuscript 3* (Chapter 6) addresses research question #2 by describing the barriers and enablers to sexual health service use among university students from the perspective of students, health care providers, and university administrators. Chapter 7 provides more details on Phase 2 data analysis and integrates the quantitative and qualitative findings to address research question #3. *Manuscript 4* (Chapter 8) focuses on research questions #4 and builds on the previous two phases to identify intervention components. The final chapter summarizes the practice, policy and research implications of this study and offers recommendations for future research in the area of sexual health behaviour change and intervention design.

CHAPTER 2 LITERATURE REVIEW

The following chapter provides an overview of the literature on sexual health service use among university students. This literature review is divided into three sections: (1) Individual, interpersonal, and health service level factors that influence sexual health service use; (2) Interventions aimed at improving sexual health service use and other high-risk behaviours among university students; and (3) Use of behaviour change theory in intervention design. The search strategy for this literature review involved searching relevant electronic databases (Pubmed, CINAHL, PsycInfo), reference lists from key papers, and relevant grey literature sources (government websites, intervention databases, Google Scholar) (Appendix A). The database search strategy included a combination of MeSH headings and keyword searches that were applied using the Boolean operators "AND" and "OR". A date range of 1995-2018 and an English language limit were also applied on each database search to identify relevant literature. Due to the paucity of published Canadian literature on this topic, the review included literature from the United States, Australia, United Kingdom, and European countries. Further, there were few studies that examined the university or college student population specifically; as a result, relevant literature on the broader population of young adults was also included in the review. This narrative review was conducted as a first step at synthesizing the literature on university students' use of sexual health services. Future work is needed to conduct a rigorous systematic review on factors influencing sexual health service use and the effectiveness of sexual health service interventions to improve sexual health service use.

2.1 FACTORS THAT INFLUENCE SEXUAL HEALTH SERVICE USE

Factors at multiple conceptual levels (i.e., individual, interpersonal, and health service) influence university students' use of sexual health services. This section highlights how these factors can act as both barriers and/or enablers to sexual health service utilization.

2.1.1 Individual-Level Factors

There is an extensive body of literature that has used cross-sectional study designs to identify demographic, behavioural, and psychosocial factors associated with sexual health service use among university students and young adults. A summary of the literature on demographic and behavioural variables and sexual health service use is outlined in Table 2-1 and is followed by a discussion of psychosocial factors. These studies provide a valuable description of students that are more likely to access sexual health services; however, due to the cross-sectional design, it is not possible to determine causality. Further investigation beyond descriptive study designs is needed to understand how or why these factors impact sexual health service use.

Table 2-1. Demographic and behavioural factors associated with sexual health service use from the literature.

Factors	Study findings	Population	Authors
Age	Older students are more likely to be tested for STIs/HIV than young students	University students	(Cragg, 2014; Llewellyn, Sakal, Lagarde, Pollard, & Miners, 2013)
	There is no relationship between age and STI/HIV testing behaviour	University students	(Moore, 2013)
Sex and Gender	Females are more likely to be tested for STIs/HIV than males	University students and young adults	(Caldeira, Singer, O'Grady, Vincent, & Arria, 2012; Cragg, 2014;

Factors	Study findings	Population	Authors
			Fortenberry et al., 2002; Moore, 2013)
	Female students are more likely to receive reproductive health care	University students	(Bersamin, Fisher, Marcell, & Finan, 2017)
Ethnicity	Blacks are more likely to be tested for STIs/HIV than other racial groups	University students	(Moore, 2013; Thomas et al., 2008)
	Aboriginal students are more likely to report any lifetime testing for pregnancy and STIs	University students	(K. Wilson, Steenbeek, Asbridge, Cragg, & Langille, 2015)
Sexual Orientation	Heterosexual students are more likely to be tested for STIs/HIV than non-heterosexuals	University students and young adults	(Diamant, Wold, Spritzer, & Gelberg, 2000; Kerr, Ding, & Thompson, 2013)
Year of Post-Secondary Education	Younger students are less likely to be tested for STIs/HIV	University students	(Cragg, 2014)
Age of Sexual Debut	Younger age of sexual debut is associated with greater likelihood of STI/HIV testing	University students and young adults	(Cayetano, 2010; Oliver de Visser & O'Neill, 2013)
Alcohol and Drug Use	Greater alcohol and other drug use is associated with greater likelihood of STI/HIV testing	University students and young adults	(Cayetano, 2010)
Sexual partners	STI testing is significantly associated with a greater number of sexual partners	University students and young adults	(Cayetano, 2010)

2.1.1.1 Knowledge

It is often assumed that knowledge drives behaviour; however, studies have found that knowledge alone does not lead to changes in behaviour, such as healthy eating, physical activity, and condom use (Cook & Bellis, 2001; Happell, Stanton, Hoey, & Scott, 2014; Mnguni, Abrie, & Ebersohn, 2015). Findings on the relationship between knowledge and sexual health service use are also mixed. Some studies have found sexual health knowledge to be a statistically significant predictor of intention to get tested for STIs and actual STI testing behaviour (Cragg, 2014; Greaves et al., 2009), while other studies report no association between knowledge and sexual health service use (Wolfers et al., 2010). Further research is needed to understand the impact of knowledge on sexual health promotion behaviours. While information and education alone does not always lead to behaviour change, knowledge may be an important determinant that interacts with other factors to influence sexual health service use (Cook & Bellis, 2001; Corace & Garber, 2014; Happell et al., 2014; Kelly & Barker, 2016).

2.1.1.2 Risk Perceptions

Risk-taking in emerging adulthood is a combination of heightened stimulation seeking and an immature self-regulatory system that is not yet able to control reward-seeking impulses (Steinberg, 2004). This heightened risk-taking period is normal, biologically driven, and inevitable; however, it may lead to impaired risk perceptions and negative outcomes in certain circumstances (Steinberg, 2004). Risk perceptions are an important component to university students' sexual health care decision-making processes. Perceived risk is defined as, "the subjective assessment of the probability of a specified type of accident happening and how concerned we are with the consequences"

(Sjöberg, Moen, & Rundmo, 2004, p. 8). It involves a complex process that goes beyond the individual's subjective evaluation of the probability of consequences. Perceived risk reflects a variety of factors, including the context in which the risk information is presented, the way risk is described, as well as personal and cultural characteristics and experiences (Sjöberg et al., 2004; Van der Pligt, 1998).

Many public health campaigns use risk communication strategies to target young adults' risk perceptions. These strategies assume that youth receive and interpret risk information in a logical fashion and change their behaviour in order to reduce their risk of negative outcomes (Cook & Bellis, 2001). However, similar to the relationship between knowledge and behaviour, communicating risk alone does not always lead to change in sexual health behaviour (Cook & Bellis, 2001). Studies have found that young adults and university students underestimate their risk for experiencing negative sexual health outcomes, which decreases their likelihood of accessing sexual health services (Balfe & Brugha, 2010; Moore, 2013; Oliver de Visser & O'Neill, 2013; Wolfers et al., 2010). Young adults' perceived risk of negative sexual health outcomes is influenced by characteristics of the sexual partner (e.g., identity, reputation, sexual history, histories of testing and drug use) and specific activities that may occur during sexual encounters, such as alcohol, drugs, condom use, and ejaculation (Barth et al., 2002). Using a mixed methods design, Oliver de Visser and O'Neill (2013) found greater perceived risk of STIs to be a significant predictor of STI testing among young adults aged 17 to 25 years. The authors also interviewed participants and found that young adults do not access STI testing services because they do not feel at risk of contracting an illness (Oliver de Visser & O'Neill, 2013). Students' underestimated risk of negative health outcomes may be

explained by the absence of symptoms in many STI cases. Some students do not access sexual health services because they perceive STIs to not be a serious medical condition or they prefer to wait until they have severe symptoms (Barth et al., 2002; Hook et al., 1997). This is concerning, considering many illnesses begin asymptomatically but can have serious long-term health consequences (PHAC, 2017).

University students' extent of perceived behavioural control may help to mitigate the challenges associated with risk perceptions (Duffett-Leger, Letourneau, & Croll, 2008; Hermans, 2010). Perceived behavioural control is defined as the degree to which an individual believes they have control over the behaviour (Ajzen, 1991; Conner & Norman, 2008). An Australian study of young adults found perceived behavioural control to be positively associated with STI testing behaviour (Hermans, 2010). Similarly, in a Canadian study of female university students' intentions to be screened for cervical cancer, Duffett-Leger, Letourneau, and Croll (2008) found perceived behavioural control, including perceptions about personal resources and barriers to receiving a Pap test, to be positively associated with intentions to be screened.

This extensive body of literature emphasizes the important role of students' risk perceptions on sexual health service use during the emerging adulthood developmental stage. Perceived risk, perceived vulnerability to illness, and perceived behavioural control work together to influence sexual health service use. Further research efforts are needed to understand how to effectively target university students' risk perceptions to improve their use of sexual health services.

2.1.2 Interpersonal Factors

The social and environmental context in which individuals live, work, and play can impact sexual health behaviours (World Health Organization, 2010). The following section explores the influence of social networks and the environment on university students' use of sexual health services.

2.1.2.1 Perceived Norms and Stigma

It is clear that peers are influential in shaping students' sexual health beliefs and behaviour (Wolfers et al., 2010): Peers are important sources of information for youth and they often mimic each other's behaviour (Garcia, Lechner, Frerich, Lust, & Eisenberg, 2014; Wolfers et al., 2010). Perceived norms, defined as perceptions about others' beliefs and behaviours, have been found to influence young adults' use of sexual health services (Buhi & Goodson, 2007; Cerwonka, Isbell, & Hansen, 2000). Perceived norms are comprised of two interrelated ideas: injunctive norms, which represent perceived approval of the peer group in relation the behaviour, and descriptive norms, which refer to the perception of peers' actual behaviour (Borsari & Carey, 2003). Oliver de Visser and O'Neill (2013) found injunctive and descriptive norms to be an enabler to sexual health service use: Young adults were more likely to be tested for STIs if they believed their peers were tested too. Contrarily, when individuals perceive that their peers do not access sexual health services, perceived norms decrease the likelihood of STI testing and Pap testing among young adults and university students (Duffett-Leger et al., 2008; Oliver de Visser & O'Neill, 2013; Wolfers et al., 2010).

Stigma plays a critical role in the relationship between perceived norms and sexual health service use among university students (Barth et al., 2002). Studies have

found that stigma related to STIs and STI-testing directly influence young adults' decision to seek sexual health services (Bersamin et al., 2017; Fortenberry et al., 2002). University students and young adults often reject STI testing because they are concerned with being judged by others (Balfe & Brugha, 2010; Barth et al., 2002; Bersamin et al., 2017; Oliver de Visser & O'Neill, 2013). In a qualitative study with college students, Barth et al. (2002) found that students believed they would be perceived as 'loose, dirty, stupid, irresponsible, or not caring about yourself' if they were to seek STI testing. Further, Balfe and Brugha (2010) found that young women believed that the stigma associated with having an STI outweighed any potential benefits that came from having an STI test. The stigma associated with sexual health services can lead to negative personal emotions among young adults and university students. Feelings of shame, embarrassment, and fear are most often reported (Bender & Fulbright, 2013; Fortenberry et al., 2002; Oliver de Visser & O'Neill, 2013). Students fear being seen at a clinic by their peers and having their anonymity compromised (Donnelly, 2000; Hermans, 2010). Moreover, studies report fear and uncertainty in anticipation of the services provided, (Bender & Fulbright, 2013; Donnelly, 2000) fear of receiving a positive test (Barth et al., 2002; Wolfers et al., 2010), fear of the test itself, and fear that their future may be affected (Barth et al., 2002). Further research is needed to understand how to leverage the influence of peers and address sexual health stigma and fear to promote healthy sexual behaviours among university students.

2.1.2.2 University Environmental Context

As previously described, the unique environmental context of universities and the university experience differentiates university students from young adults not in

university. The campus culture and social influences foster risky activities, including alcohol and drug use among students and their peers (Stinson, 2010). Studies have shown that engaging in such activities can also lead to risky sexual behaviours, including casual sex, or 'hooking up', which is a prominent occurrence on university campuses (Garcia, Reiber, Massey, & Merriwether, 2012; Paul & Hayes, 2002). Studies examining the hook-up culture have found that for the majority of students, alcohol was involved in their most recent casual sex encounter (Downing-Matibag & Geisinger, 2009; Fielder, Walsh, Carey, & Carey, 2014). The relationship between the university campus environment and sexual health service use has not yet been explored. Further research is needed to understand the influence of campus culture on sexual health promotion behaviours.

2.1.3 Service-Level Factors

Service-level factors, including characteristics of health care providers and perceptions of staff, can help or hinder sexual health service use among university students and young adults. Young people's decision to access sexual health services or return for care is strongly influenced by health care providers' attitudes (Carroll, Lloyd-Jones, Cooke, & Owen, 2012). Students are more likely to access a service if they consider their health care provider to be personable, welcoming, understanding, nonjudgmental, and empathetic (Balfe & Brugha, 2010; Garcia et al., 2014). Further, young adults' willingness to return to sexual health services is influenced by their familiarity and relationship with their health care providers. University students value health care providers' sexual health knowledge and expertise and prefer to receive care from providers that are specialists on the subject (Barth et al., 2002; Garcia et al., 2014;

Llewellyn et al., 2013). In one of the few studies that examined sexual health services from the perspective of health care providers, Masaro, Johnson, Chabot, and Shoveller (2012) found that when clinicians feel knowledgeable and skilled in providing sexual health care, they are able to build a more trusting relationship with their patients.

Characteristics of the services, including the policies and structure of service delivery, have shown to influence sexual health service use (Bender & Fulbright, 2013; Buzi & Smith, 2014; Carroll et al., 2012; Eisenberg, Garcia, Frerich, Lechner, & Lust, 2012). Accessibility is critical for service users; without accessible services, any efforts to improve students' use will fall short (Carroll et al., 2012). Students stress the importance of convenient service hours that work around their school schedule, including more frequent opening times during lunch and in the evenings (Buzi & Smith, 2014; Eisenberg, Garcia, et al., 2012). Further, young adults are more likely to access services in a convenient and accessible location that has secure confidentiality and privacy measures in place (Carroll et al., 2012). Young adults value a clinic that provides multiple health services, so they can access care without being identified by peers as seeking sexual health-related services (Barth et al., 2002; Johnston et al., 2015). Similarly, they prefer services that are located away from a highly visible public area to avoid being seen by someone they know (Bender & Fulbright, 2013; Carroll et al., 2012). While strong privacy and confidentiality measures facilitate the use of sexual health service use, their absence can be a significant barrier to access among university students (Barth et al., 2002; Buzi & Smith, 2014; Eisenberg, Garcia, et al., 2012; Wolfers et al., 2010).

The components of sexual health services can also influence students' use of sexual health services (Barth et al., 2002; Llewellyn et al., 2013). From a systematic

review of young people's reasons for the use and non-use of sexual health services, Carroll et al. (2012) found that young people value the following two components of services the most: making contraception available and providing information and advice. These findings highlight the need for a holistic approach to sexual health care that moves beyond diagnosis and treatment of illness. Further, some studies have explored student preferences for method of testing (Fielder, Carey, & Carey, 2013; Shoveller et al., 2009). First-year college students preferred self-collected vaginal swabs over other STI-testing methods (Fielder et al., 2013). In contrast, Shoveller et al. (2009) found that young male participants in British Columbia avoided STI testing because they feared the urethral swab and were unaware of other methods such as a urine specimen. These studies indicate that sexual health service policies and protocols can influence students' use of such services.

Overall, it is clear that service-related factors play an important role for university students' use of sexual health services. However, to date, these factors have been examined predominantly from the perspective of university students and young adults. The perspective of health care providers and administrators on service-level barriers and enablers has not yet been explored in detail.

2.1.4 Summary of Factors That Influence Sexual Health Service Use

There are several strengths and limitations to the existing literature on the factors that influence sexual health service use among university students. First, the majority of research has focused on the impact of individual-level factors on university students' sexual health care-seeking intentions and behaviours. The impact of specific emerging adulthood and university environment complexities on students' use of sexual health

services has not been explicitly discussed in the literature. More recently, researchers have started to explore how normal transition-to-adulthood complexities influence risk-taking behaviour, such as smoking, alcohol and drug use (Allem, Forster, Neiberger, & Unger, 2015; Allem, Lisha, Soto, Baezconde-Garbanati, & Unger, 2013). Although these studies focused on smoking, alcohol, and drug use, a similar approach is needed to advance sexual health research with this population. Moving forward, research is needed to understand the emerging adulthood complexities that occur for university students and how these complexities impact their sexual health service use.

Second, there is a paucity of literature focused on the university student population. Although some of the findings from non-university specific populations may be transferable to this population, variance is expected. Non-university students are not embedded in the campus environment and, as a result, do not have to adjust to the complexities of emerging adulthood and the university experience in tandem.

Third, additional research is needed to take into account the perspective of health care providers, administrators, and decision makers to understand the service-level barriers and enablers to sexual health service use. Furthermore, although important descriptive and exploratory research has been conducted at multiple conceptual levels, it is unclear how the barriers and enablers intersect to influence sexual health service use.

Fourth, the majority of these studies provide valuable insights into factors associated with STI/HIV testing among university students; however, there is a dearth of literature on other sexual health services, such as cervical cancer screening, contraception provision, and sexual health counselling. The predominant focus on STI testing is likely because this population is at high risk for STIs. However, when taking a comprehensive

primary health care approach to sexual health service delivery, it is important to move beyond the negative sexual health outcomes and consider all health promotion initiatives.

Fifth, there are very few Canadian-based studies that have examined this area of sexual health behaviour. The majority of research has been conducted in the United States and United Kingdom. Canada is a multicultural country with distinct health and social policies that differ from other countries. For example, Canada has a lower legal drinking age than the United States, which means students can purchase and consume alcohol in their first or second year of university. As previously described, binge drinking is significantly associated with risky sexual behaviours. As such, Canadian-specific research is needed these understand context-related barriers and enablers to sexual health service use.

Lastly, the majority of the studies described above use a cross-sectional research design. These studies provide valuable descriptive and correlational data; however, additional research designs are needed to answer questions such as: How and why are these factors impacting sexual health service use? How can we use these findings to change behaviour? What interventions are effective at changing sexual health service use? A comprehensive approach that combines quantitative and qualitative methods is needed to answer these questions and advance sexual health care for university students.

2.2 Sexual Health Service Interventions

To date, there has been limited success with increasing sexual health service use among university students. The few sexual health service interventions tailored to the university student population are discussed below. Due to the paucity of literature on this population, research with non-university student populations is also explored to develop

an understanding of current sexual health service intervention research efforts. Further, interventions targeting other high-risk behaviours of university students are examined to identify effective intervention components for this population.

2.2.1 Sexual Health Service Interventions with University Students

Few studies have tested the effectiveness of interventions for improving university students' use of sexual health services. In the Netherlands, Wolfers, Kok, Looman, de Zwart, and Mackenbach (2011) conducted a cluster-randomized control study with 24 vocational schools to determine the effects of health education and school-based sexual health services on STI testing among students aged 16 to 25 (Wolfers et al. 2012). The intervention included an in-class movie, an interactive internet activity, and sexual health services available on campus. Combining health education with accessible sexual health services had a significant positive effect on the uptake of STI testing among students compared to the control group (OR= 4.25, $p < 0.05$).

There have also been very few non-experimental program evaluations conducted with the university student population. Anderson, Eastman-Mueller, Henderson, and Even (2015) conducted a program evaluation of the STI testing campaign titled "Man-Up Monday" where STI testing events were conducted on five consecutive Mondays to increase awareness of sexual health and STI testing and motivate students to get tested. This study had no comparison group to determine the effectiveness of the intervention on improving STI testing. Further, the authors did not evaluate students', health care providers', or administrators' perceptions of the program. These insights would make a valuable contribution to our understanding of important components of sexual health service interventions.

2.2.2 Sexual Health Service Interventions with Non-University Students

There is a more substantial body of literature on experimental and program evaluation studies with young adults. These studies evaluate sexual health service interventions that target individual patients, health care providers, and health service delivery. While not specific to university students, the research designs, methods, and findings will help to inform future intervention design for the university student population.

2.2.2.1 Individual-Level Interventions

Many sexual health service interventions target specific high-risk groups of young adults; however, they have had mixed success at improving rates of sexual health service use (Baird & Merchant, 2014; Friedman et al., 2014). For example, Baird and Merchant (2014) conducted a randomized controlled trial to determine the effectiveness of an intervention aimed at increasing STI testing among young adult female emergency department patients. They recruited female patients (aged 19 to 25 years) who reported having sex with males but were not at the emergency department for STI-related concerns. The intervention group that received a brief educational intervention that focused on the women's perceived risk for STIs did not significantly increase their acceptance of testing in comparison to the control group. Further, Friedman et al. (2014) documented the outcomes of an STI campaign in the United States, known as "Get Yourself Tested". Nine programs promoted chlamydia screening and treatment to sexually active women aged 15 to 25 and their partners with accessible, free or low cost sexual health services. Services were provided through community centres, high schools and colleges, community and clinic events, online or text-based ordering or test kits, and

community pickup locations. All but one site reported increases in the number of persons being tested during the campaign compared to baseline. Although increased testing rates were reported, the uncontrolled before and after study design may have led to overestimated intervention effects (Eccles, Grimshaw, Campbell & Ramsay, 2003).

2.2.2.2 Web-Based Interventions

As technology continues to evolve, innovative digital and web-based interventions have been developed to facilitate sexual health service use. Brown, Newby, Caley, Danahay and Kehal (2016) tested a digital media intervention (website and app) aimed at improving sexual health service access among youth. Using a pre-post intervention design, the intervention was tested with 148 respondents. The authors reported significant improvement in beliefs related to service access (i.e., service access being important and normal) among females, and a significant increase in the behaviour of visiting sexual health services among males. Furthermore, Mevissen, Ruiter, Meertens, Zimbile, and Schaalma (2011) tested the effectiveness of a web-based intervention that targeted the following behavioural determinants: STI risk perception; attitudes, normative beliefs, self-efficacy, and skills towards maintenance of condom use within a current relationship; and STI-testing behaviours. It was compared against a non-tailored intervention and a control group. The tailored intervention group reported greater intentions to talk with their partner about taking an STI test than those in the non-tailored group and the control group. However, the intervention had no significant effect on the number of STI-testing appointments and STI-testing behaviour (Mevissen et al., 2011).

Some web-based interventions leverage peer influence to enhance young adults' sexual health promotion behaviours. Peer referral programs, where patients reach out to

peers to get tested for STIs, have been shown to increase rates of STI testing (Levine, McCright, Dobkin, Woodruff, & Klausner, 2008; Theunissen et al., 2015). More recently, researchers have examined the effects of social media interventions on increasing STI testing. From a scoping literature review, Gabarron and Wynn (2016) identified 51 studies on the use of social media for sexual health promotion. The majority of these studies employed a non-experimental design and Facebook as a means to target youth or young adults to promote STI testing behaviours. One quarter of the studies reported promising results from social media interventions; however, only four were able to report intervention effectiveness. While there is some evidence to support the use of social media interventions, Gabarron and Wynn (2016) recommend additional theory-based studies with stronger research designs to advance our understanding of social media interventions for sexual health promotion.

2.2.2.3 Service and Provider-Level Interventions

Service and provider-level interventions have also been shown to improve sexual health service use. Taylor, Frasure-Williams, Burnett, and Park (2016) conducted a systematic review and comparative analysis of service and provider-level interventions to improve STI screening rates in clinic-based settings. Intervention effectiveness was categorized by: highly effective, moderately effective, and not effective. Structural service-level interventions, including strategic placement of specimen collection materials or automatic collective of urine or blood as part of routine visit, were found to be highly effective interventions for improving STI screening. Further, at the provider-level, seven studies implemented electronic health record reminders for health care providers to screen patients: Three interventions were highly effective and four were

moderately effective. Six educational interventions aimed at the provider (e.g., continuing medical education modules, meetings, simulation videos, workshops, resources packages, guidelines updates) showed moderate effectiveness (n=2) or no effectiveness (n=4). Depending on their feasibility for implementation, these initiatives may be useful in a university health centre environment to target health care providers.

2.2.3 High-Risk Behaviour Interventions with University Students

Due to the paucity of sexual health service intervention research with the university student population, the following section reviews components of other high-risk behaviour interventions with this population. There has been extensive alcohol consumption research with university students since binge drinking is common across university campuses (Statistics Canada, 2010). The majority of these interventions target individual-level factors, including knowledge, self-efficacy, and readiness to change, in an effort to change drinking behaviours (i.e., quantity of alcohol and frequency of alcohol consumption) (Carey, Scott-Sheldon, Elliott, Garey, & Carey, 2012; Kypri, Vater, Bowe, et al., 2014; Voogt, Poelen, Kleinjan, Lemmers, & Engels, 2013). These interventions have had mixed success at reducing alcohol consumption. For example, the "What Do You Drink" intervention used motivational interviewing principles to address heavy drinking behaviours and was not effective at reducing alcohol consumption among heavy drinking students (N=913) in the Netherlands (Voogt et al., 2013). Similarly, Kypri et al. (2014) found no significant reductions in the frequency or volume of drinking or academic problems among a sample (N=3,422) of university students in the Netherlands following a 10-minute personalized feedback intervention. Contrarily, a meta-analysis of 62 individual-level interventions to reduce college student drinking found that students

who received risk reduction interventions engaged in significantly less heavy drinking behaviour (Carey et al., 2012). It is not clear why some of these alcohol-reduction interventions yielded significant intervention effects while others did not. There may be specific intervention components that have had greater success with university students; however, these findings are not well articulated in the literature.

Some alcohol reduction interventions target interpersonal-level factors, such as perceived social norms, in an effort to decrease high-risk drinking behaviours. For example, Ridout and Campbell (2014) used Facebook to deliver a social norms intervention to reduce heavy drinking among a sample of 244 university students. The intervention targeted alcohol consumption behaviours as well as descriptive and injunctive norms and led to significant reductions in quantity and frequency of alcohol consumption at one and three-month post intervention. Additionally, students' perceived drinking norms were significantly more accurate at the three-month post intervention follow-up. This intervention may have had greater success because it targeted multiple system levels (individual and interpersonal). Further research is needed to determine if a targeted, multi-component intervention could have similar implications for university students and their use of sexual health services.

At the provider-level, Fleming et al. (2010) tested an intervention with primary care physicians at five college health centres in an effort to decrease risky drinking behaviours among college students. The intervention consisted of two 15-minute counselling visits and two follow-up phone call with the student's primary care physician. Fleming et al. (2010) found a statistical significant difference in favour of the brief-intervention group in 28-day drinking totals among the sample of college students

(N=986). This provider-level approach to changing university students' behaviour may also be useful for designing sexual health service interventions.

2.2.4 Summary of Intervention Research

Overall, there is a paucity of sexual health service intervention literature related to university students. One comprehensive study was conducted with a sample of vocational students, which is the most similar population to university students that has been studied to date (Wolfers et al. 2010, 2012). The authors describe important findings related to sexual health service interventions that could be translated to the university student population, including the influence of perceived norms and characteristics of the health centre; however, they do not take into account complexities that are unique to the emerging adult developmental stage and university environmental context (Wolfers et al., 2012). Other studies with non-university student populations highlight different types of sexual health service interventions and modes of service delivery. These interventions have found mixed success at improving sexual health service use. Similarly, the alcohol reduction literature with the university student population highlights some promising features of health behaviour interventions (i.e., targeting multiple conceptual levels). From this review, it is clear that there is no one-size-fits-all sexual health service intervention that can easily be translated to the university student population. Further research is needed to develop and test sexual health service interventions that take into account the multi-level factors that influence university students' sexual health promotion behaviours.

2.3 Behaviour Change Theory and Intervention Design

It is well understood that individuals contribute to their own health and well-being by adopting healthy behaviours (e.g., healthy eating, physical activity, condom use, STI testing) and avoiding health-compromising behaviours (e.g., smoking, unprotected sexual intercourse) (Conner & Norman, 2008; Glanz, Rimer, & Viswanath, 2008). As human behaviour is inherently complex, health behaviour change theories, models, and frameworks are helpful to examine why some individuals engage in certain health behaviours, while others do not (Conner & Norman, 2008). Further, theory allows for a better understanding of what works in an intervention across different contexts, populations, and behaviours (Michie, 2008). Evidence suggests that interventions are more likely to be effective if theory is used in the intervention development stage (Michie, 2008; Painter, Borba, Hynes, Mays, & Glanz, 2008; Webb, Joseph, Yardley, & Michie, 2010).

In the sexual health literature, health behaviour theories are used to help explain and predict sexual health behaviours (Albarracín et al., 2005; Batista Ferrer, Audrey, Trotter, & Hickman, 2015; Cassidy et al., 2015). Many researchers have used theory to select theoretical constructs that may be predictors of sexual health service use. For instance, the Socio-Ecological Model, Theory of Planned Behaviour and Health Belief Model have been used to explain STI testing behaviours among young adults (Barth et al., 2002; Cayetano, 2010; Eisenberg, Garcia, et al., 2012; Oliver de Visser & O'Neill, 2013; Wolfers et al., 2010). Some studies have used theory as a guide for selecting behavioural determinants to target with interventions (Baird & Merchant, 2014; Barak & Fisher, 2003; Friedman et al., 2014; Mevissen et al., 2011). For example, in the "Get

Yourself Tested" campaign, Friedman et al. (2014) targeted key constructs from the Health Belief Model and Theory of Planned Behaviour to increase awareness of STIs and perceived risk, reduce STI testing-related fear, and frame STI testing as a normal part of sexually active peoples' lives.

From a systematic review, NICE (2004) found that STI prevention interventions are more likely to be effective if theoretical models are used in the development stage. However, few researchers have used theory as a framework for designing and evaluating sexual health service interventions for young adults (Newby et al., 2017; Theunissen et al., 2013; Wolfers, de Zwart, & Kok, 2012). For example, Wolfers, de Zwart, and Kok (2012) conducted a comprehensive mixed methods sexual health intervention design study for vocational school students in The Netherlands. They followed an intervention mapping protocol (Eldredge et al., 2016) to design the 'ROsafe' intervention. First, they conducted a needs assessment with vocational school students to determine the behavioural determinants of STI testing among this population. Second, they translated the needs assessment data into one desired behavioural outcome: taking an STI test after unsafe intercourse and before having unprotected intercourse within a steady relationship. Third, the authors created a matrix of behaviour change objectives that mapped behavioural outcomes onto specific actions. Fourth, they selected theoretical models and practical strategies and linked them to specific behaviour change objectives. Lastly, the authors consulted teachers, public health nurses, health educators, and students to develop the program and materials. Throughout the entire intervention design process, Wolfers et al. (2012) involved key stakeholders to plan for adoption and implementation into practice and program evaluation. This comprehensive theoretical approach to intervention

design and implementation led to a significant positive effect on the uptake of STI testing among students compared to the control group (OR=4.3, $p<0.05$).

2.3.1 Behaviour Change Wheel

Many models and theories exist to guide the development of behaviour change interventions. Michie et al. (2011) conducted a systematic review of 19 behaviour change frameworks with theoretical constructs that help to explain and predict health behaviours. The 19 frameworks were evaluated against three criteria: comprehensiveness, coherence, and a clear link to an overarching model of behaviour. Michie et al. (2011) found that each model focused on different behavioural determinants (e.g., beliefs and perceptions, unconscious biases, social environment). While these determinants are important to understanding behaviour and designing interventions, none of the traditional behaviour change frameworks offered a coherent and comprehensive model. This makes it difficult for researchers to choose the most appropriate theory to address their research question. As a result, Michie et al. (2011) synthesized the 19 frameworks and developed a comprehensive and pragmatic framework for intervention design, known as the Behaviour Change Wheel (BCW) (Figure 2-1).

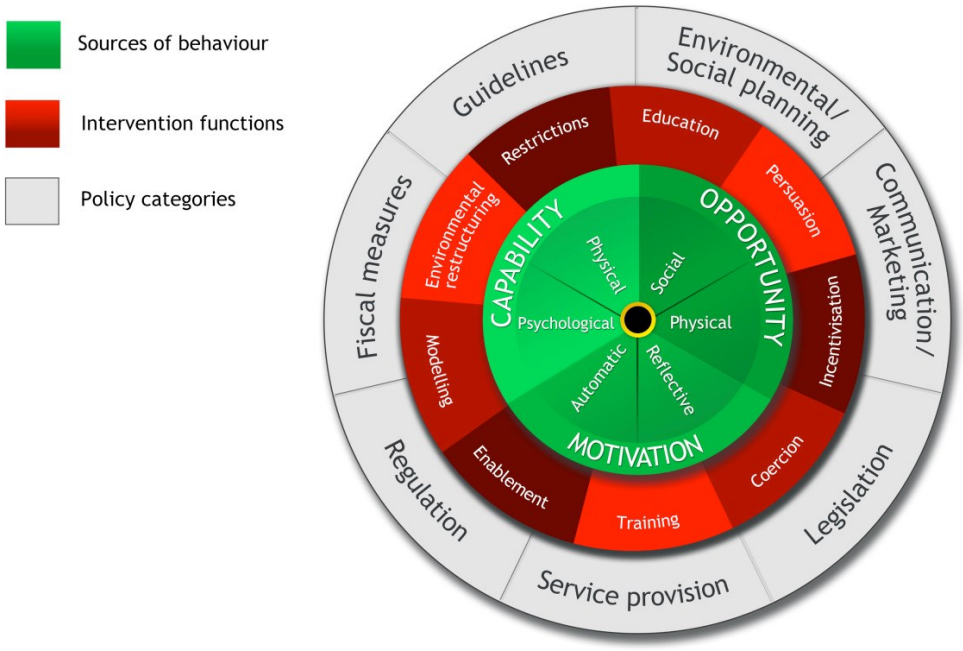

Figure 2-1. Behaviour Change Wheel (Michie et al., 2014).

The BCW is a comprehensive guide for designing behaviour change interventions. A model of health behaviour, known as COM-B, is at the core of the BCW. The COM-B model assumes that behaviour occurs as an interaction between three conditions: Capability (psychological or physical ability to perform the behaviour); Opportunity (physical and social environment that enables the behaviour); and Motivation (reflective and automatic mechanisms that activate or inhibit behaviour). The BCW also includes numerous intervention options and policy considerations, as outlined by the two outer rings of the wheel. The BCW follows a three-stage process to intervention design: 1. Understand the behaviour, 2. Identify intervention options, and 3. Identify components and implementation options (Michie et al., 2014).

2.3.1.1 Stage 1: Understand the Behaviour

The first stage includes a behavioural analysis, which aims to understand the target behaviour in as much detail as possible. The COM-B model is used in the behavioural analysis to help understand the behaviour in the context in which it occurs (Michie et al., 2014). The COM-B model can be further expanded into 14 domains by using the Theoretical Domains Framework (TDF) (Michie et al., 2014). The TDF is a framework for behaviour change that integrates 33 behaviour change theories and 128 explanatory constructs into an accessible structure of 14 theoretical domains (knowledge; skills; memory, attention, and decision processes; behavioural regulation; social/professional role and identity; beliefs about capabilities; optimism; beliefs about consequences; environmental context and resources; social influences; emotion; intentions; goal; reinforcement) (Cane, O'Connor, & Michie, 2012). Figure 2-2 illustrates how the 14 TDF domains relate to the three COM-B components (Michie et al., 2014).

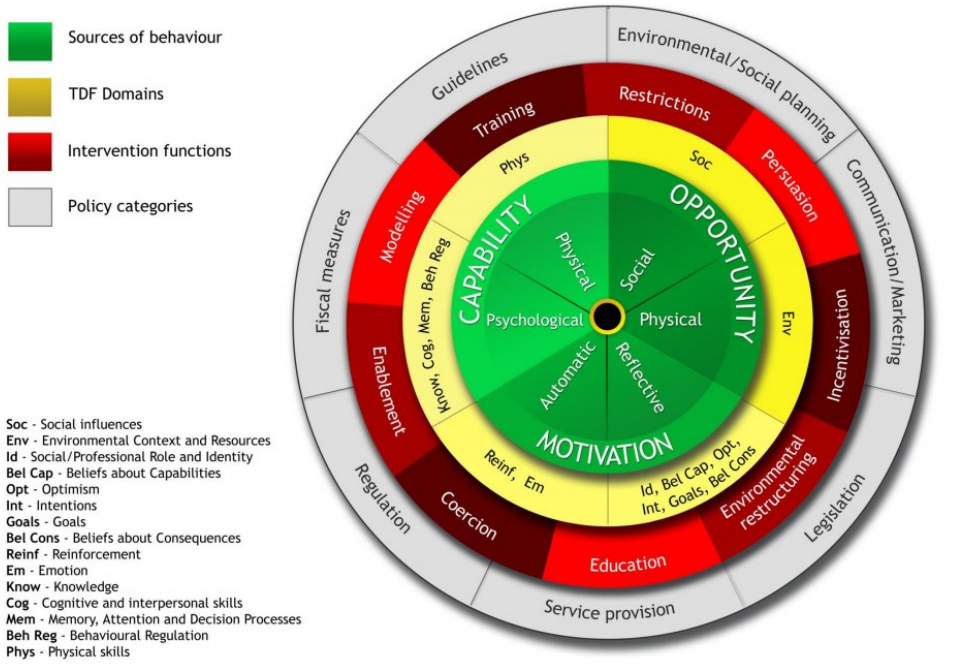

Figure 2-2. BCW with the Theoretical Domains Framework (Michie et al., 2014).

2.3.1.2 Stage 2: Identify Intervention Options

In Stage 2, the BCW outlines which intervention functions and policies are likely to be effective in changing the target behaviour. A matrix is used to map the COM-B model with nine intervention functions and seven policy categories that would support the delivery of the intervention (Michie et al., 2014). The APEASE criteria are used in this stage to ensure the intervention functions and policy categories are: Affordable, Practical, Effective/cost-effective, Acceptable, Safe, and Equitable (Michie et al., 2014).

2.3.1.3 Stage 3: Identify Content and Implementation Options

In the final stage, the BCW identifies intervention content, including behaviour change techniques (BCTs), that would best serve the intervention functions and modes of intervention delivery (Michie et al., 2014). BCTs are the active ingredients in an intervention that have the potential to change behaviour (e.g., goal setting, self-

monitoring of behaviour) (Michie et al., 2011). In this stage, the intervention functions identified in stage 2 are linked with appropriate BCTs using existing guidance from the BCW. Lastly, the APEASE criteria are used to identify the most appropriate and feasible modes to deliver the intervention components (e.g., workshop, pamphlets, website).

2.3.1.4 Strengths and Limitations of the BCW for Sexual Health Service Intervention Design

The BCW offers a number of strengths for developing an intervention to improve sexual health service use among university students. First, the BCW is a synthesis of 19 existing behaviour change models and incorporates a range of important behavioural determinants that may influence sexual health service use including, including beliefs and perceptions, unconscious biases and motivation, and the environment (Michie et al., 2014). Second, the BCW takes into consideration a wide range of factors at multiple conceptual levels (i.e., individual, interpersonal, system level) (Michie et al., 2014). As outlined in this literature review, there are numerous multi-level factors that influence university students' use of sexual health services. It will be important to address these factors when designing behaviour change interventions. Third, contrary to other models of health behaviour, the BCW goes beyond explaining and predicting sexual health behaviour and provides a systematic way to design sexual health interventions based on a detailed analysis of the behaviour (Michie et al., 2014). Lastly, the BCW has been used successfully in sexual health research, including the design of a condom use intervention for heterosexual young males (Bailey et al., 2015; Webster et al., 2016). The BCW provides a robust individual-level examination of behavioural determinants and behaviour change techniques. However, while context and system-level BCTs are included the BCW, it does not go into as much detail on organizational-level

determinants as some other frameworks (Atkins et al., 2017). Further, the BCW promotes a deductive qualitative analysis approach that may limit the researcher to only coding utterances that are within the COM-B components and TDF domains. This can lead to a restriction of the themes within the framework (Smits et al., 2018). Despite these limitations, due to its systematic and comprehensive approach to intervention design, the BCW was chosen to guide this study.

2.4 Summary of the Literature and Perceived Gap in Research

This literature review outlines the multi-level factors that influence university students' use of sexual health services. The mixed effects of interventions aimed at improving sexual health service use and other health behaviours were discussed. Further, this review illustrates the utility of behaviour change theory to design effective interventions. Overall, the limited literature on effective, theory-based sexual health interventions for university students highlights a significant gap in current research efforts. This lack of evidence limits the opportunity for researchers and decision-makers to design effective interventions and health promotion programs to improve sexual health service use for university students. Using behaviour change theory in the development of intervention strategies will advance the evidence in this field and enhance the success of sexual health service interventions. As such, this research study aims to use the BCW to develop a comprehensive understanding of the barriers and enablers influencing sexual health service use and develop intervention strategies to improve service use among university students.

CHAPTER 3 PROTOCOL

The work in Chapter 3 also appears in: Cassidy, C., Steenbeek, A., Langille, D., Martin-Misener, R., Curran, J. (2017). Development of a behaviour change intervention to improve sexual health service use among university undergraduate students: Mixed methods study protocol. *JMIR Research Protocols, 6*(11):e217, http://dx.doi.org/10.2196/resprot.8326.

Statement of manuscript contribution: CC conceived the study with input from JC, AS, DL and RMM. CC drafted the manuscript. AS, DL, RMM, and JC contributed to revising the manuscript. All authors read and approved the final manuscript. Copyright release details can be found in Appendix G.

3.1 ABSTRACT

Background: University students are at risk for acquiring sexually transmitted infections and other negative health outcomes. Sexual health services offer preventive and treatment interventions that aim to reduce these infections and associated health consequences. However, university students often delay or avoid seeking sexual health services. An in-depth understanding of the factors that influence student use of sexual health services is needed to underpin effective sexual health interventions.

Objective: In this study, we aim to design a behaviour change intervention to address university undergraduate students' use of sexual health services at two universities in Nova Scotia, Canada.

Methods: This mixed methods study consists of three phases that follow a systematic approach to intervention design outlined in the Behaviour Change Wheel. In Phase 1, we examine patterns of sexual health service use among university students in Nova Scotia, Canada, using an existing dataset. In Phase 2, we identify the perceived barriers and enablers to students' use of sexual health services. This will include focus groups with university undergraduate students, health care providers, and university administrators using a semi-structured guide, informed by the Capability, Opportunity, Motivation-Behaviour Model and Theoretical Domains Framework. In Phase 3, we identify behaviour change techniques and intervention components to develop a theory-based intervention to improve students' use of sexual health services.

Results: This study will be completed in March 2018. Results from each phase and the finalized intervention design will be reported in 2018.

Conclusions: Previous intervention research to improve university students' use of sexual health services lacks a theoretical assessment of barriers. This study will employ a mixed methods research design to examine university students' use of sexual health service and apply behaviour change theory to design a theory- and evidence-based sexual health service intervention. Our approach will provide a comprehensive foundation to co-design a theory-based intervention with service users, health care providers, and administrators to improve sexual health service use among university students and ultimately improve their overall health and well-being.

3.2 INTRODUCTION

Progressing from adolescence to adulthood can be a challenging time for young adults who leave home for the first time to start university (Fromme, Corbin, & Kruse, 2008; Hicks & Heastie, 2008). For most, this transition is uneventful, but for others, newfound independence and campus culture may lead to high-risk behaviours including excessive alcohol consumption (White & Hingson, 2014), casual sex, and inconsistent condom use (Bailey, Haggerty, White, & Catalano, 2010). It is normal for young adults to explore their sexual identity and sexual relationships throughout their university journey (Arnett, 2000). However, such behaviours can increase students' risk of undesired health consequences, such as sexually transmitted infections (STIs), unplanned pregnancy, and psychological distress and regret (Public Health Agency of Canada [PHAC], 2011). For example, in Canada, university students are in the age group at highest risk for acquiring an STI (PHAC, 2012). In 2014, the rate of chlamydia infection in young adults in Canada, aged 20-24, was 1627.6 per 100,000 (PHAC, 2012).

Many university and college campuses offer a range of sexual health services to promote healthy sexual behaviours (e.g., health education, condom distribution) (Eisenberg, Garcia, Frerich, Lechner, & Lust, 2012) and to prevent sexual health–related illness (e.g., STI/human immunodeficiency virus [HIV] testing and treatment, gynecological exams, pregnancy testing) among students (Eisenberg, Garcia, et al., 2012; Eisenberg, Lechner, et al., 2012). University sexual health services are seen as ideal 'health care homes' for students during their studies, as they provide timely, accessible, and convenient services for many students who are away from their primary care provider (Eisenberg, Garcia, et al., 2012). However, young adults, including university

students, often delay or avoid seeking sexual health care (Barth et al., 2002; Bersamin et al., 2017; Malek et al., 2013; Moore, 2013). In the United States, only 27% of university students report having ever accessed sexual health services (Bersamin et al., 2017).

Based on a review of the literature, Bender and Fulbright (2013) identified four categories of perceived barriers to sexual health services among young people in the United Kingdom, United States, and Canada: service access (i.e., location, hours, confidentiality), service entry (i.e., waiting time, waiting environment, fear of being seen), quality of services (i.e., health care provider characteristics), and personal factors (i.e., stress associated with seeking sexual health services). Few studies have examined sexual health service use among the university and college student population specifically, as they begin to explore their sexuality and engage in risky behaviours during their university experience and found similar results (Barth et al., 2002; Bersamin et al., 2017; Moore, 2013). Enhancing university students' access to sexual health services is important given the need to prevent their risk of STI transmission and associated negative health consequences (Bersamin et al., 2017). However, we lack a clear understanding of the barriers and enablers to sexual health service use among university students and how their help-seeking behaviours can be changed.

One strategy for addressing students' use of sexual health services is to use behaviour change theory in the design, implementation, and evaluation of sexual health interventions (Michie, Atkins, & West, 2014). Incorporation of theory into the development and evaluation of complex interventions facilitates behaviour change and provides an explanation of the mechanisms of change (Michie et al., 2011). The Medical Research Council in the United Kingdom suggests that complex interventions are more

likely to succeed when theory is used to underpin the design process (P. Craig et al., 2013). Many behavioural theories and frameworks exist and have numerous overlapping theoretical constructs, which makes it difficult for researchers to choose a theory and apply it to their behavioural problem. In an effort to make theory more accessible for intervention designers, Michie et al. (2011, 2014) developed the Behaviour Change Wheel (BCW). The BCW is a systematic guide to intervention design that is based on (1) an analysis of the target behaviour, (2) the determinants of behaviour that need to be addressed in order to create behaviour change, and (3) the interventions and policies required to support the change (Michie et al., 2014). The BCW uses the Capability, Opportunity, Motivation-Behaviour (COM-B) model and Theoretical Domains Framework (TDF) to obtain a better understanding of the behaviour in context, which is known as a behavioural analysis. The COM-B model is a theory of behaviour that proposes that behaviour is influenced by one or more of the following: capability (C), opportunity (O), and/or motivation (M) (Michie et al., 2014). The TDF is a behavioural framework consisting of 14 domains (knowledge, skills, behavioural regulation, beliefs about capabilities, beliefs about consequences, social/professional role and identity, optimism, reinforcement, intentions, goals, memory, attention, and decision making, emotion, environmental context and resources, and social influence) that is used in combination with the COM-B model to identify specific behavioural determinants of one's capability, opportunity, and motivation (Cane, O'Connor, & Michie, 2012; Michie et al., 2014). Based on the behavioural analysis, users are guided through a series of systematic steps in the BCW to identify intervention functions, policy categories, and behaviour change techniques (BCTs) that are likely to bring about change (Michie et al.,

2014). The BCW has been used to design interventions in a variety of contexts, such as smoking cessation and alcohol reduction, prescribing behaviours, condom use, and clinician guideline utilization (Michie et al., 2014).

This paper describes the study protocol for using the BCW to design an intervention to address university undergraduate students' use of sexual health services at two universities in Nova Scotia, Canada. The study will address the following four research objectives through three phases. Phase 1 will describe the pattern of university undergraduate students' use of sexual health services at two Nova Scotia universities in 2012 using an existing quantitative dataset. Phase 2 will identify university students', health care providers', and university administrators' perceived barriers and enablers for student use of sexual health services and will examine how the qualitative data related to the perceived barriers and facilitators to service use help to better explain the patterns of student sexual health service use. Phase 3 will identify intervention components and/or strategies that can be used by service providers, university decision makers, policy planners, and students to facilitate the use of sexual health services

3.3 METHODS

A sequential explanatory mixed methods research design (Creswell & Plano Clark, 2011) will be used to address the research objectives (Figure 3-1). The phases will follow the systematic stages outlined in the BCW. Data gathered from Phases 1 and 2 will be used to guide a series of stakeholder consensus meetings in Phase 3 to identify intervention components that could be used to overcome the barriers and enhance the enablers to sexual health service use. The third phase will culminate in the design of a theory- and evidence-based intervention aimed at improving the use of sexual health

services by university students. Future research will pilot test and evaluate this intervention in the university health service setting.

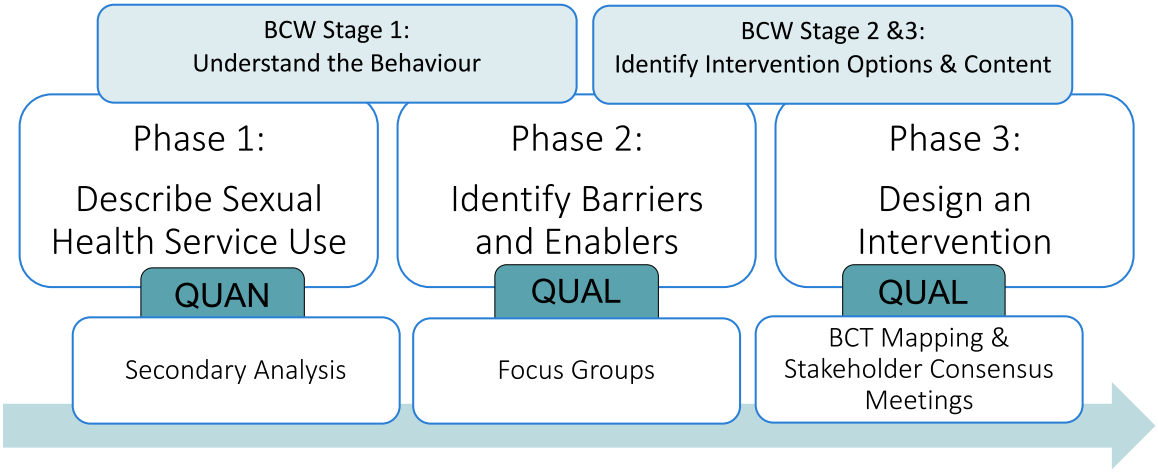

Figure 3-1. BCW stages and study design diagram.

3.4 Phase 1: Understanding the Target Behaviour (Quantitative Strand)

3.4.1 Design

To understand the pattern of university students' sexual health service, we will conduct a secondary analysis of data collected during the online Undergraduate Student Sexual Health Survey in the fall of 2012 (Steenbeek, Langille, Cragg, & Wilson, 2014). This was a cross-sectional survey of a voluntary study population of undergraduate students from eight universities on the East Coast of Canada. Data were collected using the Dillman tailored design method (Dillman, 2007) through OPINIO, a secure, online surveying service (ObjectPlanet I, 2014). The survey comprised 49 multiple choice and two open-ended questions. The purpose of this survey was to describe students' substance use, sexual health knowledge, attitudes, and behaviours, and sexual health service use. We will conduct a secondary analysis of these data to identify significant predictors of students' sexual health service use.

3.4.2 Sample

For the purpose of this study, a secondary analysis of a subset of the data collected from sexually active male and female undergraduate students aged 18-25 at two universities in Nova Scotia will be conducted. Both universities provide general health services in addition to sexual health specific services. These two universities were chosen for three reasons. First, University A is a large urban university, with approximately 13,600 undergraduate students (45% male, 55% female) and University B is a small rural university, with about 3500 undergraduate students (42% male, 58% female) (Association of Atlantic Universities, 2013). At University A, 70% of first year undergraduate students and 18% of all undergraduate students live on campus, compared to 77% of first year students and 41% of all undergraduate students at University B (Association of Atlantic Universities, 2013). The inclusion of a rural and urban university will improve the generalizability and transferability of the study's results to universities in similar contexts. Second, as these universities are in relatively close proximity geographically, the data collection in Phases 2 and 3 will be more feasible. Third, University A and University B yielded two of the highest response rates of the eight participating universities (31.2% and 23.8%, respectively; N=5,633) (Steenbeek et al., 2014).

3.4.3 Measures

Many factors at the individual, social, service, and policy levels influence young adult and university students' use of sexual health services (Bersamin et al., 2017; Donnelly, 2000; Eisenberg, Lechner, et al., 2012; Oliver de Visser & O'Neill, 2013; Wolfers et al., 2010). The individual- and social-level variables outlined in Table 3-1

were measured in the Undergraduate Student Sexual Health Survey and will be included in the proposed secondary analysis to identify significant predictors of sexual health service use. Survey questions and possible answers can be found in Appendix B.

Table 3-1. Variables of interest for Phase 1 secondary analysis.

Variable of Interest	**Survey Item**	**Psychometric Properties**	**Composite Variable for Analyses**
Age	*What is your age in years?*	Pearson's = 0.98 (Langille, 2006)	Continuous variable (18-25)
Ethnic/Racial Background	*What ethnic/racial background do you consider yourself to be?*	New question; No retest performed	0= Caucasian Descent (White) 1= Non-Caucasian Descent (African Descent, Aboriginal, Asian, Middle Eastern, and Other)
Residential Status	*What are your living arrangements?*	New question; No retest performed	0= On Campus 1= Off campus, with self or peers 2= Off campus with romantic partner 3= Off campus, with parents
Sexual orientation	*People have different feelings about themselves when it comes to questions of being attracted to other people. Which of the following best describes your feelings?*	Kappa= 0.8 (Langille, Flowerdew, Aquino-Russell et al., 2009)	0= Heterosexual 1= Non-heterosexual
Sexual Health Knowledge (Langille et al., 2009)	*Please indicate whether you believe each of the following statements are true or false by checking the*	Cronbach's α = 0.71 (Langille et al., 2009)	Continuous (0-12)

Variable of Interest	Survey Item	Psychometric Properties	Composite Variable for Analyses
	appropriate response.		
Barriers to Help Seeking (Mansfield, Addis, & Courtenay, 2005)	*Please indicate how much you disagree or agree with the following statements by checking the appropriate number on the 5-point scale, where 1 = "Strongly disagree" and 5 = "Strongly agree"*	Cronbach's α = 0.93 (Mansfield, Addis, & Courtenay, 2005)	Continuous (0-32)
Social Support (Dolbier & Steinhardt, 2000)	*Please describe how true you believe each of the following statements about your social relationships and support networks, where 1 = "not true at all" and 5 = "completely true".*	Cronbach's α = 0.86 (Dolbier & Steinhardt, 2000)	Continuous (0-84)
Sexual Health Service Use Males: STI & HIV Testing Females: STI, HIV, Pap, & Pregnancy Testing	*Have you ever seen a health professional in order to obtain the following services? If you answer yes for a particular service, please indicate the location where you access that service: University health centre or Other*	New question; no retest performed	Males: 0=No 1=Yes (STI or HIV Testing) Females: 0=No 1= Yes (STI, HIV, Pap, or Pregnancy Testing)

3.4.4 Data Analysis

Since males and females use sexual health services for different reasons and with different frequencies (Cragg, Steenbeek, Asbridge, Andreou, & Langille, 2016;

Fortenberry et al., 2002; Moore, 2013; Public Health Agency of Canada, 2011), we will stratify the data by sex for all statistical analyses. First, descriptive statistics will be reported to describe the characteristics of the undergraduate students and their use of sexual health services at University A and University B (i.e., means/proportions with 95% confidence intervals). Second, to identify factors that are significant predictors of sexual health service use among undergraduate students at the two universities, we will conduct a series of multivariable logistic regressions. We will analyze each of the independent variables using univariable regression to determine significant predictors of sexual health service use at the university health centers. Variables found to be significant predictors ($P<0.2$) (Cragg et al., 2016) will be included in multivariable logistic regression analyses using the enter method (Field, 2013). For males, a multivariable logistic regression will be conducted with the STI and HIV testing composite dependent variable. For female respondents, a multivariable logistic regression will be conducted with the STI, HIV, Papanicolaou (Pap), and pregnancy testing composite dependent variable (Table 3-1). We conducted a power analysis and found that a sample size of 5633 is adequate to detect a minimum odds ratio of 1.2 at 89% power. A significance alpha level of $P<0.05$ will be used as a cut-off for statistical significance. The data will be analyzed using the statistical software program, SPSS (Statistical Package for the Social Sciences), Version 21 (IBM Corp, 2016).

3.4.5 Anticipated Outputs

Findings from this phase will be used in two ways. First, we will develop a detailed description of the pattern of university undergraduate students' use of sexual health

services on campus. Second, we will incorporate findings into a theory-based semi-structured focus group guide to use in Phase 2.

3.5 Phase 2: Understanding the Target Behaviour (Qualitative Strand)

3.5.1 Design

We will use a qualitative descriptive design (Lambert & Lambert, 2012; Sandelowski, 2000) involving semi-structured focus groups and policy document analyses to develop a detailed description of the barriers and facilitators to sexual health service use among university students.

3.5.2 Study Population and Sampling

For the focus groups, we will use a stratified purposive sampling strategy (Patton, 2002) with convenience sampling techniques (Teddlie & Yu, 2007) to recruit university undergraduate students, aged 18-25, as well as health care providers and university administrators (i.e., health service directors and managers), from the two university health centres. Based on the descriptive results and significant findings from the Phase 1 analysis, we will divide groups of interest into strata (e.g., users and nonusers of sexual health services, males and females) and separately recruit participants from each stratum to identify their perceived barriers and enablers to sexual health service use. Due to the sensitive nature of the topic, we will conduct single-sex focus groups to facilitate discussion (Morgan, 1996). We will recruit 6-10 participants per focus group as outlined by Wilkinson's (1998) recommendations for conducting focus groups to uncover rich data for health-related phenomena of interest. We aim to recruit 18-30 students from each university (for a total of 36-60) and 6-10 health care providers/university administrators from each university clinic to participate (for a total of 12-20).

Since the topic of sexual health and use of health services might be a sensitive one for university students (Sherriff, Gugglberger, Hall, & Scholes, 2014), recruitment approaches that take place in public places may result in reduced enrollment. As such, we will use recruitment and enrollment mechanisms that allow for discretion. Identical posters and flyers will be distributed across the two university campuses, including libraries and student union buildings. An email describing the study and inviting students to participate will be distributed to student organizations and listservs. For the health care providers and administrator participants, an email will be sent to campus health clinic managers and university administrators with study details and an invitation to participate. Interested participants may contact the research assistant (RA) via email. The RA will respond by sending a study information sheet and a screening questionnaire to student participants to determine eligibility (Appendix C). Once eligibility is confirmed, the RA will send the focus group/interview details and a copy of the consent form (Appendix D & E). The consent form will be reviewed and completed in person at the focus group meeting. We will provide an option on the consent form for participants to consent to be sent an invitation to participate in the next phase of our research (see Phase 3).

3.5.3 Materials

We will conduct separate semi-structured focus groups with university undergraduate students, health care providers, and university administrators at each university. We will develop a semi-structured focus group guide, informed by the COM-B model and TDF to guide the behavioural analysis and probe participants on their perceived barriers and enablers to sexual health service use among university students (Atkins et al., 2017) (Appendix F). This will allow us to identify key beliefs from the

different TDF domains that an intervention could target to improve students' use of sexual health services. As part of the development process, we will review the focus group guide with 3 students and 3 health care providers or administrators. The participants will be asked to read through the guide to identify flaws, uncertainties, concerns about the questions, or need for clarification. The focus groups guides will be refined based on their feedback (Tong, Sainsbury, & Craig, 2007; Turner III, 2010). We chose to conduct semi-structured focus groups using a theory-based guide for three reasons. First, focus groups are a useful method for obtaining qualitative data on social and psychological processes (Morgan, 1996), as well as social norms and cultural expectations related to sexual health (World Health Organization, 2015). Second, a semi-structured guide will increase the likelihood that participants will cover the topic of interest in an efficient and effective manner (Morgan, 1996). Third, the semi-structured guide enables flexibility, so the focus group facilitator can explore issues in greater depth (Creswell, 2012).

3.5.4 Procedure

The principal investigator, who has been trained in conducting focus groups and using the BCW (COM-B and TDF) to conduct behavioural analyses and design interventions, will facilitate the focus groups using the theory-based focus group guide. The focus groups will take place on the university campus and the RA will be present to take notes on group dynamics and nonverbal participant observations. Focus groups discussions will be audio-recorded and are expected to last approximately 45-60 minutes. Participants will be offered a CAN $30 grocery store gift card in appreciation of their time.

3.5.5 Data Analysis

Audio-recordings from the focus groups will be transcribed verbatim and coded using directed content analysis (Hsieh & Shannon, 2005) in NVivo 11 (QSR International, 2015). Content analysis is a systematic coding and categorization approach to qualitative data analysis used to examine trends and patterns of the data and to identify the frequency and relationships of the words used by participants (Hsieh & Shannon, 2005). Atkins et al. (2017) recommend a content analysis approach when using the TDF in qualitative research. Focus group transcript analysis will involve the following three steps. First, two coders will independently code the first two focus groups by categorizing similar statements into the three COM-B categories and further into the 14 TDF domains. Second, an inductive coding approach will be used to generate subcategories of specific beliefs of the different groups of participants within the initial coding scheme of the 14 TDF domains. Squires et al. (2013) define a specific belief as a group of similar responses that suggest the belief may influence the target behaviour. The coders will compare their results and examine discrepancies. Discussion will be used to achieve consensus and finalize a coding scheme. All subsequent coding will be guided by the coding scheme in an effort to reduce subjective bias (Thompson, McCaughan, Cullum, Sheldon, & Raynor, 2004). The two coders will independently code all remaining transcripts and meet after every two focus groups to review their coding and seek consensus. Third, the coded data will be further inductively examined to identify relevant theoretical domains to our target behaviour (Atkins et al., 2017). The research team will examine trends, patterns, frequencies, and relationships of the words used by the participants to identify (1) any conflicting beliefs within a domain, (2) the frequency of

specific beliefs across the data, and (3) the likely strength of the impact of a belief on the behaviour (sexual health service utilization) (Atkins et al., 2017). All three criteria will be considered when examining the relevance of the TDF domains.

3.5.6 Policy Document Analysis

Document analysis is a systematic procedure for reviewing documents that involves skimming, reading, and interpreting the text. It is often combined with other qualitative research methods as a way to seek convergence and corroboration or identify inconsistencies and provide data on the context in which the health system operates (Bowen, 2009). We will contact the health clinic managers at University A and University B via email and request a copy of their STI, HIV, Pap, and pregnancy testing guidelines, as well as any general sexual health service policies. Policies will be compared with the current Canadian Guidelines on Sexually Transmitted Infections (PHAC, 2016) to identify differences and similarities between the documents and barriers identified in the focus groups (Teddlie & Yu, 2007).

3.5.7 Anticipated Outputs

Findings from this phase will be used in two ways. First, we will use the data to provide a detailed description of students', health care providers', and administrators' perceived barriers and facilitators to sexual health service use among university students. Second, we will use the findings in Phase 3 to develop a theory-based behaviour change intervention to address the target behaviour (sexual health service utilization).

3.6 INTEGRATION OF QUANTITATIVE AND QUALITATIVE DATA

We will integrate the quantitative and qualitative data from Phases 1 and 2 using a triangulation protocol to examine convergence, divergence, and discrepancies from the

different data sources (Denzin, 2010). A triangulation protocol is a detailed approach to examine meta-themes across findings from different data components that have already been analyzed individually (Farmer, Robinson, Elliott, & Eyles, 2006). First, we will create a convergence-coding matrix that will display findings from the quantitative and qualitative phases. Following this, we will evaluate the findings for convergence, divergence, and discrepancies. This approach focuses on explaining the interconnectedness of results between the quantitative and qualitative phases (Farmer et al., 2006). Overall, by integrating the qualitative and quantitative data, we will generate a clearer understanding of the barriers and enablers to university students' use and non-use of sexual health services, which will inform the next phase of intervention design.

3.7 Phase 3: Designing a Theory-based Behaviour Change Intervention (Qualitative Strand)

Using the data obtained from Phases 1 and 2, we will develop a theory- and evidence-based intervention that encompasses BCTs aimed at overcoming the identified barriers and enhancing the enablers to sexual health service use by university students. The intervention will be developed through a series of stakeholder consensus meetings which will be guided by Stages 2 and 3 of the BCW. In each meeting, we will use the nominal group technique to generate ideas, identify potential problems, structure the decision-making process, and achieve consensus (Gallagher, Hares, Spencer, Bradshaw, & Webb, 1993).

3.7.1 Step One

The research team will meet to review Phases 1 and 2 findings and identify intervention functions and content. The BCW outlines which types of intervention functions are likely to be effective in bringing about behaviour change in each COM-B

component and TDF domain (Michie et al., 2014). Through discussion, the research team will apply the APEASE criteria (affordability, practicability, effectiveness and cost-effectiveness, acceptability, safety, and equity) to each intervention function to explore its appropriateness for the sexual health service context (Michie et al., 2014). The APEASE criteria are used to guide decision making during intervention design. Once the intervention functions are identified, the research team will use the BCT Taxonomy version 1 (BCTTv1) (Michie et al., 2013) to identify BCTs that would best serve the intervention function. The BCTTv1 uses a standardized language for describing the active ingredients in interventions Michie et al., 2013). Michie et al. (2014) developed a matrix that maps relevant BCTs to intervention functions and corresponding COM-B and TDF components. The research team will use the APEASE criteria to consider which BCTs would be feasible within the context of university sexual health service delivery and most useful for addressing the identified barriers and enablers to university students' use of sexual health services.

3.7.2 Step Two

We will conduct stakeholder consensus meetings at each university with 3-5 students and 3-5 health care providers and university administrators. Participants who provided consent to be followed up in the Phase 2 focus groups will be contacted via email and invited to participate in the advisory committee. The objective of the meeting is to review the findings from Phases 1 and 2 and the results from the BCT mapping exercise (Step One) and further refine the intervention design. Through discussion, the advisory committee will identify potential modes of intervention delivery and apply the

APEASE criteria to explore its feasibility. The advisory committee will also discuss optimal intervention content, provider, setting, recipient, intensity, duration, and fidelity. Following the advisory committee meetings, we will collate the meeting results to produce a summary of the final intervention design that could be delivered in the university setting to improve students' use of sexual health services. A copy of the intervention design findings will be sent via email to the participants of each advisory committee.

3.7.3 Anticipated Outputs

Phase 3 will culminate with a co-designed (Boyd, McKernon, Mullin, & Old, 2012), theory- and evidence-based behaviour change intervention for improving sexual health service use among university students.

3.8 RESULTS

Phases 1 and 2 are complete, and Phase 3 intervention design is ongoing. Results from each phase and the finalized intervention design will be reported in 2018.

3.9 DISCUSSION

3.9.1 Principal Considerations

Increasing university students' use of sexual health services is important given the need to prevent their risk of STI transmission and associated negative health consequences. This study will follow a systematic, theory-based approach using a mixed methods research design to develop a behaviour change intervention aimed at improving university students' use of sexual health services. The mixed methods approach will allow for an integration of both numerical findings and qualitative text from the perspective of university students, health care providers, and university administrators to

enhance our understanding of sexual health service use among university undergraduate students. This study is guided by the BCW, which uses the COM-B model and TDF as theoretical approaches to understanding the target behaviour in context and designing theory-based interventions. The BCW has been used extensively in health services research (Barker, Atkins, & de Lusignan, 2016; Cadogan, McHugh, Bradley, Browne, & Cahill, 2016; Fulton, Brown, Kwah, & Wild, 2016), including the design of sexual health–related interventions for young adults (Webster et al., 2016). Based on the success of these studies, we anticipate the proposed theory- and evidence-based intervention will be successful at improving university undergraduate students' use of sexual health services.

3.9.2 Limitations

All findings from this study will be interpreted with the following limitations in mind, among others that may arise. First, the two universities included in the Phase 1 secondary analysis had response rates of 31.2% and 23.8%. These response rates are lower than the primary researchers had anticipated, as previous Web-based survey research with Canadian university students had a mean response rate of 40.9%. Further, Web-based sexual health research with US college students yielded response rates that ranged from 24% to 55%. This can result in nonresponse bias that may impact generalizability of the study findings. Second, the Phase 1 data were collected in 2012, which may result in findings that are no longer relevant today. For example, with recent developments in health service technologies (e.g., online booking, electronic notification of results, online provision of sexual health information), there may be differences in the accessibility and acceptability of sexual health services among university students.

However, our Phase 2 focus groups with students, health care providers, and university administrators will provide an opportunity to follow up on the 2012 data and describe any differences in the accessibility and acceptability of sexual health services during this period of time. Last, a limitation of secondary analyses is that researchers must work with the available data, which may not have been collected to address the research question. The only measures of sexual health service use in the secondary dataset are STI testing, HIV testing, Pap testing, and pregnancy testing. The Phase 2 focus groups will allow for further exploration of a more comprehensive definition of sexual health services, including sexual health promotion initiatives.

3.10 CONCLUSION

Overall, the methods presented in this paper demonstrate a theoretically robust and evidence-based approach to design an intervention to improve university students' use of sexual health services. The BCW will be used to understand the behaviour in greater detail, identify intervention options, content, and implementation strategies. Future pilot testing in university settings will be needed to evaluate the effectiveness of the proposed intervention.

CHAPTER 4 PHASE ONE

The work in Chapter 4 also appears in: Cassidy, C., Steenbeek, A., Langille, D., Martin-Misener, R., Curran, J. (in press). Sexual health service use among university undergraduate students in Nova Scotia. *The Canadian Journal of Human Sexuality*.

Statement of manuscript contribution: AS and DL were the co-principal investigators on the original study in which the data were collected. CC conceived the plan for secondary analysis with input from JC, AS, DL and RMM. CC analyzed the data and drafted the manuscript. AS, DL, RMM, and JC contributed to revising the manuscript. All authors read and approved the final manuscript. Copyright release details can be found in Appendix G.

4.1 ABSTRACT

Background: University undergraduate students are within the highest risk population for acquiring sexually transmitted infections. However, the rates of sexual health service utilization among this population remain low. In this study, we sought to describe the rates and predictors of sexual health service use among undergraduate students at two Nova Scotia universities.

Methods: An online survey of eight Canadian Maritime universities was conducted to collect information on undergraduate students' sexual health behaviours (N=10,631). We conducted a secondary analysis on a subset of the data collected from sexually active undergraduate students at two Nova Scotia universities (n=3,709). We performed descriptive statistics and multivariable regression analyses to determine the factors associated with undergraduate students' sexual health service use on campus.

Results: The majority of sexually active female students (73%) and 20% of male students have accessed sexual health services at least once in their lifetime. Fewer sexually active students (41% females; 25% males) have ever had an STI test. Twenty-two percent of female students and 8% of male students had ever accessed sexual health services at their university health centre. Students in higher years of study were more likely to have accessed sexual health services on campus than students in first year. Non-heterosexual students were less likely to access sexual health services on campus than heterosexual students. Among female respondents, those who reported a greater sense of social support were more likely to access sexual health services on campus.

Conclusion: Our results illustrate the characteristics of university undergraduate students who do and do not access sexual health services on campus. These findings will be used to inform the design of a qualitative study to further explore the perceived barriers and enablers to sexual health service use at university health centres.

4.2 INTRODUCTION

Young adults are a population at highest risk for acquiring sexually transmitted infections (STIs) and other negative sexual health outcomes (Public Health Agency of Canada [PHAC], 2011). For example, the prevalence of chlamydia in Canada is substantially greater in sexually active young men and women aged 20 to 24 than any other age group. These outcomes are of significant concern: If left untreated, STIs can lead to serious health consequences, especially for women, including pelvic inflammatory disease, ectopic pregnancy, and infertility (PHAC, 2011). The age of first sexual intercourse for Canadians is between 15-and 19-years. As such, by the time young adults begin university, most students have had sexual intercourse at least once and continue to be sexually active (PHAC, 2011). University students, in particular, may be at an increased risk of acquiring STIs, not only because they are in the highest age group at risk but, from the experimental nature of the university experience, which often includes alcohol and drug use and increased sexual exploration (Alexander, Jemmott, Teitelman, & D'Antonio, 2015; Arnett, 2000).

Effective prevention of STIs relies on early detection and treatment. Many university and college campuses offer a range of sexual health services to address STI prevention and transmission, decrease the risk of the health consequences of STIs, and promote positive sexual health practices among students (Eisenberg, Lechner, Frerich, Lust, & Garcia, 2012). Furthermore, individuals who are actively engaged in their health and use primary care services report better health outcomes (Hibbard & Greene, 2013; Shi & Shi, 2012). National guidelines exist for routine screening of young adults to prevent negative sexual health outcomes. Current Canadian guidelines on STI

management recommend screening all sexually active females under 25 years of age, and males who present with risk factors including: sexual contact with person(s) with a known STI, a new sexual partner, or having more than two sexual partners in the past year (PHAC, 2016). Although these services and guidelines exist, many university students often delay or avoid seeking sexual health services (Malek, Chang, Clark, & Cook, 2013). Studies show that on average, only 11-55% of university/college students report having ever accessed sexual health services (Bersamin et al., 2017; Moore, 2013; Wolfers et al., 2010).

Factors commonly associated with sexual health service use include increasing age, female sex, heterosexual sexual orientation, higher perceived risk, social stigma, accessibility of services, and health care provider characteristics (i.e., level of health-related knowledge, comfort level) (Eisenberg et al., 2012; Oliver de Visser & O'Neill, 2013). To date, few studies have focused specifically on the university student population, especially Canadian students. Cragg, Steenbeek, Asbridge, Andreou, and Langille (2016) examined STI testing behaviours among Canadian Maritime university students and found only 34% of students had ever been tested for STIs; older students, those who reported experiencing non-consensual sex while enrolled in university, and those with more sexual health knowledge were more likely to be tested.

It is clear that students underutilize sexual health services (Bersamin et al., 2017; Cragg et al., 2016); however, the underlying complexities related to this issue are not well understood. As such, the overall aim of this paper is to describe sexually active university undergraduate students' use and non-use of sexual health services at two Canadian Maritime universities in 2012. We addressed the following research objectives:

i) Describe the prevalence of sexual health service use on campus among sexually active university undergraduate students in Nova Scotia, and ii) Identify the predictors of sexual health service use on campus. This study was the first phase of a larger, three-phased, mixed methods study aimed at designing an intervention to address university undergraduate students' use of sexual health services in Nova Scotia, Canada. Findings from this phase will be used to inform the subsequent qualitative phases related to identifying barriers and enablers to sexual health service use at university health centres and select intervention strategies. Full study methods have been published elsewhere (Cassidy, Steenbeek, Langille, Martin-Misener, & Curran, 2017).

4.3 METHODS

4.3.1 Design

We conducted a secondary analysis of data collected during the online *Undergraduate Health Survey* (UHS) in the Fall of 2012 (Steenbeek, Langille, Cragg, & Wilson, 2014). This was a cross-sectional online survey of a voluntary study population of undergraduate students from eight Canadian Maritime universities.

4.3.2 Survey Administration

Data were collected using the Dillman tailored design method (Dillman, 2007) through OPINIO – a secure, online surveying service hosted by Dalhousie University (ObjectPlanet, 2014). The survey was comprised of 49 multiple choice and two open-ended questions. The purpose of this survey was to describe students' substance use, sexual health knowledge, attitudes, and behaviours, and sexual health service use. Extensive analyses on sexual health service use from the UHS data have been published

elsewhere (Budden, 2017; Cragg et al., 2016; Keeler, 2017; Monaghan, 2016; K. Wilson et al., 2015).

4.3.3 Study Population

All 50,790 undergraduate students enrolled at the eight Canadian universities were eligible to participate in the survey; 10,361 undergraduate students (20.4%) participated. For this secondary analysis, we limited the population to sexually active male and female undergraduate students aged 18 to 25 at two universities in Nova Scotia (N=3,709). One is a large urban university, with approximately 13,600 undergraduate students (45% male; 55% female) and the second is a small rural university, with about 3,500 undergraduate students (42% male; 58% female) (Association of Atlantic Universities, 2013). These two universities were chosen for this secondary analysis as they yielded the two highest response rates of the eight participating universities (31.2% and 23.8%) (Steenbeek et al., 2014). Further, as this study is part of a larger, mixed methods study aimed at designing an intervention, we chose two universities that are in close proximity to make it more feasible to collect data in the follow-up phases. This study was approved by the Research Ethics Boards at both universities (#2016-3917; #16-50).

4.3.4 Measures

Many factors at the individual, social, service and policy levels influence young adult or university students' use of sexual health services (Deri, 2005; Eisenberg, Golberstein, & Gollust, 2007; Eisenberg et al., 2012; Oliver de Visser & O'Neill, 2013). The individual- and social-level variables outlined below were measured in the UHS and included in the current analysis. One survey item measuring year of study (κ=1.0;

Langille, 2006) was used to categorize students into one of five categories: "*first", "second", "third", "fourth",* and *"other"*. One survey item measuring ethnic/racial background was used to create a binary variable for ethnicity: Caucasian Descent ("*White"*) and Non-Caucasian Descent ("*African Descent", "Aboriginal", "Asian", "Middle Eastern",* and *"Other"*). Two survey items measuring living arrangements were used to create a residential status variable with four categories: "*On campus", "Off campus, with self or peers", "Off campus with romantic partner"*, and *"Off campus, with parents".* One survey item measuring sexual orientation (κ=0.8; Langille et al., 2009) was used to create a binary variable: Heterosexual ("*100% heterosexual*" and "*mostly heterosexual"* and Non-heterosexual (*"bisexual", "mostly homosexual", "100% homosexual",* and *"unsure").* Sexual health knowledge was measured using a 12-item true/false/don't know test (Cronbach's α = 0.71) (Langille et al., 2009). This test measured a variety of sexual health topics, including contraception methods, prevention, symptoms and treatment of STIs, and the menstrual cycle (e.g. *If a guy or girl aged 18 – 24 gets chlamydia and is treated properly, he or she can never get chlamydia again).* Correct responses were summed to create a continuous variable with a score range of 0-12. Attitudinal barriers to help-seeking (e.g. *I would think less of myself for needing help*) were measured using an eight-item scale (Cronbach's α =0.93) (Mansfield, Addis, & Courtenay, 2005). Respondents rated their agreement with each statement on a five-point scale ranging from "*strongly disagree"* (0) to "*strongly agree"* (4) (score range 0-32). A higher score indicates more barriers to help-seeking (Mansfield et al., 2005). The Sense of Support Scale is a 21-item measure that was used to assess perceived social support (Cronbach's α = 0.86; Dolbier & Steinhardt, 2000). Respondents rated their agreement

with each statement (e.g., *I feel well supported by my friends and/or family)* on a five-point scale ranging from "*not true at all*" to "*completely true*" (score range 0-84). A higher score indicates greater perceived social support.

Using one survey item that measured lifetime incidence of having ever accessed sexual health services on campus, we created a binary outcome variable: Sexual Health Service Use on Campus Ever (*"Yes"* versus *"No")*. The following skip logic for this item was used during survey administration: Only respondents who answered yes to having ever used sexual health services were prompted to answer the location of the sexual health services ("*on*", "*off campus*" or "*both*"). Respondents that answered "*both*" were collapsed into the "*Yes*" category of Sexual Health Service Use On Campus Ever. The categories included in the Sexual Health Service Use On Campus Ever variable were different for males and females as they were based on their different needs for sexual health service use. The Sexual Health Service Use on Campus Ever variable for female students included: having ever had an STI test, human immunodeficiency virus (HIV) test, Papanicolaou (Pap) test, or pregnancy test at their university clinic. While for males, the variable included: having ever had an STI or HIV test at their university clinic.

4.3.5 Statistical Analysis

Since males and females use sexual health services for different reasons and at different frequencies (Moore, 2013), we stratified the data by self-reported participant sex for all statistical analyses. First, we used descriptive statistics to illustrate the characteristics of the undergraduate students and their use of sexual health services (i.e., means/proportions with 95% confidence intervals). Next, we conducted a series of multivariate logistic regressions to identify the significant predictors of the use of sexual

health services on campus among sexually active female and male undergraduate students. We analyzed each of the independent variables using univariate logistic regression to determine significant predictors of sexual health service use at the university health centres. Variables found to be significant predictors ($p < 0.2$) were entered into a series of multivariate logistic regressions. A significance alpha level of 0.05 was used as a cut-off in the multivariate logistic regression analyses, which is consistent with past literature on STI/HIV testing among university students (Moore, 2013; Wolfers et al., 2010). The data were analyzed using the statistical software program, SPSS (Statistical Package for the Social Science), Version 24 (IBM Corp, 2016).

4.4 RESULTS

4.4.1 Characteristics of the Sample

Descriptive statistics of the male and female samples are presented in Table 4-1. A total of 2,625 sexually active female students and 1,074 sexually active male students were included in the analysis. Together, the 3,709 male and female undergraduate students had a mean age of 20.4 years (SD =1.8), with the majority being in their second year of undergraduate studies (mean=2.7 years). The majority of the sample (87.9%) were Caucasian and lived off campus by themselves or with peers (49.8%); were heterosexual (66%) or mostly heterosexual (28%) with few students (6%) reported as bisexual, mostly homosexual, or homosexual. Students had a mean score of 15 on the barriers to help-seeking scale (SD=5.6; highest achievable score = 32), and a mean score of 60 on the sense of support scale (SD=11.9; highest achievable score = 84). Female

students reported a mean score of 8.7/12 (SD=2.1) on the sexual health knowledge test, while male students obtained a mean score of 6.9 (SD=2.5).

Table 4-1. Characteristics of the study population (N=3,709) stratified by student sex.

	Females	***Males***
	Mean (SD) or Percent (*n*=2,625)	**Mean (SD) or Percent (*n*=1,074)**
Age, years (18-25)	20.4 (1.8)	20.6 (1.8)
Year of Study		
First	22.3%	22.7%
Second	23.2%	21.7%
Third	23.6%	23.0%
Fourth	23.5%	26.2%
Other	7.4%	6.4%
Ethnicity		
Caucasian	88.7%	86.2%
Non-Caucasian	11.3%	13.8%
Residential Status		
On Campus	24.1%	23.2%
Off campus, with self or peers	49.7%	51%
Off campus, with romantic partner	12.8%	10.2%
Off campus, with parents	13.4%	15.7%
Sexual Orientation		
Heterosexual	93.0%	95.4%
Non-heterosexual	7.0%	4.6%
Sexual Health Knowledge Score (out of 12)	8.7 (2.1)	6.9 (2.5)
Sense of Support Score (out of 84)	61.1 (11.5)	57.3 (12.4)
Barriers to Help-seeking (out of 32)	14.8 (5.5)	16.0 (5.8)

Table 4-2 presents descriptive statistics on sexually active male and female students' use of health services including, general university health services, and sexual health services on and off campus. Over half (52.2%) of female students and 38.7% of male students indicated that they had seen a doctor or nurse at their university health

centre for any reason. The majority of female students (73%) and 27.6% of male students reported having ever accessed sexual health services. Only 22.3% of the female student sample had accessed sexual health services at their university health centre, with Pap testing being the most common sexual health service accessed, followed by STI testing. Only 7.7% of the male student sample had accessed sexual health services at their university health centre, with STI testing being the most frequently accessed sexual health service.

Table 4-2. Prevalence of health service use ever by sexually active undergraduate students attending two Maritime universities, by sex, 2012.

	Females	*Males*
	Percentage (*n*=2,625)	**Percentage (*n*=1,074)**
General University Health Service Use		
Yes	52.2%	38.7%
No	47.2%	61.3%
Sexual Health Service Use Ever[a]		
Yes	73.0%	27.6%
No	27.0%	73.4%
Location of Sexual Health Service Use[b]		
On Campus	22.3%	7.7%
Off Campus	55.1%	19.6%
Type of Service Accessed and Location[b]		
STI Test	40.9%	25.2%
On Campus	13.2%	7.7%
Off Campus	30.6%	18.8%
HIV Test	10.1%	10.1%
On Campus	1.4%	2.2%
Off Campus	9.1%	8.2%
Pap Test	64.1%	-
On Campus	19.6%	-
Off Campus	49.8%	-
Pregnancy Test	15.6%	-
On Campus	3.1%	-
Off Campus	13.3%	-

[a]Sexual health service use ever variable for female students includes STI test, HIV test, Pap test, or pregnancy test. Sexual health service use ever variable for male students includes STI test or HIV test.
[b]Restriction and skip logic was used so if students answered yes to having ever used sexual health services they were prompted to answer the location of the sexual health services (on or off campus or both).

4.4.2 Predictors of Sexual Health Service Use on Campus

The unadjusted univariate models for the sexually active female sample revealed that year of study, ethnicity, residential status, sexual orientation, and sense of social support were associated with sexual health service use on campus at $p < 0.2$ (Table 4-3). The unadjusted univariate models for the sexually active male sample revealed that year of study and sexual orientation were associated with sexual health service use on campus (Table 4-3). These variables were included in multivariate logistic regression models for male and female students (Table 4-4).

Table 4-3. Univariate logistic regression of ever having accessed sexual health services on campus among sexually active female (n=2,625) and male (n=1,074) undergraduate students attending two Maritime universities, 2012.

Independent Variables	***Females***		***Males***	
	Odds ratio (95% CI)	***p* value**	**Odds ratio (95% CI)**	***p* value**
Year of Study				
First	1.00		1.00	
Second	0.20 (0.08, 0.47)	0.000**	0.69 (0.19, 2.34)	0.572
Third	0.99 (0.43, 2.27)	0.977	1.20 (0.35, 4.09)	0.771
Fourth	2.30 (0.94, 5.66)	0.069*	4.50 (1.27, 15.90)	0.020**
Other	1.74 (0.79, 3.82)	0.169*	1.19 (0.39, 3.67)	0.757
Ethnicity				
Caucasian	1.00		1.00	
Other	0.60 (0.31, 1.15)	0.121*	0.67 (0.28, 1.57)	0.354
Residential Status				
On Campus	1.00			
Off campus (self or peers)	2.06 (0.79, 5.39)	0.142*	1.00 (0.45, 2.67)	0.833
Off campus (partner)	4.19 (1.99, 8.90)	0.000**	1.10 (0.31, 4.16)	0.839
Off campus (parents)	1.44 (0.63, 3.29)	0.383	1.14 (0.30, 4.51)	0.823
Sexual Orientation				
Heterosexual	1.00			
Non-heterosexual	0.30 (0.15, 0.62)	0.001**	0.20 (0.05, 0.73)	0.015**
Sexual Health Knowledge score	0.94 (0.82, 1.08)	0.393	0.95 (0.83, 1.08)	0.413
Sense of Support score	1.03 (1.01, 1.05)	0.001**	1.01 (0.10, 1.04)	0.293
Barriers to Help-seeking score	1.02 (.98, 1.07)	0.377	0.97 (0.92, 1.03)	0.352

Note. Other includes African Descent, Aboriginal, Asian, Middle Eastern or Other. Italics indicates reference category. CI refers to confidence interval. *p<0.2 ** p<0.05

Among sexually active females, being in a higher year of study, being heterosexual, and having a greater sense of social support were associated with accessing sexual health services on campus (Table 4-4). Female students in their second, third, or fourth year of study were more likely to access sexual health services on campus than students in first year. Non-heterosexual female students were 63% less likely to access

sexual health services on campus compared to heterosexual students. Further, with every one unit increase on the sense of support scale, female students were 3% more likely to access sexual health services on campus. Among sexually active males, being in a higher year of study and being heterosexual were associated with accessing sexual health services on campus. Results showed that male students in their third year of study were more likely to access sexual health services on campus than students in first year. Non-heterosexual male students were 79% less likely to access sexual health services on campus compared to heterosexual male students.

Table 4-4. Multivariate logistic regression of ever having accessed sexual health services on campus among sexually active female (n=2,625) and male (n=1,079) undergraduate students, attending two Maritime universities, 2012.

Independent Variables	***Females***		***Males***	
	Odds ratio (95% CI)	***p* value**	**Odds ratio (95% CI)**	***p* value**
Year of Study				
First	1.00		1.00	
Second	4.69 (1.93, 11.34)	0.001**	1.64 (0.52, 5.18)	0.401
Third	11.54 (4.44, 29.99)	0.000**	6.00 (1.83, 19.64)	0.003**
Fourth	7.90 (3.44, 18.18)	0.000**	1.57 (0.56, 4.40)	0.396
Other	4.87 (1.90, 12.46)	0.001**	1.39 (0.37, 5.32)	0.627
Sexual Orientation				
Heterosexual	1.00 (0.00, 000)		1.00	
Non-heterosexual	0.37 (0.16, 0.84)	0.018**	0.21 (0.06, 0.83)	0.026**
Ethnicity				
Caucasian	1.00			
Other	0.62 (0.30, 1.29)	0.199		
Residential Status				
On Campus	1.00 (0.00, 000)			
Off campus, with self or peers	1.08 (0.44, 2.67)	0.86		
Off campus, with partner	0.53 (0.20, 1.42)	0.211		
Off campus, with parents	0.39 (0.12 1.16)	0.090		
Sense of Support Score (per unit change)	1.03 (1.01, 1.05)	0.017**		

Note. Other includes African Descent, Aboriginal, Asian, Middle Eastern or Other. Italics indicates reference category. ** p<0.05

4.5 DISCUSSION

This study found that 73% of sexually active female students and 19.6% of sexually active male students have accessed sexual health services at least once in their lifetime. These results indicate that the majority of female students (64%) have had at least one Pap test in their lifetime. However, only a minority of sexually active students

reported ever having been tested for STIs (40.9% of females and 25.3% of males). These rates are consistent with other studies of post-secondary student populations and STI/HIV testing in Canada. Cragg et al. (2014) conducted an analysis of all eight Maritime universities included in the UHS study and found 34% of sexually active undergraduate students have ever been tested for STIs. The results from the current study were lower than previous findings from the United States: Moore (2013) found 55% of heterosexual female college students and 29% of heterosexual male college students have ever been tested for STIs/HIV. Higher rates among US college students may be explained by the provision of free health services for students who may not have insurance coverage for off-campus resources (Eisenberg et al., 2012). Of the university undergraduate students who have accessed sexual health services, only 22.3% of sexually active female students and 7.7% of sexually males have ever accessed their universities' sexual health services. These testing rates do not meet PHAC's guidelines, which recommend that all sexually active women under the age of 25 and men with risk factors be tested annually for chlamydia (PHAC, 2016). These findings have important implications for university administrators and program planners. There is an opportunity to leverage students' daily interactions with the university environment, both in-person and online, to enhance outreach initiatives and improve students' access of sexual health services.

Although we found low rates of sexual health service use on campus, over half (52%) of sexually active female students and 39% of sexually active male students have accessed the university health centre for general health concerns. University health services may be missing valuable opportunities to incorporate sexual health-related primary and secondary prevention (e.g., assessing and discussing risks, offering screening

and testing), and patient-centred sexual health counselling, into routine patient care with university students. This proactive approach to primary care would help to improve the university health centres' adherence to the PHAC guidelines for STIs (Public Health Agency of Canada, 2016) and the World Health Organization (WHO) guidelines for sexual health service provision (WHO, 2013). Furthermore, studies have shown that individuals who are actively engaged in protecting their health and using health services report better health outcomes (Hibbard & Greene, 2013; Shi & Shi, 2012).

The results of this study highlight several important predictors of sexual health service utilization among sexually active university students, including year of study, sexual orientation, and sense of social support. Year of study was found to be associated with greater odds of having ever accessed sexual health services on campus among both student sexes. Year of study has not been examined in previous research to the same extent as age as a potential predictor of sexual health service utilization. To date, studies that have examined the association between age and sexual health service utilization have yielded mixed results (Cragg et al., 2016; Moore, 2013). In this research, year of study appears to have been a useful variable to describe this temporal relationship, which may be explained by the fact that students in higher years of study may have more time to become familiar with the services offered on campus and access the health services. Further, students in higher years of study are older and may have more sexual experience; as a result, these students may access sexual health services more frequently. These findings highlight the importance of identifying opportunities to target first-year students of any age, such as first-year student orientation, to improve their use of sexual health services.

Social support refers to the process through which social relationships help to facilitate health goals (Dolbier & Steinhardt, 2000). We found sexually active female students who reported a greater sense of social support were more likely to access sexual health services on campus. Studies report high levels of social support are linked to positive health outcomes (Latkin & Knowlton, 2015); however, this finding has not been described in detail in previous sexual health service research. Social-level variables in the sexual health literature focus more on the influence of perceived norms on sexual health behaviours. For example, Oliver de Visser and O'Neill (2013) examined peer norms among young adults and found that peers influenced their likelihood of being tested for STIs. Further, there is evidence concerning the relationship between social support and general health service utilization. Deri (2005) found that social networks affect health service utilization behaviour through information provision and the influence of norms. This may help to explain the relationship we found between greater social support and sexual health service utilization among female university students. As a result, health care providers and university health centre administrators may be able to leverage students' existing social networks to improve their use of sexual health services. The quantitative measure of social support, as reported in this study, focuses on the structural nature of social relationships (Dolbier & Steinhardt, 2000). Further research would benefit from a qualitative approach that explores the significance and meaningfulness of relationships (Dolbier & Steinhardt, 2000).

The results included in this paper focus primarily on STI, HIV, Pap and Pregnancy testing, which is consistent with much of the sexual health service literature. There is a paucity of research that addresses other aspects of sexual health care provision,

including gynecological exams and counselling. In doing so, researchers fail to capture important primary, secondary, and tertiary prevention services that should be included in the provision of all sexual health care, including: sexual health education and prevention information; sexuality counselling; contraceptive use and prescription renewal; counselling, testing, treatment and follow-up for STIs and HIV; diagnosis, screening, treatment, and follow-up for reproductive tract infections, reproductive cancers, and associated infertility; and diagnosis and referral for sexual dysfunction (World Health Organization, 2010). Future research needs to shift from the restricted focus on testing services to include a more comprehensive examination of sexual health services.

This research identified several individual-level predictors and one interpersonal-level predictor of sexual health service use among sexually active students. Other studies have identified service-level factors (e.g., characteristics of the health care provider and health centre) that influence students' use of sexual health services. Further research is needed to understand how multi-level factors related to university students, the university context, and health service characteristics interconnect to influence university students' use of sexual health services and what interventions are effective at improving their rates of service use. A mixed methods research approach that combines quantitative and qualitative methods may be useful to answer such questions and develop targeted interventions for improving students' use of sexual health services.

4.5.1 Limitations

Study findings must be interpreted with the following limitations in mind. The survey was cross-sectional in nature, and therefore we cannot determine causation. The response rate to the UHS was low (27.5%); however, this is consistent with other web-

based student surveys (Lindley et al., 2009). Further, the sample size for our logistic regression analyses was low (females n=660; males n=158) because restriction and skip logic were used in the survey: when students answered yes to having ever used sexual health services they were prompted to answer the location of the sexual health services (on or off campus or both). Due to the limited sample size, it was necessary to collapse categories related to sexual orientation and ethnicity to create dichotomous variables. Previous studies have identified significant predictors of health service use among members of the LGBTQ community and students of different ethnic background (Budden, 2017; Kerr et al., 2013; K. Wilson et al., 2015). However, our small sample size may have limited our ability to detect similar results within these subgroups. Further, since the sample was predominantly Caucasian (87.9%), the results may not be generalizable to all Canadian university students, including International and Aboriginal students. Lastly, there may also be contextual differences between the rural and urban universities included in these analyses, including availability of resources offered on and off campus.

4.6 CONCLUSION

We found low rates of sexual health service use on campus among sexually active university undergraduate students, aged 18 to 25, in Nova Scotia, Canada. This study identified several predictors of sexual health service use, some of which have not been examined in detail in the literature, including year of study and perceived sense of social support, as well more well-known predictors, such as sexual orientation. These findings will be useful for health care providers, university administrators, and sexual health program planners to take into consideration when designing interventions to improve

students' use of sexual health services. In the next phase of our research, we will build on these findings in a qualitative study to explore in more depth, students', health care providers' and university administrators' perceived barriers and enablers to the use of university sexual health services. These findings will inform the design of an intervention to improve the use of sexual health services among university undergraduate students.

CHAPTER 5 POST-PHASE 1 SCRIPT

With a sequential explanatory, mixed methods research design, one data collection procedure informs the data collection approach of the other (Fetters, Curry, & Creswell, 2013; O'Cathain, Murphy, Nicholl, & others, 2010). In this three-phased, mixed methods study, Phase 1 results informed both the sampling strategy and semi-structured guides for the Phase 2 focus groups and interviews. This process was important in the development of a robust sampling strategy and comprehensive interview guide for Phase 2. The following section outlines the Phase 2 sampling strategy, recruitment methods, and focus group/interview guide development before leading into the Phase 2 results manuscript, titled *Barriers and enablers to sexual health service use among university students: A qualitative descriptive study using the Theoretical Domains Framework and COM-B model.*

5.1 SAMPLING STRATEGY

Phase 1 results indicated that male and female students access sexual health services at different rates and for different reasons. As a result, we stratified our sampling strategy to include males and females and conducted separate focus groups with these two groups of students. Second, we found that non-heterosexual students were less likely to access sexual health services on campus compared to heterosexual students. Based on these results, we recruited students from the LGBTQ community and conducted separate focus groups with these students to explore any unique barriers and enablers (Table 5-1).

5.2 RECRUITMENT

Recruitment posters were posted across University A and B campuses, including libraries and student union buildings. An email describing the study and invitation to

participate was distributed to various student organizations (e.g., student union, LGBTQ student organizations). Interested participants contacted the research assistant (RA) via email. The RA responded with study information and a screening questionnaire to determine eligibility (age, year of study, preference for male, female, or LGBTQ focus group) (Appendix C). The screening questionnaire was developed and reviewed by two researchers with expertise in LGBTQ health. Once eligibility was confirmed, the RA sent the date and time of the focus group and consent form to the participant. Due to recruitment and focus group scheduling challenges, we revised the study protocol to conduct key informant interviews with health care providers and university administrators. Recruitment procedures for the key informant interviews are described in the following chapter.

5.3 FOCUS GROUP AND INTERVIEW GUIDE

We developed a focus group and interview guide based on the COM-B model and TDF (Appendix F). We included questions and prompts in the guides based on significant findings from Phase 1 (Table 5-1). We tested the focus group and interview guides with three university undergraduate students and one administrator to identify any confusing terminology or concerns about the questions. The guides were then refined based on the feedback.

Table 5-1. Phase 1 findings informing phase 2 methods.

COM-B	**Phase One Findings**	**Phase Two Methods**	
		Sampling Strategy	*Focus Group Guide*
Capability Motivation	Males and female use sexual health services for different reasons	Conduct separate focus groups with female and male students	Include prompts throughout on STI/HIV, Pap and pregnancy testing with female group Include prompts throughout on STI/HIV testing with male group • Tell me about the sexual health services that are offered at your university? (have you used the services?; what services exist?)
Capability Motivation	Males and females have different rates of sexual health service use	Conduct separate focus groups with female and male students Recruit students who have or have not accessed sexual health services	Include prompts throughout on reasons for accessing and types of services accessed • Tell me about the sexual health services that are offered at your university? (have you used the services?; what services exist?)

Capability	Students in higher years of study were more likely to access sexual health services on campus	Recruit undergraduate students in all years of study within the emerging adulthood developmental stage (18-25)	Under *Knowledge,* ask the following questions: • Tell me about the sexual health services that are offered at your university? What do you know about these services? (Prompt- have you used the services?; what services exist, how do you make an appointment, what is the process for service use?) • How do you find out information about sexual health services offered at your university?
Opportunity Motivation	Non-heterosexual female students were 63% less likely to access sexual health services compared to heterosexual female students	Conduct separate focus group with student members of the LGBTQ community	Under *Beliefs About Consequences,* ask the following question: • Are there any harms that can occur from using the sexual health services at your university? Are there any harms that can occur from NOT using the sexual health services at your university?

			Under *Social/Professional Role and Identity*, ask the following question: • Do you feel like you have a responsibility to access sexual health services? Tell me about this. Under *Social Influences,* ask the following question: • Would your family, friends, or sexual partners influence your decision to access sexual health services? How would they influence your decision? To what extent?)
Opportunity	With every one unit increase on the sense of support scale, female students were 3% more likely to access sexual health services		Under *Social Influences,* ask the following question: • Do you ever discuss access of sexual health services with your family, friends, or sexual partners? (prompt-does their support influence your decision to access services?)

			• Would your family, friends, or sexual partners influence your decision to access sexual health services? How would they influence your decision? To what extent?)
Opportunity Motivation	Non-heterosexual male students were 79% less likely to access sexual health services compared to heterosexual students	Conduct separate focus group with student members of the LGBTQ community	Under *Beliefs About Consequences,* ask the following question: • Are there any harms that can occur from using the sexual health services at your university? Are there any harms that can occur from NOT using the sexual health services at your university? Under *Social/Professional Role and Identity*, ask the following question: • Do you feel like you have a responsibility to access sexual health services? Tell me about this.

			Under *Social Influences,* ask the following question: • Would your family, friends, or sexual partners influence your decision to access sexual health services? How would they influence your decision? To what extent?)

CHAPTER 6 PHASE TWO

The work in Chapter 6 also appears in: Cassidy, C., Bishop, A., Steenbeek, A., Langille, D., Martin-Misener, R., & Curran, J. (2018). Barriers and enablers to sexual health service use among university students: A qualitative descriptive study using the Theoretical Domains Framework and COM-B model. *Manuscript has been submitted.*

Statement of manuscript contribution: CC conceived the study with input from JC, AS, DL and RMM. CC collected data. CC and AB analyzed data with input from JC. CC drafted the manuscript. AB, AS, DL, RMM, and JC contributed to revising the manuscript. All authors read and approved the final manuscript.

6.1 ABSTRACT

Background: University students are within the age group at highest risk for acquiring sexually transmitted infections and other negative health outcomes. Despite the availability of sexual health services at university health centres to promote sexual health, many students delay or avoid seeking care. This study aimed to identify the perceived barriers and enablers to sexual health service use among university undergraduate students.

Methods: We used a qualitative descriptive design to conduct semi-structured focus groups and key informant interviews with university students, health care providers, and university administrators at two university health centres in Nova Scotia, Canada. The semi-structured focus group and interview guides were developed using the Theoretical Domains Framework and COM-B Model. Data were analyzed using a directed content analysis approach, followed by inductive thematic analysis.

Results: We conducted 6 focus groups with a total of 56 undergraduate students (aged 18-25) and 7 key informant interviews with clinicians and administrators. We identified 10 barriers and enablers to sexual health service use, under 7 TDF domains: knowledge; memory, attention and decision-making processes; social influences; environmental context and resources; beliefs about consequences; optimism; and emotion. Key linkages between students' social opportunity and motivation were found to influence students' access of sexual health services.

Conclusions: We identified barriers and enablers related to students' capability, opportunity and motivation that influence sexual health service use. We will use these findings to design an intervention that targets the identified barriers and enablers to improve students' use of sexual health services, and ultimately, their overall health and well-being.

6.2 BACKGROUND

The transition from adolescence to adulthood is a complex and exciting time for young adults as they begin to explore their sexual identity and sexual relationships (Alexander et al., 2015b). Although healthy sexual relationships yield many physical and emotional benefits (Higgins et al., 2011; Morgan, 2014), young adults are at risk for acquiring sexually transmitted infections (STIs) and other negative sexual health outcomes (Public Health Agency of Canada [PHAC], 2011). Evidence indicates that young adults aged 20 to 24 are more susceptible to contracting STIs than any other age group (PHAC, 2017). University students may be at an increased risk of acquiring STIs due to pressure to engage in high-risk behaviours, including excessive alcohol consumption (White & Hingson, 2014), casual sex, and inconsistent condom use (Bailey et al., 2010). As such, many university and college campuses offer a range of sexual health services to prevent and treat STIs, decrease the risk of the health consequences of STIs, and promote positive sexual health practices among students (Rogstad, Ahmed-Jushuf, & Robinson, 2002). Sexual health services include: health education, student outreach, STI testing and treatment, peer education, and condom distribution (Eisenberg, Lechner, et al., 2012). University health services are viewed as ideal 'health care homes' for students living away from their usual primary care providers (Eisenberg, Lechner, et al., 2012). Despite the existence of such services, many university students often delay or avoid seeking sexual health services. In the United States, only 27% of university students report having ever accessed sexual health services (Bersamin, Fisher, Marcell, & Finan, 2017). In Nova Scotia, Canada, only 22% of female undergraduate students and

8% of male undergraduate students report having ever accessed their university's sexual health services (Cassidy, Steenbeek, Langille, Martin-Misener, & Curran, 2018).

Multi-level barriers and enablers are known to influence sexual health service use among university students and provide some insight into the low rates of service use. Studies have predominantly focused on individual and interpersonal-level factors from the perspective of post-secondary students and young adults, including biological sex, ethnicity, age, perceived risk, stigma, and perceived norms (Moore, 2013; Wolfers et al., 2010). Perceived barriers to sexual health services among young adults include: service access (i.e., location, hours, confidentiality), service entry (i.e., waiting time, waiting environment, fear of being seen), quality of services (i.e., health care provider characteristics) and personal factors (i.e., stress associated with seeking sexual health services) (Bender & Fulbright, 2013). Few studies have explored health service-level factors from the perspective of health care providers, administrators or policy-makers (Johnston et al., 2015; Masaro, Johnson, Chabot, & Shoveller, 2012). Further, there is a paucity of literature on how university students' developmental stage, the university context, and health service characteristics merge to create barriers and/or enablers to university students' use of sexual health services.

Many researchers and organizations, including the Medical Research Council (Campbell et al., 2007) and the National Institute for Health and Care Excellence (NICE, 2004) in the United Kingdom, propose that interventions are more likely to be effective if theoretical models are used in intervention development. The Behaviour Change Wheel (BCW) is one such approach (Michie, Atkins, & West, 2014). It is a systematic, theory-based guide to intervention design based on the principles of the COM-B model, which

suggests that for any behaviour to occur there must be a change in one or more of the following: capability, opportunity or motivation. The COM-B model has also been used alongside the Theoretical Domains Framework (TDF) to better understand the influences on the target behaviour (Michie et al., 2014). The TDF is a behavioural framework consisting of 14 domains that expands on the COM-B components and captures potential mediators of behaviour change (Cane, O'Connor, & Michie, 2012). While the BCW has been used to design interventions in many contexts, such as smoking cessation (Gould et al., 2017), alcohol reduction (Michie et al., 2012), condom use (Webster et al., 2016), and sexual counselling (Mc Sharry, Murphy, & Byrne, 2016), it has yet to be applied to the use of sexual health services by university students. Therefore, the aim of this study was to use the COM-B model and TDF to identify barriers and enablers for students' use of sexual health services on campus to inform the design of future interventions to promote sexual health service use among university students.

6.3 METHODS

6.3.1 Design

A larger, three-phased mixed methods study is being conducted to develop a theory-based intervention to improve university students' use of sexual health services. Full study methods and Phase 1 study results have been published elsewhere (Cassidy, Steenbeek, Langille, Martin-Misener, & Curran, 2017; Cassidy, Steenbeek, et al., 2018). This present study was Phase 2 in the intervention design process. We used a qualitative descriptive design (Lambert & Lambert, 2012; Sandelowski, 2000) to conduct semi-structured focus groups with students and key informant interviews with health care

providers and administrators to identify barriers and enablers to sexual health service use among university undergraduate students.

6.3.2 Setting

Participants were identified from two universities in Nova Scotia, Canada that offer on-campus sexual health services. University A is large urban university, with approximately 13,600 undergraduate students (45% male; 55% female). University A's health centre staffs nine full-time physicians, three registered nurses, and one advanced practice nurse. University B is a small, rural university, with approximately 3,500 undergraduate students (42% male; 58% female) (Association of Atlantic Universities, 2013). University B's health centre staffs five part-time physicians and one full-time registered nurse. Both universities offer general health care and sexual health services to their student populations, including STI/HIV and Pap testing, sexual health education, birth control counselling, and emergency contraception.

6.3.3 Participants

Focus group participants were university undergraduate students, aged 18-25, from the two universities who had or had not accessed their university sexual health services in the past. In our Phase 1 analyses, we found different patterns of sexual health service use among students who self-identified as male, female, and members of the LGBTQ community (Cassidy, Steenbeek, et al., 2018). As a result, we used a stratified purposive sampling strategy with snowballing sampling techniques (Teddlie & Yu, 2007) to identify participants from these three subgroups. Interview participants were health care providers (physicians and nurses) and administrators (directors and managers) from the two university health centres.

6.3.4 Procedure

Focus group and interview guides were developed based on the COM-B model of behaviour and the 14 domains included in the TDF (Appendix F). We developed two to three questions per domain using existing guidance from Atkins et al. (2017). Additional prompts were prepared to probe domains if further clarification was needed. Further, we added questions within the TDF domains that probed or expanded on Phase 1 results (Cassidy, Steenbeek, et al., 2018). We tested the focus group guide with three university undergraduate students and interview guide with one administrator to identify any confusing terminology or concerns about the questions. The focus group and interview guides were then refined based on the feedback.

6.3.4.1 Student Focus Groups

A consent form was reviewed and signed by each participant prior to each focus group (Appendix D). Students were provided an honorarium for their participation in the form of a $30 grocery store gift card. The focus groups lasted between 40-60 minutes. All focus groups were audio-recorded, transcribed verbatim and anonymized prior to analysis. Additional field notes were also taken by either the RA or interviewer.

6.3.4.2 Health Care Provider and Administrator Interviews

The consent form was sent via email to participants prior to the interview (Appendix E). It was reviewed at the beginning of the interview and verbal consent to participate was obtained. Health care provider and administrator participants were offered a $10 honorarium for their participation. The interviews lasted between 15-30 minutes. They were audio-recorded, transcribed verbatim, and anonymized prior to analysis.

6.3.5 Data Analysis

Focus group and interview transcripts were combined to provide one complete dataset for analysis. Data were analyzed using a directed content analysis approach (Hsieh & Shannon, 2005) followed by inductive thematic analysis (Atkins et al., 2017; Braun & Clarke, 2006). All transcripts were coded in NVivo 11 (QSR International, 2015). First, two reviewers (CC, AB) read the transcripts and categorized similar statements into the three COM-B categories and further into the 14 TDF domains. One reviewer (CC) coded all focus groups and key informant interviews, while a second reviewer (AB) independently reviewed three focus group transcripts and two interview transcripts. Coding stripes on NVivo were compared for consistency in coding and a codebook was finalized for the remaining analyses. Second, an inductive coding approach was used to generate subcategories of participants' specific beliefs within the initial coding scheme of the 14 TDF domains. A specific belief is a group of similar responses that suggest the belief may influence the target behaviour (Atkins et al., 2017). Third, the coded data were further inductively examined to generate themes that represent the barriers and enablers perceived to influence students' sexual health service use. Lastly, the student focus group and health care provider/administrator key informant interview data were compared for areas of agreement, partial agreement, silence, or dissonance between findings from the students focus groups and health care provider/administrator key informant interviews (O'Cathain, Murphy, Nicholl, et al. 2010).

6.3.6 Member Checking

Following the deductive and inductive data analyses, we brought the initial themes to a group of students at each university for member checking. Member checking involves verification of the emerging themes and inferences, and provides participants with the opportunity to offer clarification, add information, and prioritize the initial themes (Creswell & Miller, 2000; Lincoln & Guba, 1985).

6.3.7 Ethics

The study was approved by the Research Ethics Boards at both University A and University B (REB #2016-3917; #16-50). Written informed consent was obtained from all focus group participants and verbal consent was obtained from all interview participants.

6.4 RESULTS

We conducted six focus groups, including one with male students, one with female students, and one with student members of the LGBTQ community, from each of the two universities (N=56). Further, we conducted seven key informant interviews with two administrators, three physicians and two nurses (Table 6-1).

Table 6-1. Focus group and key informant interview participants.

Participants	University A	University B
Focus Groups (N=56)		
Male Students	10	9
Female Students	14	12
LGBTQ Students	6	5
Total	*30*	*26*
Key Informant Interviews (N=7)		
Administrators	1	1
Physicians	3	0
Nurses	1	1
Total	*5*	*2*

Following data analysis, we conducted two member checking exercises with a group of seven University A students and four University B students. These students had also participated in the original focus groups. All students confirmed that our understanding of their perceived barriers and enablers to sexual health service use were accurately reflected in these initial themes. Together, minor refinements were made to the wording of the themes to better reflect their perspectives on sexual health services and students further described relationships between the themes. Overall, the focus group and interview participants identified several barriers and enablers to university students' use of sexual health services. Below we describe how the data align with the COM-B model and TDF (Tables 6-2 and 6-3).

Table 6-2. Barriers and enablers to sexual health service use among university undergraduate students.

COM-B	TDF Domain	Themes	Belief Statements	Participant*	
				Students	HCP/ Admin
Capability	*Knowledge*	1. Limited sexual health knowledge and awareness	Knowledge and awareness of the services is important to know when and how to access First year students lack sexual health-related knowledge and find it difficult to remember where to go or how to access services Students have questions but do not know where to go, which can lead to a cycle of misinformation Students have go-to informants for sexual health information, including Residence Assistants (RAs) and the internet	✓	✓
		2. Lack of clarity for LGBTQ students	LGBTQ students do not always understand what they are at risk for or what services they should be accessing Some health care providers do not feel confident providing sexual health care to LGBTQ students	✓	✓
	Memory, Attention, Decision-Making Processes	3. Visibility of sexual health services	Certain prompts and reminders help students to remember to access their sexual health services, including emails, posters, Facebook groups Sexual health service use can be a game of hide and seek – students have to go searching for information related to the health clinic	✓	✓
Opportunity	*Social Influences*	4. Health care provider interaction	Students favour seeing the same health care provider for continuity in their care Student-HCP interaction (both positive and negative) during a sexual health visit impacts their experience with care and willingness to return	✓	✓
		5. Peer influence	Supportive friends promote access of sexual health services There is a stigma related to accessing sexual health services which prevents service use	✓	-

			Seeing classmates at the clinic is uncomfortable Female students felt a sense of responsibility to access sexual health services to protect both themselves and their partner's health.		
	Environmental Context and Resources	6. Campus culture	University culture promotes sexual experimentation and exploration, risk taking behaviour, and avoidance of health promotion behaviours such as sexual health service use It is important to have sexual health services available in an environment that promotes risk-taking behaviour	✓	-
		7. Accessibility of services	Financial access: students are paying into the wellness fund, so they feel as so they should use the services Hours of operation can help or hinder students' access depending on their flexibility Location of services is an important characteristic Wait times hinder students' access; students are forced to miss class due to wait times	✓	✓
Motivation	*Beliefs about Consequences*	8. Period of exploration and experimentation	University is a time of sexual exploration and risk-taking behaviours; it is important to have these services available during this period	✓	-
	Optimism	9. Normalizing sexual health	Some students are seeing trends towards normalizing sexual health and access of sexual health services There is a trend towards sex-positivity which supports service use	✓	✓
	Beliefs about Consequences and Emotions	10. Stigma, privacy and confidentiality	There is still a stigma related to accessing sexual health services Students feel a range of emotions when accessing sexual health services (awkward, discomfort, frustration, shame) Services that value privacy and confidentiality can mitigate the negative emotions	✓	✓

* ✓ = Agreement by participants; - = Silence by participants; *HCP*, health care provider; *Admin,* university administrator

6.4.1 Capability

Students' psychological capabilities influenced their use and non-use of sexual health services on campus. Psychological capability is defined within the COM-B model as the capacity to engage in the necessary thought processes, such as comprehension and reasoning (Michie et al., 2014).

6.4.1.1 Limited Sexual Health Knowledge and Awareness

Student participants identified their lack of knowledge and awareness of sexual health services, particularly during their first year of undergraduate studies, as an important barrier. Students felt overloaded with new information during their first-year orientation and found it difficult to remember information related to sexual health services throughout the year. Participants also reflected on questions they had related to sexual health but did not know where to seek information, which often leads to a "cycle of misinformation".

> *"And a lot of students come from out of province, and they're here, and they're just like, 'Wait, I have to go to the hospital to do this?' And it becomes like a cycle of misinformation. And it took me a long time to figure out all those things."* – University A FG #1

Students would often seek out key informants (e.g., residence assistants, peers) with their questions related to sexual health services. These key informants were deemed to be an important enabler of sexual health services.

> *"I found that when I was a resident at least, and this was only a year ago, that the RAs [Residence Assistants] were great with making us aware of like consent and*

sexual health awareness and stuff like that…the RAs are primarily where I got the information about where to go and who to see." –University B FG #2

Health care provider and administrator participants also stressed the need to enhance sexual health promotion and education amongst university students, particularly for students entering their first year.

6.4.1.2 Lack of clarity for LGBTQ students

Participants from the LGBTQ community described a lack of clarity regarding when and why they needed to access sexual health services. Students stated that they do not always understand what STIs they are at risk for contracting or transmitting. This is further complicated by their interactions with clinicians who are also not always clear on what LGBTQ students need with respect to STI testing.

"I found there's been like an interesting assumption that like I know what I need to be tested for. Like I've been asked like, 'Oh, do you want to be tested for HIV, do you want…' And I'm like, 'I don't know what I need to be tested for.' Especially because like as a woman who sleeps with women, it's like I don't really know. We don't really have a lot of education around what we could be exposed to. So I'm just kind of like, "Test me for what you think I need to be tested for." - University A FG #3

Some health care providers have specialized training in sexual health care provision for LGBTQ patients. Other health care provider participants described themselves as less confident with caring for LGBTQ students and sought out colleagues with advanced training in LGBTQ health to ask questions.

"And sometimes for me, like I don't have a lot of experience with like the trans community and those different types of communities. So sometimes I'm uncomfortable." – University B Health Care Provider Interview

6.4.1.3 Visibility of Sexual Health Services

Students believed that enhanced visibility of sexual health service information would help to improve students' access. Some students felt that they were playing a game of 'hide and seek' when trying to access sexual health services, as they had to go searching for information.

"Like my partner and I have like actually searched for it, and we couldn't find it. So we ended up just going to the doctor. But we've actually been looking for it and we just didn't know where to check." – University A FG #1

Participants recommended using prompts and reminders to improve access and promote visibility. Students suggested regular emails and posters with sexual health service information and having recurring mobile clinics in high-traffic areas and at consistent times to promote visibility and accessibility of the services. Similarly, clinician and administrator participants also identified the need for improved advertisement. One administrator at University B stated: *"[We] need to highlight who we are, where we are, and what we do."*

6.4.2 Opportunity

Barriers and enablers within the social and physical university environment shaped the opportunities for students' use of health services. Social opportunity refers to the social factors that influence the way that we think about things (i.e., cultural norms,

social cues). Physical opportunity is afforded by the environment (i.e., time, location, resources) (Michie et al., 2014).

6.4.2.1 Health Care Provider Interaction

Student participants recalled their previous experiences with the university health clinic and how it influenced their perceptions of sexual health services. Student-health care provider interactions (both positive and negative) during a sexual health-related visit impacts students' experience with care and willingness to return. For example, students favoured seeing the same clinician at each visit because it provided them with an opportunity to build a trusting relationship.

> *"I've had like situations where… well, like the doctor that I see regularly, he always is like if there's something wrong like I'll call you. And I guess I have a relationship with him that way so I don't mind waiting in that way."* – University A FG#2

> *"I had a bad experience with one particular doctor, and I didn't know which days they would be working. And if I needed to go that day, and there were the only one working, then I wouldn't want to go there."* - University B FG #1

LGBTQ students also identified their interactions with health care provider as an important barrier to accessing sexual health services. Students stated that their health care providers often assume they are in a heterosexual relationship, and subsequently, they are frustrated when they have to reiterate their sexual orientation at each visit. Participants stated these interactions added further confusion to their visit, and negatively influenced their willingness to return.

"Even though I go to the same doctor, she often forgets that I'm gay. And so I repeatedly have to come out to her in terms of like if… Like she'll just see my file and see that I'm not on birth control, and she'll be like, "Why aren't you on birth control?" … And I have to like disclose again. And it's just kind of uncomfortable because it's like why don't you remember this?" - University A FG #3

Findings from health care provider interviews also highlighted the importance of building trusting relationships between clinicians and students. Health care provider participants reiterated the importance of the nurse-student relationship, as they are often the first point of contact for students and have more time to spend with patients. They found that avoiding medical jargon and using a common language with students was useful for building relationships with students. Participants also stated that continuity of care is critical to encourage students, particularly LGBTQ patients, to return to the clinic.

"I think being able to talk to a student in a language…. to be able to find a common language. Because you know, if you're just using very medical terminology, that doesn't always…it's not always understood by the patient." – University A Health Care Provider Interview

6.4.2.2 Peer Influence

Students identified the positive and negative influence of peers on their use of sexual health services. Several students described accessing sexual health services as a social activity, where they support one another by going to the clinic together.

"Any time that I know that there's a pop-up clinic or anything going on, like I'll text my roommates and be like what's happening. I mean it's not related to that

but like it's just… it's kind of a fun thing to do together…. and you know, you can make a little date out of it with friends." – University A FG#1

Other students described the stigma related to accessing sexual health services, specifically focusing on the discomfort of seeing other classmates at the clinic. This barrier was especially relevant for participants from University B, where knowing other students on campus was highly probable and accessing sexual health services could impact their social status or how they were viewed amongst their peers. For example, one male student at University A stated: *"You don't want to be that guy…. that guy with an STD. Nobody wants to be patient zero."* Another student described the stigma from their perspective:

"I mean there's still a stigma around people going to access these services and just people as sexual human beings. So I think when you have it on campus, there's always a fear that you're going to bump into someone that you know, and you don't know how they're going to receive that. I think most of the people are like, "Good for you." Like that's a good thing to go do. But you never really know how people are going to react and who you're going to see there." – University A FG #3

6.4.2.3 Campus Culture

Students expanded on the influence of peers and described that the campus culture promotes partying and risk-taking behaviours, such as alcohol and drug use, casual sex, and inconsistent condom use. Students believed this environment does not always support health promotion behaviours and can lead to the avoidance of sexual health services.

Students highlighted the importance of having a safe environment, such as accessible sexual health services, to engage in risk-taking behaviour.

> *"And I agree, like I think it's super important at this stage especially just because like of different things that come with the culture and experimenting."* – University A FG #2

> *"Like obviously if you're like sexually active and like you're engaging in multiple partners, like because this is university and everyone's so out there and experimenting with so many different things, that like it's good to go get yourself checked out and like make sure your partners are checked out."* – University B FG #3

6.4.2.4 Accessibility of Services

The accessibility of sexual health services was seen as both a barrier and enabler to students' use. Services are financially accessible, as students did not have to pay out-of-pocket for services. Further, some participants felt compelled to use the services since they were paying into a wellness fund each semester. The location of services was seen as an important aspect for many students. University A students valued having a clinic that was visible on campus and was seen as a safe and welcoming place.

> *"At the same time, I like accessing services on campus because I feel like campus is a safe place. Like I'm here every day and I love it, I'm familiar with it. So I like it in that sense."* – University B FG #1

University B students, however, felt that they had to go searching for the clinic as it was not clearly visible on campus. This in turn created an unwelcoming atmosphere.

"It's right underneath [Building Name]. So like it's right underneath like a res[idence]. And it's like it's just an awkward placement. And it's not really like there it is. Like you have to like really walk by and then see it." – University B FG #2

Clinic hours of operation can also help or hinder students' access of sexual health services. Student participants described difficulties with accessing services that are only open during class times. University A students appreciated the opportunity to schedule appointments in the evenings and on weekends. This service was not available to University B students who were then faced with having to decide whether to miss class in order to access the services. Similarly, students discussed how they are often forced to miss class due to wait times, which in turn, impacted the likelihood of them returning to the clinic.

"The only time I went to the on campus health clinic for sexual health, I waited there for probably about an hour and a half or two hours. And I was missing my classes. And I went up to the receptionist and I said, you know, I'm missing my classes. You know, I have a quiz today. I can't just, you know, skip my quiz but I need this [STI] test. And she said, "Oh, like I can try but I can't do anything for you." So I left and I never went back there. Because like when can you find the time to again skip your classes" – University B FG #1

Health care provider and administrator participants recognized that hours of operation make it difficult for students to access the clinics. To improve accessibility, both universities employ registered nurses to provide student outreach and sexual health promotion and prevention initiatives across campus. As well, providers at University A

indicated the presence of weekly mobile STI testing clinics helped to facilitate students' access of sexual health services.

6.4.3 Motivation

Several barriers and enablers tapped into students' motivations, which are defined as the brain processes which direct our decisions and behaviours. The COM-B model differentiates between automatic motivation (i.e., emotions and impulses) and reflective motivation (i.e., evaluations and plans) (Michie et al., 2014).

6.4.3.1 Period of Exploration and Experimentation

Student participants described their university experience as a period of sexual exploration and experimentation, which was seen as a motivator for accessing sexual health services. Since sexual experimentation and exploration is a normal aspect of growth and development, students believed it to be important to have sexual health services available to them during this time.

> *"It's needed, point blank. Especially I think at this age where, I don't know, people I guess are maybe experimenting.... And like trying different things like meeting people and all that kind of stuff. So it puts you in situations where you need those kind of services maybe more so than at other stages in your life."* – University A FG #1

6.4.3.2 Normalizing Sexual Health Matters

Participants described the importance of normalizing sexual health matters to improve access to sexual health services. Students are starting to see trends towards normalizing sexual health and creating a sex-positive environment. Further, while female students in heterosexual relationships indicated they felt that the responsibility for STI

testing currently lies with them in their relationships, they were optimistic that with enhanced sex positivity there may be a shift toward a shared responsibility amongst male partners.

> *"I think I'm optimistic just because of how normalized it is around campus. And I think like the pop-up clinics do a really good job of normalizing it. And like I know res[idence] life and having those like let's talk about sex things, it really opens the conversation."* – University A FG #1

6.4.3.3 Stigma, Privacy and Confidentiality

Student participants described the stigma related to accessing sexual health services which can lead to a range of emotions including discomfort, frustration, and shame. A lack of privacy and confidentiality when accessing the services can jeopardize students' satisfaction with care and willingness to return and leads to these negative emotions. When students feel their privacy and confidentiality is maintained, they are more comfortable with accessing the services.

> *"I don't like seeing other students, especially if I'm there for sexual health reasons. And I've had bad experiences in the past where they would say out loud that like I'm there for a pap test. And it's a small place. So like people in the waiting room could hear that. And it just made me uncomfortable."* – University B FG #2

Health care provider and administrator participants also recognized the importance of maintaining privacy and confidentiality with university students. They identified this as a critical component to building a trusting relationship.

"Because there's an awful lot of personal anxiety around sexual health. Clearly there are barriers to conversation and communication. So obviously stressing confidentiality and expressing some comfort in conversation is important for them to open up about their own anxiety and concern." – University B Health Care Provider Interview

Table 6-3. Barriers and enablers to sexual health service use: Salient domains from the TDF mapped to the COM-B.

Barriers and Enablers	**COM-B and TDF Domains**						
	Capability		**Opportunity**		**Motivation**		
	Psychological		**Social**	**Physical**	**Reflective**		**Automatic**
	K	**MAD**	**SI**	**E**	**CO**	**OP**	**EM**
Limited Sexual Health Knowledge	✓						
Lack of Clarity for LGBTQ Students	✓						
Visibility of Sexual Health Services		✓					
Health Care Provider Interaction			✓				
Peer Influence			✓				
Campus Culture				✓			
Accessibility of Services				✓			
Period of Exploration and Experimentation					✓		
Normalizing Sexual Health						✓	
Stigma, Privacy and Confidentiality					✓		✓

Note. K, Knowledge; MAD, Memory, Attention, and Decision-Making Processes; SI, Social Influences; E, Environmental Context and Resources; CO, Beliefs about Consequences; OP, Optimism; EM, Emotion.

6.5 DISCUSSION

In this study, we used the COM-B model and TDF to identify barriers and enablers to sexual health service use from the student, health care provider, and administrator perspective. Our findings illustrate barriers and enablers at the individual, interpersonal, and health service levels. The COM-B model and TDF enabled a comprehensive theoretical analysis of university students' capability, opportunity, and motivation and how these components work together to influence their sexual health behaviours.

Our findings suggest that limited sexual health knowledge is a barrier to sexual health service use among university students. Carroll, Lloyd-Jones, Cooke, and Owen (2012) found similar results in a systematic review of the reasons for use and non-use of school sexual health services among young adults: participants did not use the services because they were unaware that services existed or did not know what was available. As our study participants identified, students enter into their first year of university with diverse sexual experiences and varying levels of sexual health knowledge. Many participants were not aware of the sexual health services that are provided on campus or the reasons for accessing these services when they started their university journey. These findings expand on our previous quantitative results where undergraduate students in higher years of study were more likely to access sexual health services on campus (Cassidy, Steenbeek, et al., 2018). One way to improve students' capability of accessing sexual health service use is to provide more education with respect to availability of health care services and how to access these services. For example, student participants recommended delivering prompts or reminders of key messages throughout the year to avoid being overwhelmed with new information during their first week of orientation.

Previous research has found that non-heterosexual young adults and university students are less likely to access sexual health services (Diamant, Wold, Spritzer, & Gelberg, 2000; Kerr, Ding, & Thompson, 2013). We found similar results in our quantitative study where non-heterosexual female students were 63% less likely to access sexual health services on campus compared to heterosexual students, and non-heterosexual male students were 79% less likely to access sexual health services on campus compared to heterosexual male students) (Cassidy, Steenbeek, et al., 2018). LGBTQ participants in the current study were uncertain about when to access sexual health services and did not know what illnesses they were at risk for. Further, our results support previous research on health care providers' perceived challenges with providing LGBTQ health care (Knight, Shoveller, Carson, & Contreras-Whitney, 2014; Ontario HIV Treatment Network, 2015; Sekoni, Gale, Manga-Atangana, Bhadhuri, & Jolly, 2017). These findings suggest that addressing both student and health care providers' capabilities, including knowledge on LGBTQ health, and promoting a welcoming, nonjudgmental, and confidential environment may facilitate students' sexual health service use.

Students also described the physical opportunity, including service accessibility and campus culture, as both a barrier and enabler to sexual health service use. Because the campus culture promotes risky behaviours and avoidance of health promotion behaviour, student participants described the importance of having accessible sexual health services, including flexible hours of operation, convenient location, and mobile clinics. Service access is well-documented in the literature as a common barrier and enabler of sexual health service use among young adults and university students

(Bersamin et al., 2017; Carroll et al., 2012). Our findings suggest that service providers need to ensure sexual health services are delivered in a safe, accessible environment before they can tap into students' motivations for accessing the services.

The findings indicate a strong link between students' social opportunity and their motivation to access sexual health services. Student participants placed both positive and negative peer influence at the core of the relationship between social opportunity and motivation. Evidence has shown that peer norms influence university students' attitudes and behaviours as they navigate the emerging adulthood developmental stage and begin to address issues of identity and intimacy (Arnold, 2010; Stinson, 2010; Theunissen et al., 2013). This helps to explain the value our participants placed on privacy and confidentiality of the services to avoid being seen by their peers. This is a consistent finding in the sexual health literature, particularly with young adults (Carroll et al., 2012) and university students (Chanakira et al., 2015; Chanakira, O'Cathain, Goyder, & Freeman, 2014): A lack of privacy and confidentiality can lead to feeling stigmatized, uncomfortable, judged, and shameful and an unwillingness to access sexual health services (Balfe & Brugha, 2010; Theunissen et al., 2013). Student participants also indicated that peer support helped to normalize sexual health. Students felt comfortable discussing sexual health matters with their peers and accessing health services together. Similarly, studies have found that social support can influence help-seeking attitudes and behaviours (Latkin & Knowlton, 2015; Theunissen et al., 2013; World Health Organization, n.d.) and likelihood of being tested for STIs (Oliver de Visser & O'Neill, 2013).

Health care provider-student interaction was also seen as both a barrier and enabler to sexual health service use. Student participants described their relationship with their health care provider as an important factor in deciding whether to return to the clinic. Our findings are supported by a previous systematic review of young peoples' views on the reasons for use and non-use of school sexual health services (Carroll et al., 2012). The review found that participants accessed sexual health services because the staff were welcoming, comforting, friendly, nonjudgmental, and good listeners. Similarly, findings from the World Health Organization show that young people report staff attitudes as the most important issue that attracted them to the health service or that led them to return (World Health Organization, 2015). Overall, social opportunity for students to access sexual health services appears to exist as a spectrum with stigma on one end and supportive relationships on the other. Future interventions should aim to overcome the social barriers and leverage the social enablers to motivate students to access sexual health services.

6.6 LIMITATIONS

Study findings must be interpreted with the following limitations in mind. First, we recruited participants from two universities in Nova Scotia, Canada, which may not be representative of universities in other provinces and countries. However, through our inclusion of both a rural and urban university, the transferability of our findings may be improved. Second, our focus group methods may have introduced social desirability bias. We aimed to mitigate such bias by conducting separate focus groups for different subgroups. Lastly, due to challenges recruiting part-time clinicians from a small population (N=6), only one clinician participated from University B. Despite these

limitations, the COM-B model and TDF offered a systematic, theory-driven approach to identify barriers and enablers to sexual health service use among university students. By using the COM-B model of behaviour in combination with the TDF, we were able to first conceptualize the findings more broadly within students' capability, opportunity, and motivation, and then use the TDF domains to provide a more granular understanding of the barriers and enablers. Using this deductive analysis approach can potentially lead to a restriction of the findings to the COM-B components and TDF domains; however, by combining the deductive analysis with an inductive thematic analysis, we were able to identify overarching themes of barriers and enablers to sexual health service use. The next step in this intervention design process is to use the BCW to select intervention components aimed at overcoming the barriers and enhancing the enablers identified in this study.

6.7 CONCLUSION

Our findings highlight a range of factors related to students' capability, opportunity and motivation that require attention to improve their use of sexual health services. It is clear that tailored, multi-level interventions are needed to target barriers and enablers at the individual, interpersonal and health system levels. Using a theory-based approach, we identified ten barriers and enablers to sexual health service use among university students related to students' capability, opportunity and motivation for accessing these services. Based on these findings, we recommend that researchers, health care providers, and university administrators tailor sexual health service interventions to target the identified barriers and enablers to improve students' use of sexual health services, and ultimately their overall health and well-being.

CHAPTER 7 POST-PHASE 2 SCRIPT

The previous chapter outlined ten barriers and enablers to student sexual health service use related to three essential factors; student's capability, opportunity, and motivation. The following chapter provides more details on Phase 2 data analysis, including member checking and mixed methods data integration. Further, this chapter presents specific contextual data related to University A and B that helped to inform the final intervention design phase.

7.1 MEMBER CHECKING AND CONCEPT MAP

As previously discussed, the Phase 2 findings illustrate barriers and enablers to sexual health service use that fall within the three COM-B model components (Michie, Atkins, & West, 2014) and seven TDF domains, including: knowledge; memory, attention and decision-making; social influences, environmental context and resources; beliefs about consequences, optimism, and emotions (Cane, O'Connor, & Michie, 2012). I created a concept map to illustrate the study findings and help conceptualize the link between students' capability, opportunity, and motivation for accessing sexual health services. First, I started with the barriers and enablers grouped under the COM-B components. Second, I used arrows to connect the barriers and enablers that were found to be interrelated. Third, I refined the concept map during the member checking exercise with student participants (Chapter 6). I posted the barriers and enablers on a whiteboard and asked students to pose clarification questions, refine theme names, and describe the relationships between the barriers and enablers. During this discussion, I drew arrows between the themes to represent a relationship between two or more barriers/enablers. This approach is not commonly used with the TDF, as this framework does not explicitly

specify formal relationships between domains (Atkins et al., 2017). However, the COM-B model outlines how the components interact by interlinking arrows (i.e., increasing opportunity or capability can increase motivation and vice versa) (Michie et al., 2014). As such, by using the COM-B in combination with the TDF, I was able to explore these relationships with the student member checking participants. The final concept map illustrates the interconnecting relationships of the barriers and enablers within each of the COM-B components (Figure 7-1).

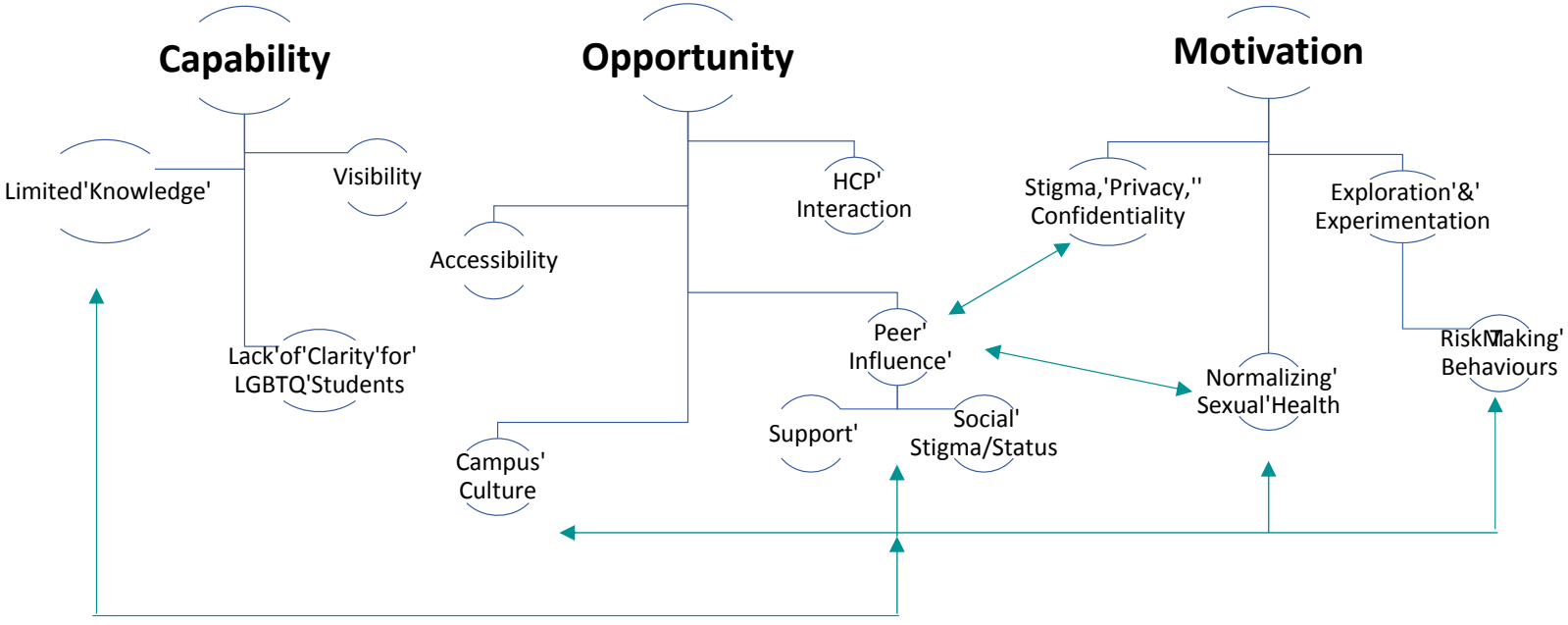

Figure 7-1. Concept map of barriers and enablers to sexual health service use refined during member checking exercise.

7.2 MIXED METHODS DATA INTEGRATION

Data integration is a fundamental component of mixed methods research. Integrating two forms of data helps to assess the validity of quantitative results and explain qualitative findings (Fetters, Curry, & Creswell, 2013; O'Cathain, Murphy, & Nicholl, 2010). After Phase 2, I used a triangulation protocol to merge the quantitative survey data and qualitative focus group and interview data. A triangulation protocol is a detailed approach to examine meta-themes across findings from different data sources that have already been analyzed individually (Farmer, Robinson, Elliott, & Eyles, 2006). First, I created a convergence-coding matrix to cross-tabulate the quantitative results with qualitative themes (Table 7-1). Next, I identified where the quantitative and qualitative findings agree (*convergence*), offer complementary information on the same issue (*complementarity*), contradict each other (*discrepancy*) (O'Cathain et al., 2010) or where findings from one dataset were not found in the other (*silence*) (Farmer et al., 2006). This approach led to a more comprehensive understanding of the quantitative and qualitative findings and how they relate to the COM-B components. The data integration findings are described below. Overall, Phase 2 strengthened the evidence related to three TDF domains and added new evidence within four TDF domains (Figure 7-2).

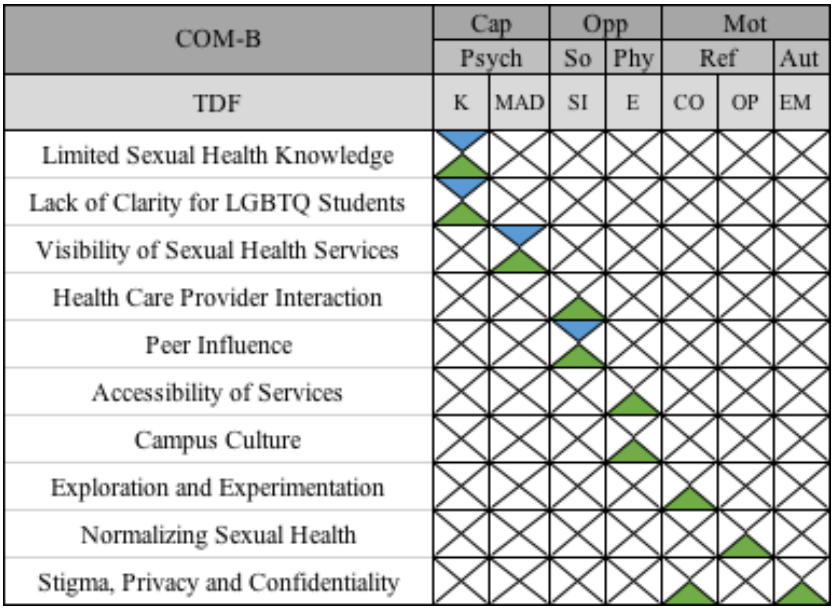

Figure 7-2. Salient TDF domains and COM-B components influencing sexual health service use from Phases 1 and 2.

Legend: *Blue* Phase 1 secondary analysis of online survey, *Green* focus group and interviews with students, health care providers, and university administrators; *Cap* capability, *Opp* opportunity, *Mot* motivation, *Psych* psychological, *So* social, *Ref* reflective, *Aut* automatic; *K* knowledge, *MAD* memory, attention and decision-making, *SI* social influences, *E* environmental context and resources, *CO* beliefs about consequences, *OP* optimism, *EM* emotion

7.2.1 Capability

In Phase 1, undergraduate students' sexual health knowledge score was not found to be a significant predictor of sexual health service use on campus. However, in Phase 2, student's limited sexual health knowledge and awareness was found to influence their use of sexual health services. The discrepancy in these data may be related to the instrument used in the survey that measured students' knowledge on STIs, emergency contraception, condoms, and pregnancy; whereas, the qualitative data focused on knowledge and awareness of sexual health services, specifically. This finding suggests that enhanced

education on sexual health services, not just sexual health in general, may facilitate sexual health service use. Further, Phase 1 results indicated that students in higher years of study are more likely to access sexual health services. This may be explained by the fact that students in higher years of study have more time to become familiar with the services offered on campus. These findings highlight the importance of identifying opportunities to target first-year students of any age with sexual health education, such as first-year student orientation, to improve their use of sexual health services.

The qualitative findings on students' psychological capabilities provided insight into why non-heterosexual students are less likely to access services (Cassidy, Steenbeek, et al., 2018). Phase 2 findings suggest that students from the LGBTQ community do not always understand what they are at risk for and as a result, do not always know when they should be accessing sexual health services. Further, some health care providers do not feel confident providing sexual health care to LGBTQ students. These findings contribute to the sexual health education literature for members of the LGBTQ community and health care providers (Kerr, Ding, & Thompson, 2013). However, future research is needed to delve into the unique barriers and enablers to sexual health service use among LGBTQ students in greater detail.

7.2.2 Social Opportunity and Motivation

Our qualitative findings strengthened our understanding of the interplay between social opportunity and motivation for accessing sexual health services. Students described the impact of positive and negative peer influence on their motivations to access sexual health services. Some students described the stigma related to accessing sexual health services and fear of being seen by their peers. Other students described

accessing sexual health services as a social activity, where they support one another by going to the clinic together. These findings help to explain our previous quantitative study results on the influence of social support on sexual health service use and contributes to an important gap in the literature.

Research has shown that males and females use sexual health services for different reasons and at different rates (Cragg, Steenbeek, Asbridge, Andreou, & Langille, 2016; Moore, 2013). Our Phase 1 findings align with previous research on this topic: 22% of females and 8% of males reported having ever accessed sexual health services on campus. Our qualitative findings offer an additional explanation for why more female students have accessed sexual health services than male students: Heterosexual female student participants felt as though the responsibility to access sexual health services was always placed on them, as opposed to their male partners. Similarly, Darroch, Myers, and Cassell (2003) conducted qualitative interviews with 24 heterosexual partners (12 men; 12 women) diagnosed with chlamydia infection on their experience with STI testing and found that women expressed more protective attitudes towards their partner's sexual health. This greater sense of responsibility to protect both themselves and their male partners' health is another reason why the rates of sexual health service use are different between males and females.

Overall, several barriers and enablers identified in Phase 2 were not found in the Phase 1 secondary analysis. It is evident that the focus groups and key informant interviews built on the Phase 1 findings and provided a greater understanding of the barriers and enablers to students' sexual health service use (Table 7-1). The integrated findings were used to inform the next phase of intervention design.

Table 7-1. Triangulation matrix for Phase 1 and 2 findings.

Phase 1 Quantitative Results	Phase 2 Qualitative Results		Convergence Assessment
	Barriers and Enablers	***Belief Statements***	
Capability			
Non-heterosexual female students were 63% less likely to access sexual health services compared to heterosexual female students (OR 0.37, 95% CI [0.16, 0.84], p=0.018)	Lack of clarity for LGBTQ students	LGBTQ Students do not always understand what they are at risk for Some health care providers do not feel confident providing sexual health care to LGBTQ students	Complementarity
Non-heterosexual male students were 79% less likely to access sexual health services compared to heterosexual students (OR 0.21, 95% CI [0.06, 0.83], p=0.026)	Lack of clarity for LGBTQ students	LGBTQ Students do not always understand what they are at risk for Some health care providers do not feel confident providing sexual health care to LGBTQ students	Complementarity
Students' sexual health knowledge score was not found to be a significant predictor of sexual health service use on campus	Limited sexual health knowledge and awareness	Knowledge and awareness of the services is important to know when and how to access First year students lack sexual health-related knowledge and find it difficult to remember where to go or how to access services	Discrepancy
Students in higher years of study were more likely to access sexual health services than students in first year (p values < 0.003)	Visibility of sexual health services	Certain prompts and reminders help students to remember to access their sexual health services, including emails, posters, Facebook groups	Complementarity

Phase 1 Quantitative Results	Phase 2 Qualitative Results		Convergence Assessment
	Barriers and Enablers	***Belief Statements***	
Social Opportunity			
With every one unit increase on the sense of support scale, female students were 3% more likely to access sexual health services (OR 1.03, 95% CI [1.01, 1.05], p=0.017)	Peers influence students access of sexual health services	Supportive friends promote access of sexual health services	Complementarity
Males and females have different rates of sexual health service use (8% of male and 22% of female students have ever accessed sexual health services on campus)	Peers influence students' access of sexual health services	Male students do not want to access sexual health services for fear of being "that guy". Other students feared being seen by their peers.	Complementarity
		Female students feel supported in accessing sexual health services together in groups	
		Female students felt as though the responsibility was on them to access the services for their own health and their partner's health	
Opportunity & Motivation			
	Health care provider interaction	Students favour seeing the same health care provider for continuity in their care Student-health care provider interaction (both positive and negative) during a sexual health visit impacts their experience with care and willingness to return	Silence

Phase 1 Quantitative Results	Phase 2 Qualitative Findings		Convergence Assessment
	Barriers and Enablers	***Belief Statements***	
	Accessibility of health services	Wait times hinder students' access; students are forced to miss class due to wait times Hours of operation can help or hinder students' access depending on their flexibility	Silence
	Period of exploration and experimentation	University is a time of sexual exploration and risk-taking behaviours; it is important to have these services available during this period	Silence
	Normalizing sexual health	Some students are seeing trends towards normalizing sexual health and access of sexual health services There is a trend towards sex-positivity which supports service use	Silence
	Stigma, privacy and confidentiality	There is still a stigma related to accessing sexual health services Students feel a range of emotions when accessing sexual health services (awkward, discomfort, frustration, shame)	Silence

7.2.3 University Context

Intervention design relies on a comprehensive understanding of the problem and the context in which the problem occurs (Michie et al., 2014). Context is known as the physical and social environment in which the proposed change or intervention is to be implemented (Rycroft-Malone, 2004). May et al. (2007) offer a more specific definition of context: "the physical, organizational, institutional and legislative structures that enable and constrain, and resource and realize, people and procedures" (para 12). Intervention effectiveness is always dependent on context; what works in one time and setting may be ineffective elsewhere (Moore & Evans, 2017; Pawson & Tilley, 1997). As such, an assessment of context was conducted in the behavioural analysis. The TDF recognizes context in two of the 14 domains (social influences and environmental context and resources), while context is reflected in the COM-B model's 'opportunity' component. Several barriers and enablers were identified as directly related to the social and physical context of sexual health behaviours on campus. Further, by interviewing health care providers and university administrators, we were able to uncover additional contextual factors related to existing sexual health services, care delivery, and operational structures. Both universities provide a range of sexual health services, including primary and secondary prevention, treatment, sexual health counselling, and provision of contraceptives. Following a policy analysis, it was found that both universities used the *Canadian Guidelines on Sexually Transmitted Infections* to deliver sexual health services (PHAC, 2016). While many student experiences were similar, we found a number of important contextual differences between the two universities, including: size of student population; clinician knowledge on LGBTQ health; structure of health service delivery;

financial and personnel resources; and location of services (Table 7-2). These differences were important to take into consideration during the final phase of intervention design.

Although the COM-B and TDF helped to identify barriers and enablers at multiple conceptual levels, the BCW lacked clear guidance for teasing out how the contextual mechanisms function across different organizational settings. This is a common finding in the preventative health behaviour literature, as many interventions are informed by theories of individual-level behaviour change (e.g., Health Belief Model, Theory of Planned Behaviour), and lack an organizational and/or health systems level perspective (Angus et al., 2013). Other researchers have had similar experiences in using the TDF to examine multi-level behavioural problems (Birken, Powell, Shea, et al., 2017; Gould et al., 2014; Graham-Rowe et al., 2016; Sales et al., 2016; Templeton et al., 2016). The TDF is a comprehensive framework for examining multi-level barriers and enablers but it is sometimes used with other frameworks to provide a more fully-defined understanding of multi-level determinants (Birken, Powell, Presseau, et al., 2017). For example, several researchers have paired the TDF with the Consolidated Framework for Implementation Research (CFIR) to elaborate on organizational-level determinants (Atkins et al., 2017; Birken, Powell, Presseau, et al., 2017). Using the CFIR in combination with the TDF in the data collection and analysis stages of this study may have helped to more clearly depict the multiple conceptual levels and organizational context. Instead of using a TDF-based interview guide that focused predominantly on students' behaviour, I would have used an organizational-level framework (e.g., Alberta Context Tool [Estabrooks, Squires, Cummings, Birdsell, & Norton, 2009], CFIR [Damschroder et al., 2009], Organizational Readiness to Change Assessment [Helfrich,

Li, Sharp, & Sales, 2009]) to guide and analyze the key informant interviews to identify important contextual elements. From there, I would merge the interview data with the COM-B and TDF analysis of student behaviours to reflect a more multi-level understanding of students' use of sexual health services.

The following chapter outlines the process for selecting intervention content. Due to the contextual differences identified in Phase 2, it became clear that a one-size-fits-all intervention would not be feasible for University A and B. As a result, the following chapter describes the process for creating a toolbox of theory- and evidence-based intervention content that can be tailored to meet the context and resources at each university.

Table 7-2. University A and B context comparison.

COM-B & TDF Domains		University A Contextual Elements	University B Contextual Elements
Opportunity	*Social Influences*	While privacy and confidentiality were discussed, students expressed a stronger sense of anonymity due to the larger school and number of students.	The discussion around privacy and confidentiality came up more frequently at University B. Students described University B as a small university where they either know or recognize the majority of students. As such, they felt uncomfortable accessing sexual health services for fear of running into someone they know.
	Environmental Context and Resources	University A has invested substantial infrastructure into its delivery of student health services. Most notably, they have a full-time advanced practice nurse, who focuses on student wellness outreach and engagement. She develops programming to educate students in sexual health, mental health, sleep, and alcohol and substance harm reduction. She works with 50-60 nursing students each year, who are involved with program development and implementation, including mobile STI testing clinics held twice a week. Further, the advanced practice nurse runs the "Ask a Nurse" service, an online program for students to ask health-related questions anonymously. Participants highlighted the importance of this role for sexual health promotion initiatives.	Resources at University B are limited. Due to financial constraints, they had to let go of their registered nurse position in the Fall of 2017. This was a significant loss for the health services and health promotion initiatives.
		University A is resourced with a full team of interdisciplinary care providers. As a result, there are a limited number of walk-in and same-day appointments offered to improved accessibility.	Due to limited resources, the clinic staffs 5 part-time physicians. This makes it challenging for students to have timely access to health services. As a result, many students use off campus resources, including walk-in clinics. Few participants even described travelling to an urban city for sexual health care.
		Participants valued being able to see the same clinician at each visit, which allowed them to build a trusting relationship. While it was not always possible to make an urgent appointment with the clinician of their choosing, if booked in advance they were usually able to choose.	Participants described a lack of continuity in care, due to the part-time nature of the physicians. This made it difficult to build a trusting relationship with the physicians. At the time of the interviews and focus groups, there was a full-time nurse at the clinic who offered that familiar face and continuity of care for the students.

		Students viewed the new Student Health and Wellness Centre as a welcoming place. It is located on the second floor of a new residence building on campus.	Student, health care provider, and administrator participants all remarked on the poor location of the health centre, which can be found in the basement of a building on campus. It was described as unwelcoming and hard to find.
	Environmental Context and Resources; Memory, Attention, Decision-Making Processes	University A has made significant changes in the past few years in how they coordinate and deliver health services. The Student Health & Wellness Centre is located in a new building, with an interdisciplinary team that includes: registered nurses, an advanced practice nurse, physicians, social works, a psychiatrist, counsellors, registered psychologists, and health promotions experts. All health services are now located under one umbrella, as opposed to mental health and counselling under one department and general health services under a separate department. All of this information is located on one page on the university website.	There are many different sexual health-related services that work in siloes on campus. Students find it difficult to know where to go and do not always know about all the services available to them.
	Environmental Context and Resources	University A has health care provider champions in sexual health and LGBTQ health. Clinicians feel comfortable asking questions and discussing sexual health care with their colleagues.	The nurse sometimes feels ill-equipped to care for sexual health-related concerns and wishes she had more resources to learn more about sexual health care LGBTQ health.

CHAPTER 8 PHASE THREE

Chapter 8 has been prepared as a manuscript but has not yet been submitted for publication.

8.1 BACKGROUND

Sexually transmitted infections (STIs) and associated health consequences are of significant concern for young adults. In Canada, young men and women aged 20 to 24 have the highest rates of chlamydia infections (1627.6 per 100,000) (Public Health Agency of Canada [PHAC], 2017). Many university students are among this high-risk group for acquiring STIs. Effective prevention relies on regular condom use and early detection and treatment (Steen, Wi, Kamali, & Ndowa, 2009). As such, university health centres are essential for preventing negative health outcomes and promoting healthy sexual behaviours among students. Despite their risk and the availability of these services, many university students delay or avoid seeking sexual health care. In the United States for example, approximately 27% of college students have ever accessed sexual health services (Bersamin et al., 2017). In a Canadian sexual health services study of two universities in Nova Scotia, only 41% of sexually active female students and 25% of male students reported having ever been tested for STIs (Cassidy, Steenbeek, et al., 2018).

Barriers and enablers to sexual health service use include: students' knowledge and awareness of sexual health services, accessibility of services, peer influence, stigma and feelings of shame, and relationships with health care providers (Bersamin et al., 2017; Cassidy, Bishop, et al., 2018). These barriers and enablers interact with a campus culture that promotes risky behaviours and in turn, influences students' capability,

opportunity, and motivation for accessing sexual health services (Cassidy, Bishop, et al., 2018). As such, targeted interventions are needed to address these barriers and ensure adequate sexual health promotion and illness prevention for students.

Previous studies report mixed intervention effectiveness for increasing the uptake of sexual health services (Bowden et al., 2008; Friedman et al., 2014; Miller & Nguyen, 2014; Walker et al., 2010). One possible factor contributing to these mixed findings is the lack of theory underlying the development of strategies to improve sexual health service use (McDonagh et al., 2017). There is a growing body of evidence that recommends the use of theory in the development of interventions aimed at changing behaviour (Bartholomew & Mullen, 2011; Davis et al., 2015). The Behaviour Change Wheel (BCW) is one such approach that offers theory-based tools to help understand and change behaviour (Figure 8-1) (Michie, Atkins, & West, 2014). The BCW is a synthesis of 19 existing behaviour change frameworks and provides a systematic, comprehensive approach to designing interventions. At its core is the COM-B model, which suggests that behaviour change occurs when there is a change in an individual's capability, opportunity and/or motivation (Michie et al., 2014). The Theoretical Domains Framework (TDF) can be used to expand on the COM-B components and provide a more detailed understanding of the behaviours and identify what factors need to be addressed to change behaviour (Atkins et al., 2017). The BCW identifies nine intervention functions that can be linked to 93 possible behaviour change techniques (BCTs), or "active ingredients" on which to base intervention content (Michie et al., 2013). Lastly, the BCW provides guidance on selecting relevant policies and intervention modes of delivery (Michie et al., 2014). Studies have used the BCW to guide intervention design in a variety of health care

settings, including smoking cessation (Gould et al., 2017), alcohol reduction (Michie et al., 2012), condom use (Webster et al., 2016), and sexual counselling (Mc Sharry et al., 2016).

This study was the final phase of a mixed methods study guided by the BCW and aimed at developing a behaviour change intervention to improve sexual health service use among university undergraduate students in Nova Scotia, Canada (Cassidy, Bishop, et al., 2018; Cassidy, Steenbeek, Langille, Martin-Misener, & Curran, 2017; Cassidy, Steenbeek, et al., 2018). The objectives of this final study were to: 1. Build a toolbox of theory- and evidence-based intervention strategies that can be used to improve the use of sexual health services among university students; and, 2. Describe the utility of the BCW in the area of sexual health service intervention development.

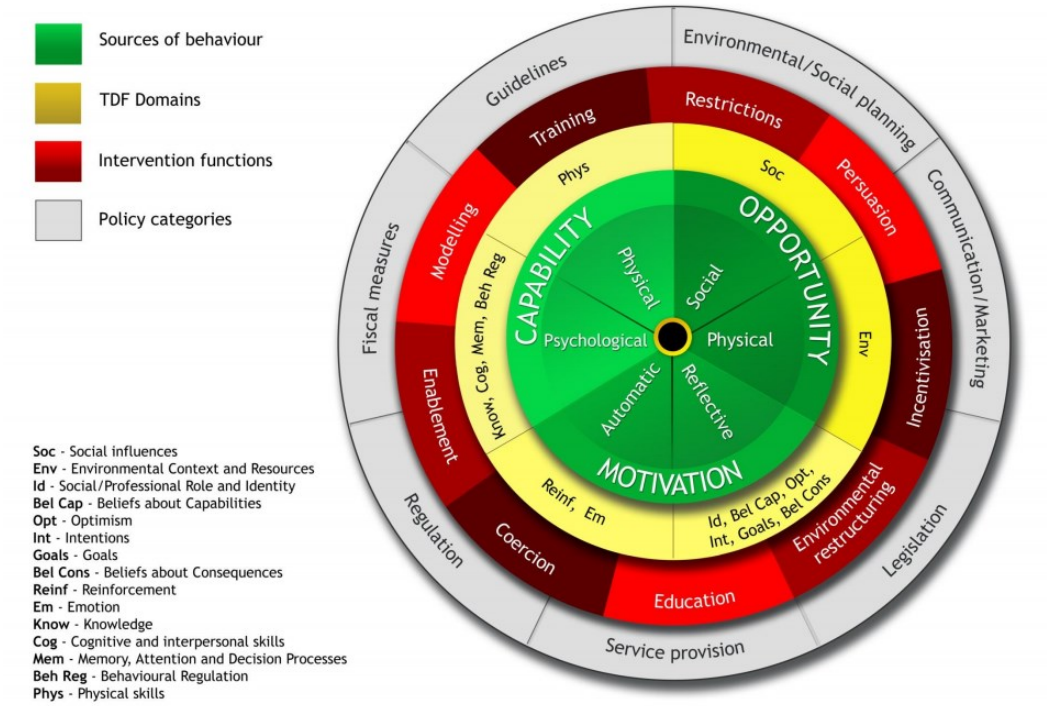

Figure 8-1. Behaviour Change Wheel (Michie et al., 2014).

8.2 METHODS

We used the BCW (Michie et al., 2014) to guide intervention development across three phases with multiple data sources (Figure 8-2). Full study methods and Phase 1 and 2 results have been published elsewhere (Cassidy, Bishop, et al., 2018; Cassidy et al., 2017; Cassidy, Steenbeek, et al., 2018). The final phase described here included stakeholder consultation meetings to identify intervention content.

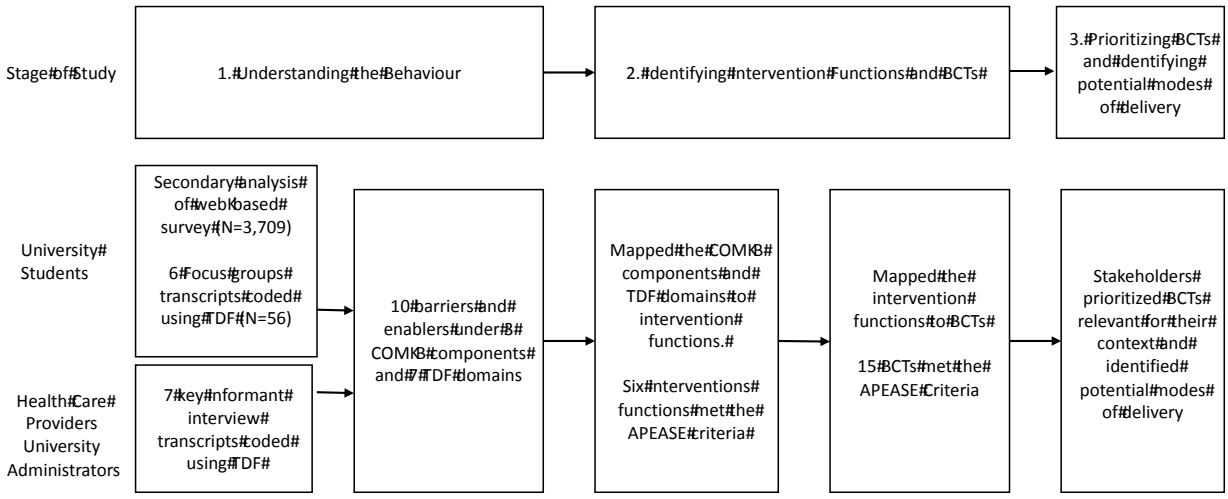

Figure 8-2. Summary of study stages and intervention content selection.

8.2.1 Step 1: Understand the Behaviour

We previously conducted two studies to gain a better understanding of university students' sexual health service use. The first study involved a secondary analysis of survey data (Steenbeek, Langille, Cragg, & Wilson, 2014) to describe the patterns of sexual health service use among university undergraduate students at two universities in Nova Scotia, Canada (Cassidy, Steenbeek, et al., 2018). The second study involved focus groups with university undergraduate students, aged 18 to 25, and key informant interviews with health care providers and university administrators at the same two universities to identify barriers and enablers to sexual health service use. The focus group

and interview guides and data analysis were guided by the TDF and COM-B model (Cassidy, Bishop, et al., 2018). The quantitative and qualitative data were integrated using a triangulation protocol (Farmer, Robinson, Elliott, & Eyles, 2006).

8.2.2 Step 2: Identify Intervention Content

The research team met to review Phase 1 and 2 findings, identify intervention functions and behaviour change techniques (BCTs), and brainstorm potential modes of intervention delivery. An intervention function is described as a broad category by which an intervention can change behaviour (e.g., education, persuasion, training). The BCW includes a matrix that links each COM-B component and TDF domain to the intervention functions most likely to be effective in bringing about behaviour change (Michie et al., 2014). Starting with this matrix, the research team applied the APEASE criteria (affordability, practicability, effectiveness/cost-effectiveness, acceptability, safety, and equity) (Michie et al., 2014) to each intervention function to explore its appropriateness for the sexual health service context.

Next, the research team used the BCT taxonomy (BCTTv1) (Michie et al., 2013) to identify potential BCTs that would best serve the intervention functions. A BCT is defined as "an observable, replicable, and irreducible component of an intervention designed to alter or redirect causal processes that regulate behaviour" (e.g., demonstration of the behaviour, information about health consequences) (Michie et al., 2013). The BCW provides a matrix developed through expert consensus that maps relevant BCTs to intervention functions and theoretical domains (Cane, Richardson, Johnston, Ladha, & Michie, 2015; Michie et al., 2014). Starting with this matrix, the research team used the APEASE criteria to consider which BCTs would be feasible within the context of

university sexual health service delivery, and most useful for addressing the identified barriers and enablers to university students' use of sexual health services. Lastly, to identify potential delivery options, the research team brainstormed modes of delivering each BCT. These were added to a list of modes of delivery developed from the literature review and focus group and interview participant input.

8.2.3 Step 3: Stakeholder Consultation

We conducted two stakeholder consultation meetings with health care providers and university administrators at each university to review the findings from Phases 1 and 2 and the intervention content identified by the research team in Step 2. Through discussion, the participants used the APEASE criteria to consider which BCTs would be feasible and prioritized in their university context. Lastly, the participants brainstormed additional modes of delivering each BCT.

8.3 RESULTS

8.3.1 Step 1: Understand the Behaviour

By using the COM-B model and TDF to conduct a behavioural assessment of students' sexual health service use, we identified the following COM-B components as important targets: psychological capability, social and physical opportunity, and reflective and automatic motivation (Table 8-1) (Cassidy, Bishop, et al., 2018; Cassidy, Steenbeek, et al., 2018).

8.3.1.1 Capability

Both focus groups and interview participants described student's limited knowledge and awareness of sexual health services as an important barrier to service use. Further, student and health care provider participants identified a lack of understanding

on LGBTQ students' sexual health. Improved visibility of the services was identified as a facilitator to sexual health service use (Cassidy, Bishop, et al., 2018).

8.3.1.2 Opportunity

Student participants described physical opportunity, including service accessibility and the campus culture, as both a barrier and enabler to sexual health service use. Due to a campus environment that promotes risky behaviours, student participants described the importance of countering this culture with safe and accessible sexual health services, including flexible hours of operation, convenient location, and mobile clinics (Cassidy, Bishop, et al., 2018).

Survey, focus group, and interview data illustrated the importance of peer influence on student behaviour. Participants described the stigma associated with sexual health service use and the influence of peer support on health promotion behaviours. These positive and negative peer influences were found to be important barriers and enablers for accessing sexual health services (Cassidy, Bishop, et al., 2018; Cassidy, Steenbeek, et al., 2018).

8.3.1.3 Motivation

We found that the social influences described above directly affected students' motivations for accessing sexual health services. Participants stated that accessing the services could jeopardize their privacy and confidentiality and lead to negative emotions (e.g., discomfort, shame, awkwardness). Further, university students are in a developmental period of exploration and experimentation and as a result, felt motivated to access sexual health services while experimenting with high-risk behaviours (Cassidy, Bishop, et al., 2018).

8.3.1.4 Contextual Differences

While the barriers and enablers to sexual health services were applicable to both universities, we found a number of important contextual differences including: size of student population; clinician knowledge on LGBTQ health; structure of health service delivery; financial resources; and location of services. These contextual elements were important factors to take into consideration when designing interventions for the two universities.

Table 8-1. Phase 1 and 2 findings mapped onto COM-B model.

Barriers and Enablers	COM-B					
	Capability		Opportunity		Motivation	
	Physical	Psychological	Social	Physical	Reflective	Automatic
Limited Sexual Health Knowledge						
Lack of Clarity for LGBTQ Students						
Visibility of Sexual Health Services						
Health Care Provider Interaction						
Peer Influence						
Accessibility of Services						
Campus Culture						
Period of Exploration and Experimentation						
Normalizing Sexual Health						
Stigma, Privacy and Confidentiality						

Legend of data sources: *Blue*, phase 1 secondary analysis of online survey; *Dark Green*, phase 2 focus groups with university students; *Light Green*, phase 2 interviews with health care providers and administrators

8.3.2 Step 2: Identify Intervention Content

Following group discussion using the APEASE criteria, the research team identified the following six intervention functions as most useful for addressing the barriers and enablers to sexual health service use among university students: education, environmental restructuring, enablement, modelling, persuasion, and incentivisation (Table 8-2). University students are the target population for the behaviour change; however, as changing student behaviour requires interaction with both health care providers and the health services, the research team considered the need for multi-level intervention content throughout the development process.

Next, we used Michie et al.'s (2014) matrix of BCTs and intervention functions to identify BCTs most likely to bring about change in students' sexual health behaviours. From there, the research team used the APEASE criteria to narrow down this list and identified the following 15 BCTs as relevant to students' use of sexual health services: *information about health consequences, information about social and environmental consequences, feedback on behaviour, feedback on outcome(s) of behaviour, prompts/cues, self-monitoring of behaviour, adding objects to the environment, goal setting (behaviour), problem solving, action planning, restructuring the social environment, restructuring the physical environment, demonstration of the behaviour, social support (unspecified),* and *credible source* (Table 8-3). Lastly, the research team added their ideas to the list of potential modes of delivery for each BCT. The BCTs can be used at multiple levels, including students, health care providers, and the health system-level. Further, the BCTs address multiple points during the service utilization process, such as prior to accessing the services (e.g., *information about health*

consequences, information about social and environmental consequences, *prompts/cues*, *restructuring the social environment, restructuring the physical environment, demonstration of the behaviour, social support, credible source),* during the visit (e.g., *feedback on behaviour, feedback on outcome(s) of behaviour, goal setting, problem solving, action planning, social support, credible source)* and after the visit (e.g., *self-monitoring of behaviour*, *feedback on behaviour, feedback on outcome(s) of behaviour).*

Table 8-2. Barriers and enablers from the COM-B and TDF mapped to intervention functions in the Behaviour Change Wheel.

Barrier & Enablers COM-B | TDF	**Intervention Functions**								
	Education	Persuasion	Incentivisation	Environmental restructuring	Modelling	Enablement	Coercion	Training	Restriction
Limited Sexual Health Knowledge									
Capabilities – Psychological | Knowledge	✓								
Lack of Clarity for LGBTQ Students									
Capabilities – Psychological | Knowledge	✓								
Visibility of Sexual Health Services									
Capabilities – Psychological | Memory, Attention, Decision-Making				✓		✓			
Health Care Provider Interaction									
Opportunity- Social | Social Influences				✓	✓	✓			
Peer Influence									
Opportunity- Social | Social Influences				✓	✓	✓			
Accessibility of Services									
Opportunity – Physical | Environmental Context & Resources				✓		✓			
Campus Culture									
Opportunity – Physical | Environmental Context & Resources				✓		✓			
Period of Exploration and Experimentation									

Motivation – Reflective | Beliefs about consequences	✓	✓			✓				
Normalizing Sexual Health									
Motivation – Reflective | Optimism	✓	✓			✓	✓			
Stigma, Privacy and Confidentiality									
Motivation – Reflective | Beliefs about consequences	✓	✓			✓				
Motivation - Automatic | Emotion		✓	✓		✓	✓			

Table 8-3. Barriers and enablers mapped to selected behaviour change techniques in the BCTTv1 (Michie et al., 2013).

Barriers and Enablers	**Behaviour Change Techniques**														
	Information about health consequences	Information about social and environmental consequences	Feedback on behaviour	Feedback on outcomes	Prompts/Cues	Self-monitoring of behaviour	Adding objects to the environment	Goal setting (behaviour)	Problem solving	Action planning	Restructuring the social environment	Restructuring the physical environment	Demonstration of the behaviour	Social support (unspecified)	Credible source
Limited Sexual Health Knowledge	✓	✓	✓	✓	✓	✓									
Lack of clarity for LGBTQ students	✓	✓	✓	✓	✓	✓									
Visibility of sexual health services					✓	✓	✓					✓		✓	
HCP Interaction							✓	✓	✓	✓	✓	✓	✓	✓	
Peer influence							✓	✓	✓	✓	✓	✓	✓	✓	
Accessibility of Services					✓		✓					✓			
Campus Culture					✓		✓				✓	✓		✓	
Period of Exploration and Experimentation	✓	✓	✓	✓	✓	✓		✓	✓	✓			✓	✓	✓
Normalizing Sexual Health	✓	✓	✓	✓	✓	✓		✓	✓	✓			✓	✓	✓
Stigma, Privacy and Confidentiality	✓	✓	✓	✓	✓	✓		✓	✓	✓			✓	✓	✓

8.3.3 Step 3: Stakeholder Consultation

We met with one key stakeholder at each university to discuss the study findings, brainstorm potential intervention modes of delivery, and prioritize BCTs that would be most feasible to implement at their university at the student, health care provider, and/or service level. The university stakeholders included a health services director and an advanced practice nurse who focuses on health promotion program planning. The stakeholders provided valuable contextual data on what BCTs and modes of delivery would be relevant for their context based on the resources available to them. The intervention modes of delivery and most feasible BCTs for implementation are outlined in Table 8-4.

8.3.3.1 Capability

To address the psychological capability barriers and enablers, we identified education, environmental restructuring, and enablement as appropriate intervention functions and the following nine BCTs: *information about health consequences, information about social and environmental consequences, feedback on behaviour, feedback on outcome(s) of behaviour, prompts/cues, self-monitoring of behaviour, adding objects to the environment, restructuring the physical environment, and social support (unspecified).* Potential modes of delivery include: education sessions during orientation week; emails and text messages with information about sexual health and sexual health services; and using Residence Assistants as key informants for sexual health.

8.3.3.2 Opportunity

To address the social and physical opportunity barriers and enablers, we found enablement, modelling, and environmental restructuring intervention functions to be most

relevant. The following nine BCTs were identified: *prompts/cues, goal setting (behaviour), problem solving, action planning, restructuring the social environment, restructuring the physical environment, demonstration of the behaviour, adding objects to the environment,* and *social support (unspecified).* Potential modes of delivery include: mobile STI testing clinics; peer outreach; flexible hours of operation; and creating a friendly and welcoming space.

8.3.3.3 Motivation

Intervention functions to address the barriers and enablers under automatic and reflective motivation include: education, persuasion, modelling, enablement, and incentivisation. The following 12 BCTs were identified: *information about health consequences, information about social and environmental consequences, feedback on behaviour, feedback on outcome(s) of behaviour, prompts/cues, self-monitoring of behaviour, credible source, demonstration of the behaviour, social support (unspecified), goal setting (behaviour), problem solving,* and *action planning.* Potential modes of delivery include: peer support groups and student outreach; health care providers and students present during orientation; email or text message reminder of sexual health services and upcoming mobile clinics.

Following these three stages, we created a toolbox for our stakeholders to use in future sexual heath intervention design and program planning (Table 8-4). The behaviour change toolbox includes: the barriers and enablers to sexual health service use among university students under the COM-B components; six intervention functions most likely to bring about change; 15 BCTs to include as active ingredients in interventions; and a

list of potential modes of intervention delivery. An electronic copy of the toolbox was sent to the participants of each stakeholder consultation meeting.

Table 8-4. Toolbox of intervention functions, behaviour change techniques, and modes of delivery.

COM-B	**Barriers & Enablers to Sexual Health Service Use**	**Intervention Functions**	**Behaviour Change Techniques**	**BCT Definition** (Michie et al., 2013)	**Examples of specific content and mode of delivery**
Capability **Motivation**	Limited sexual health knowledge and awareness Lack of clarity for LGBTQ students Period of exploration and experimentation Normalizing sexual health Stigma, privacy and confidentiality	Education Environmental Restructuring Persuasion Modelling Enablement Incentivisation	*Information about health consequences*[a,b]	Provide information (e.g. written, verbal, visual) about health consequences of performing the behaviour	· Orientation week education · Residence Assistants as key informants · Facebook and Instagram groups · Student outreach · Emails with sexual health information, text messages · Posters · Youtube videos: short videos showing location, what an STI test look likes · 'Myth Busters'/sexual health facts posted on website or sent via email · Education workshops for clinicians · Using a harm reduction approach without employing scare tactics
Capability **Motivation**	Limited sexual health knowledge and awareness Lack of clarity for LGBTQ students Period of exploration and experimentation Normalizing sexual health Stigma, privacy and confidentiality	Education Environmental Restructuring Persuasion Modelling Enablement Incentivisation	*Information about social and environmental consequences* [a,b]	Provide information (e.g. written, verbal, visual) about social and environmental consequences of performing the behaviour	

COM-B	Barriers & Enablers to Sexual Health Service Use	Intervention Functions	Behaviour Change Techniques	BCT Definition (Michie et al., 2013)	Examples of specific content and mode of delivery
Capability **Motivation**	Limited sexual health knowledge and awareness Lack of clarity for LGBTQ students Period of exploration and experimentation Normalizing sexual health Stigma and feelings of shame	Education Environmental Restructuring Persuasion Modelling Enablement Incentivisation	*Feedback on behaviour*[a]	Monitor and provide informative or evaluative feedback on performance of the behaviour (e.g. form, frequency, duration, intensity)	· Student health promotion outreach coordinator position · Text messages about previous and upcoming appointments · Text messages about upcoming mobile clinics · Use persuasive messaging in emails, posters, text messages
Capability **Motivation**	Limited sexual health knowledge and awareness Lack of clarity for LGBTQ students Period of exploration and experimentation Normalizing sexual health Stigma, privacy and confidentiality	Education Environmental Restructuring Persuasion Modelling Enablement Incentivisation	*Feedback on outcomes of behaviour*	Monitor and provide feedback on the outcome or performance of the behaviour	

COM-B	Barriers & Enablers to Sexual Health Service Use	Intervention Functions	Behaviour Change Techniques	BCT Definition (Michie et al., 2013)	Examples of specific content and mode of delivery
Capability Motivation	Limited sexual health knowledge and awareness Lack of clarity for LGBTQ students Visibility of sexual health services Accessibility of services Campus culture Period of exploration and experimentation Normalizing sexual health Stigma, privacy and confidentiality	Education Environmental Restructuring Persuasion Modelling Enablement Incentivisation	*Prompts/Cues*[a,b]	Introduce or define environmental or social stimulus with the purpose of prompting or cueing the behaviour. The prompt or cue would normally occur at the time or place of performance.	· Leverage social media · Text messages about previous and upcoming appointments · Recurring emails with sexual health facts and information · Sexual health posters on campus

COM-B	Barriers & Enablers to Sexual Health Service Use	Intervention Functions	Behaviour Change Techniques	BCT Definition (Michie et al., 2013)	Examples of specific content and mode of delivery
Capability Motivation	Limited sexual health knowledge and awareness Lack of clarity for LGBTQ students Visibility of sexual health services Period of exploration and experimentation Normalizing sexual health Stigma, privacy and confidentiality	Education Environmental Restructuring Persuasion Modelling Enablement Incentivisation	*Self-monitoring of behaviour*	Establish a method for the person to monitor and record their behaviour(s) as part of a behaviour change strategy	· App or online way to keep track of how often students attend the clinic (e.g., MyHealthNS) · Making appointments online (e.g., MyHealthNS) · Nursing holistic care approach to health and well-being, promoting self-efficacy
Capability Opportunity	Visibility of sexual health services HCP Interaction Peer influence Accessibility of services Campus culture	Education Environmental Restructuring Enablement Modelling	*Adding objects to the environment*[a]	Add objects to the environment in order to facilitate performance of the behaviour	· Posters around campus · Recurring emails or text messages with sexual health facts and information · Mobile clinics · Hours of operation that are flexible to students' schedules · Social media initiatives

COM-B	Barriers & Enablers to Sexual Health Service Use	Intervention Functions	Behaviour Change Techniques	BCT Definition (Michie et al., 2013)	Examples of specific content and mode of delivery
Opportunity Motivation	HCP Interaction Peer influence Period of exploration and experimentation Normalizing sexual health Stigma, privacy and confidentiality	Environmental Restructuring Persuasion Modelling Enablement Education Incentivisation	*Goal setting (behaviour)*	Set or agree on a goal defined in terms of the behaviour to be achieved	· Nurses and students working together to build plan of care (e.g., coming to clinic after new sexual partners; creating goals for staying healthy)
Opportunity Motivation	HCP Interaction Peer influence Period of exploration and experimentation Normalizing sexual health Stigma, privacy and confidentiality	Environmental Restructuring Persuasion Modelling Education Enablement Incentivisation	*Problem solving*	Analyze, or prompt the person to analyze, factors influencing the behaviour and generate or select strategies that include overcoming barriers and/or increasing facilitators	· Nurses and students working together at appointments to solve sexual health problems · At appointments, discuss how to address negative peer influence (e.g., with first year students)

COM-B	Barriers & Enablers to Sexual Health Service Use	Intervention Functions	Behaviour Change Techniques	BCT Definition (Michie et al., 2013)	Examples of specific content and mode of delivery
Opportunity Motivation	HCP Interaction Peer influence Period of exploration and experimentation Normalizing sexual health Stigma, privacy and confidentiality	Environmental Restructuring Persuasion Modelling Education Enablement Incentivisation	*Action planning*	Prompt detailed planning of performance of the behaviour (must include at least one of context, frequency, duration and intensity). Context may be environmental (physical or social) or internal (physical, emotional or cognitive)	· Promote scheduling appointments in advance to ensure clinician continuity · Plan schedule for year · Build capacity early in university journey
Opportunity	HCP Interaction Peer influence Campus culture	Enablement Modelling Environmental Restructuring	*Restructuring the social environment*	Change, or advise to change the social environment in order to facilitate performance of the wanted behavior or create barriers to the unwanted behavior	· Friendly, welcoming space · Promoting peer support related to sexual health around residences and campus

COM-B	Barriers & Enablers to Sexual Health Service Use	Intervention Functions	Behaviour Change Techniques	BCT Definition (Michie et al., 2013)	Examples of specific content and mode of delivery
Opportunity	Visibility of sexual health services HCP Interaction Peer influence Accessibility of services Campus culture	Enablement Modelling Environmental Restructuring	*Restructuring the physical environment*	Change, or advise to change the physical environment in order to facilitate performance of the wanted behaviour or create barriers to the unwanted behaviour	· Workshops to enhance student and clinician knowledge, communication skills · Location of clinic · More mobile clinics · Hours of operation · Length of appointment times · Keeping certain number of appointment times available for sexual health reasons
Opportunity Motivation	Visibility of sexual health services HCP Interaction Peer influence Period of exploration and experimentation Normalizing sexual health Stigma, privacy and confidentiality	Enablement Modelling Environmental Restructuring Education Persuasion Incentivisation	*Demonstration of the behaviour*	Provide an observable sample of the performance of the behaviour, directly in person or indirectly e.g. via film, pictures, for the person to aspire to or imitate	· How to" access services: YouTube videos, Facebook and Instagram presence · Clinician workshops on building rapport with students in sexual health setting · Residence Assistants · Student Outreach

COM-B	Barriers & Enablers to Sexual Health Service Use	Intervention Functions	Behaviour Change Techniques	BCT Definition (Michie et al., 2013)	Examples of specific content and mode of delivery
Opportunity Motivation	Visibility of sexual health services HCP Interaction Peer influence Campus culture Period of exploration and experimentation Normalizing sexual health Stigma, privacy and confidentiality	Enablement Modelling Environmental Restructuring Education Persuasion Incentivisation	*Social Support (unspecified)*[a,b]	Advise on, arrange or provide social support (e.g. from friends, relatives, colleagues,' buddies' or staff) or non-contingent praise or reward for performance of the behavior. It includes encouragement and counselling, but only when it is directed at the behavior	· Nurse counselling sessions · Peer support groups · Residence Assistants · Student Outreach
Motivation	Period of exploration and experimentation Normalizing sexual health Stigma, privacy and confidentiality	Education Persuasion Incentivisation Modelling Enablement	*Credible Source*	Present verbal or visual communication from a credible source in favour of or against the behavior	· Residence Assistants · Having clinicians or students give presentations during orientation · Partner with Nursing, Medicine, Allied Health and Health Promotion students

[a] = prioritized BCTs by stakeholders at University A as most feasible to implement
[b] = prioritized BCTs by stakeholders at University B as most feasible to implement

8.4 DISCUSSION

This study describes the systematic process of using the BCW to develop an intervention to improve university students' use of sexual health services. We merged multiple data sources, including survey, focus group and interview data, to describe the barriers and enablers to sexual health service use among university students. Next, we mapped the barriers and enablers onto relevant intervention functions and BCTs to include as active ingredients in an intervention. We conducted stakeholder consensus meetings to narrow down the list to the most feasible and appropriate BCTs for the context of university students' use of sexual health services and identified potential modes of intervention delivery.

8.4.1 Behaviour Change Toolbox

The barriers and enablers to sexual health service use were similar for students at the two participating universities; however, we found differences in what intervention strategies would work best for each university due to differences in context and resources. As a result, we did not design one, all-encompassing intervention to implement at both universities. Instead, we met with key stakeholders from each university to identify BCTs that would be a priority for their school, and feasible modes of delivery based on the resources available to them. In the end, we developed a theory- and evidence-based toolbox of six intervention functions and 15 BCTs that can be used to design, implement and evaluate sexual health service interventions.

The toolbox presents many benefits for the health care providers and administrators involved in this study and decision-makers in similar settings. First, the toolbox provides administrators and program planners with a new evidence-based

approach to designing interventions that differs from their traditional approach based on anecdotal evidence and personal preference. Second, many of the BCTs in the toolbox target three or more of the barriers and enablers to sexual health service use. The multi-targeted nature of these BCTs will be useful for stakeholders when advocating for funding for new sexual health programs: Administrators can demonstrate that by prioritizing these BCTs, they are able to address multiple barriers to sexual health service use. Third, the toolbox may also help to sustain theory- and evidence-based interventions at university health centres. Instead of providing the university with one intervention, we are presenting a variety of useful strategies that are malleable. Depending on the resources available, stakeholders can leverage existing structures (i.e., personnel, services, infrastructure) at their university to bring the BCTs to life. Lastly, the benefits of the toolbox extend beyond the two participating universities. Other universities may be able to use these theory- and evidence-based tools to develop interventions in their own context.

8.4.1.1 Behaviour Change Techniques

The theory- and evidence-based toolbox will likely be an improvement from the traditional atheoretical approach to intervention design in this context; however, the effectiveness of the six intervention functions and 15 BCTs to improve sexual health service use among university students is not yet known. Several studies have examined some of these BCTs in the context of sexual health services and found significant effects. Wolfers, de Zwart, and Kok (2012) used intervention mapping (Eldredge et al., 2016) to design the 'ROsafe' intervention aimed at improving STI testing rates among vocational students in the Netherlands. The 'ROsafe' intervention includes five of the 15 BCTs

identified in this study (*feedback on outcomes of behaviour, social support (unspecified), information about health consequences, demonstration of behaviour, credible source*). The BCTs were implemented through two education sessions, an internet-based home assignment, and sexual health services at the school sites. The intervention was tested in a cluster, randomized controlled trial with 24 schools. Sexually experienced students in the intervention group reported more STI testing (29%) than students in the control group (4%) (OR=4.3, $p<0.05$) (Wolfers, Kok, Looman, de Zwart, & Mackenbach, 2011). While the 'ROsafe' intervention includes several BCTs to address the barriers to sexual health service use, this current study expands on the influence of the university environment on students' use of sexual health services. Specific BCTs are needed to address the influence of campus culture and stigma associated with sexual health services.

Newby et al. (2017) also used intervention mapping to develop a web-based intervention to increase sexual health service uptake among adolescents and young adults. Newby and colleagues identified 10 BCTs to include in their intervention which overlap with the following four BCTs identified in this current study: *information about health consequences, information about emotional consequences, adding objects to the environment,* and *credible source*. In a pilot evaluation study of this intervention, the authors found a significant improvement in beliefs related to service access (i.e., service access being important and normal) among females, and a significant increase in the behaviour of visiting sexual health services among males (Brown, Newby, Caley, Danahay, & Kehal, 2016). The effectiveness of the BCTs used in these interventions shows promise for the similar BCTs identified in this current study. However, other than these few studies, the body of intervention literature on improving sexual health service

use is scarce. Additional research is needed to test the effectiveness of the BCTs and intervention functions outlined in the toolbox.

8.4.1.2 Intervention Functions

University health care providers and administrators can use the intervention functions described in the toolbox to translate the 15 BCTs into intervention content. Our results show that the *Education* intervention function maps onto five barriers and enablers to sexual health service use among university students. Studies have demonstrated that education interventions have moderate impact on sexual knowledge and attitudes (Kirby, Laris, & Rolleri, 2007; Tolli, 2012). However, an increase in knowledge alone does not always lead to behaviour change (Kirby et al., 2007). It is important to use targeted, multi-component interventions to combine education with other key elements to maximize the potential for behaviour change (Kelly & Barker, 2016; National Institute for Health and Care Excellence, 2004). As such, it may be beneficial to target students with educational interventions that include multiple BCTs, such as *information about health consequences, information about social and environmental consequences, and demonstration of the behaviour*. University students may benefit from a sexual health education intervention that also includes the *prompts/cues* BCT in the form of electronic reminders. Our student participants recommended email and text message reminders to increase their awareness of sexual health services and the reasons to access them. Studies have shown that interventions delivered by mobile technologies increase the uptake of sexual health services and STI testing, particularly for tech-savvy young adults (Burns, Keating, & Free, 2016; Kannisto, Koivunen, & Välimäki, 2014; Lim et al., 2012). This is a widely available and accessible approach for university health centres to offer a

confidential means of communicating sensitive or personal information with students (Lim et al., 2012). Further, studies have found that using social media for sexual health education can help promote STI testing behaviours (Gabarron & Wynn, 2016). As such, there is an opportunity to leverage social media to support educational interventions that include BCTs aimed at increasing students' capability and motivations for accessing sexual health services, such as *information about health consequences, information about social and environmental consequences, feedback on behaviour, prompts/cues, and self-monitoring of behaviour* (Jones, Eathington, Baldwin, & Sipsma, 2014).

The *Enablement* intervention function aligned with six barriers and enablers to students' use of sexual health services. Enablement is described as "increasing means/reducing barriers to increase capability (beyond education and training) or opportunity (beyond environmental restructuring)" (Michie et al., 2014, p. 112). Several BCTs can be included in enablement interventions, such as *social support (unspecified), goal setting (behaviour), problem solving, action planning, adding objects to the environment, self-monitoring of behaviour, restructuring the physical environment*. Our stakeholders stated that enablement interventions related to a main priority at both universities: building capacity and resiliency among their student population. Strengthening students' sexual resilience provides them with the tools needed to prevent negative outcomes from their sexual behaviour and take control of their physical, sexual, and mental health and well-being (Cox, 2011). Further research is needed to understand the intersection of sexual and mental health among university students and how enablement interventions can be used to strengthen students' sexual resiliency.

Compared to education, enablement interventions have not been as extensively examined in the literature. Enablement interventions with the *social support (unspecified)* BCT are especially relevant in this context, as our behavioural analysis illustrated how peer influence can act as a barrier and enabler to sexual health service use. Studies have shown that perceived social norms affect sexual behaviours (Bull, Levine, Black, Schmiege, & Santelli, 2012; Theunissen et al., 2015; Young & Jordan, 2013). Young and Jordan (2013) examined the influence of social networking photos on social norms and sexual health behaviours with a sample of college students in the United States. They found that students who viewed Facebook images with a low prevalence of sexually suggestive content estimated a larger percentage of peers used condoms and reported a greater intention to use condoms themselves in the future. In the context of university sexual health services, stakeholders could employ a similar approach with existing social media networks and curate positive images of peers accessing sexual health services to tap into students' intentions for sexual health promotion behaviour.

It is clear that multiple BCTs are needed to target students' capability, opportunity and motivation for accessing services. The combination of intervention functions, BCTs, and mode of delivery will depend on the what resources are available to the university. One option may be to leverage the functionalities in the existing MyHealthNS personal electronic health record to facilitate students' use of sexual health services on campus. MyHealthNS is currently available for use by all patients and health care providers in Nova Scotia. It is an electronic application for patients to manage their health information in a private, secure and confidential environment (Government of Nova Scotia, n.d.). MyHealthNS has existing functionalities that could include several

BCTs identified in this study, such as: *information about health consequences* and *information about social and environmental consequences* (e.g., sending information electronically); *feedback on outcomes of behaviour* (e.g., results from last visit); *prompts/cues* (e.g., appointment reminders, information on upcoming mobile clinics); *self-monitoring of behaviour (*e.g., record of previous appointments); *goal setting and action planning* (e.g., set behavioural goals and plans on how often student will visit clinic). MyHealthNS may be a useful existing intervention to build upon; however, future evaluation would be needed to determine its effectiveness at addressing the barriers and supporting the enablers to students' sexual health service use.

8.4.2 Utility of the BCW

The BCW offered a systematic approach for integrating multiple quantitative and qualitative data sources into the intervention design process. With its pragmatic, step-by-step framework, the BCW first helped to understand the range of factors influencing behaviour, all possible intervention options, and the full range of potential BCTs. As a result, we felt confident in choosing intervention content that was appropriate and relevant to the context of university sexual health service delivery. This study demonstrated the BCW's utility for health researchers who do not have formal training in health psychology or behavioural science. The BCW made behaviour change theory tangible and pragmatic in the 'real world' of health services. Additional strengths and limitations to the utility of the BCW are described below.

8.4.2.1 Policy Categories

The BCW includes seven broad policy categories to leverage behaviour change on a wider scale (e.g., changing legislation to encourage behaviour change at a population

level) (Michie et al., 2014). Similar to other intervention design researchers, the policy categories were found to be less practical than other BCW steps in this context (Connell, McMahon, Redfern, Watkins, & Eng, 2015; Mc Sharry et al., 2016). The selection of BCTs flowed logically from the COM-B model analysis and intervention functions. As such, we did not identify policy categories at this stage in the intervention development. Similar to Mc Sharry et al.'s recommendations, we believe that the policy categories will likely be more useful for broad, process-level guidance when designing implementation strategies for future sexual health service interventions.

8.4.2.2 Context

The influence of context on intervention effectiveness is often overlooked in the intervention design process, particularly when focusing on individual-level behaviours (Moore & Evans, 2017). As stated by Moore and Evans (2017): "We need to move away from viewing interventions as discrete packages of components which can be described in isolation from their contexts, and better understand the systems into which we are attempting to introduce change before intervening" (p. 134). The BCW recommends gathering input from a diverse group of stakeholders to examine the influence of context at multiple conceptual levels. Moore and Evans (2017) also recommend using this co-production approach with stakeholders with intimate knowledge of the context. In this study, we included stakeholders at the barriers and enablers assessment stage, as well as the intervention design stage. This helped us to move from a theoretical exercise of listing intervention functions and BCTs to a hands-on approach with our stakeholders to address the question of "What is likely to work in this situation for these people in this organization with these constraints?" (Greenhalgh, 2017).

We identified several barriers and enablers directly related to the social and physical context of sexual health behaviours on campus. From this, we identified several system-level BCTs, including *restructuring the social environment, restructuring the physical environment,* and *adding objects to the environment.* A limitation of the BCW is its lack of guidance on how contextual mechanisms function across different settings and its limited detail on the characteristics of system-level BCTs. Other researchers have had similar experiences in using the TDF to examine multi-level behavioural problems (Birken, Powell, Shea, et al., 2017; Gould et al., 2014; Graham-Rowe et al., 2016; Sales et al., 2016; Templeton et al., 2016). To address this issue, some researchers have paired the TDF with organizational context frameworks, such as the Consolidated Framework for Implementation Research (CFIR), which elaborates on organizational-level determinants (Birken, Powell, Presseau, et al., 2017). Future sexual health service intervention research would benefit from a similar approach to provide a more in-depth examination of the organizational context and how it influences service delivery. Similarly, we echo recent calls for future methodological research to elaborate upon system-level BCTs and characterise their meanings in more detail (Presseau et al., 2015).

8.4.2.3 Reporting BCTs

Traditionally, behaviour change interventions are inadequately reported which hinders the reader's ability to accurately understand, evaluate, or replicate interventions (P. M. Wilson et al., 2017; Wood et al., 2016). When theory is used to describe the plausible mechanisms of action, findings can be synthesized with existing literature to inform future replication and evaluation studies (Presseau et al., 2016). Recent efforts to improve the implementation and replication of effective interventions have led to the

development of reporting guidelines, such as the Template for Intervention Description and Replication (TIDieR) – a 12-item checklist that aims to standardize intervention descriptions (Hoffmann et al., 2014). Further, the BCTTv1 was developed to offer a shared language for clearly labelling and defining BCTs to ensure that behaviour change interventions are interpreted in the same way by different readers (Michie et al., 2013; Wood et al., 2016). The clear reporting of BCTs in this study will inform the science on sexual health behaviour change interventions. Researchers, administrators, and sexual health program planners can use the toolbox to identify intervention functions and BCTs that apply to their context and test them in implementation and evaluation studies. This will further aid in building a repository of effective sexual health service interventions and intervention components.

8.4.3 Future Research

The formative work described in this paper provides a strong foundation for future implementation and evaluation studies. We have clearly outlined proposed mechanisms of action that can be tested to build our understanding of what mechanisms work in the context of university sexual health care (Jamal et al., 2015). Next steps include: 1. Identify implementation strategies for using the toolbox in practice (i.e., a roadmap for stakeholders to guide selection of tools and implementation of interventions); and 2. Evaluate the impact of providing stakeholders with a toolbox to design interventions that fit within their context, in comparison to a one-size-fits-all intervention. Further research is needed to examine the conditions under which these BCTs will work in the university health care setting. Lastly, investigation of the

effectiveness of different combinations of the six intervention functions and 15 BCTs on student health and health system outcomes is also recommended.

8.4.4 Limitations

This phase of the mixed methods study presents the following limitations. Only one stakeholder from each university was able to attend the consensus meetings due to recruitment issues and scheduling conflicts. We aimed to have a greater representation from administrators and clinicians at this meeting. However, those that participated provided rich contextual data while reviewing the findings and identifying relevant BCTs. Further, we followed the BCW steps closely, with the exception of the initial steps used to define and select the target behaviour. We had previously specified our target behaviour (sexual health service use among university students) through a literature review. In doing so, we may have missed a candidate behaviour that could address students' sexual health outcomes. Future research in this area would benefit from first defining the problem in behavioural terms and then selecting the target behaviour to ensure a rigorous and comprehensive approach to intervention design.

8.5 Conclusion

The BCW offered a systematic and pragmatic approach for intervention development. Following a detailed behavioural analysis, we used the BCW to identify six intervention functions and 15 BCTs to address the barriers and enablers to sexual health service use. These findings were packaged in a toolbox to provide users with theory- and evidence-based tools to design sexual health service interventions that meet the needs of their context. Future research is needed to test the utility of the toolbox for designing

interventions within the university health care setting and investigate the effectiveness of the BCTs and intervention functions outlined in the toolbox.

CHAPTER 9 CONCLUSION

This study demonstrated how behaviour change theory can be used to develop an intervention to address sexual health service use among university students in Nova Scotia. Each chapter and manuscript built upon the previous phase to provide a comprehensive understanding of university students' sexual health service use and inform intervention design. *Manuscript 1* (Chapter 3) outlined the study protocol in detail. Next, *Manuscript 2* (Chapter 4) described university students' rates of service use and identified significant predictors of sexual health service use, including year of study, sexual orientation, and sense of social support. Chapter 5 outlined how the Phase 1 results informed the sampling strategy and focus group and interview guides for Phase 2. *Manuscript 3* (Chapter 6) revealed multi-level barriers and enablers to student use of sexual health services from the perspectives of students, health care providers, and administrators. Integration of the Phase 1 quantitative results and Phase 2 qualitative findings in Chapter 7 led to a more comprehensive understanding of university students' use of sexual health services, including the interplay between students' capability, opportunity, and motivation. *Manuscript 4* (Chapter 8) built on this cumulative work and described an innovative approach to using the BCW: to develop a toolbox of intervention strategies for university administrators and decision-makers to use to design, implement, and evaluate theory- and evidence-based sexual health service interventions that are feasible within the context of their health centre. This final chapter highlights the study's strengths and limitations, implications for health care providers, administrators and researchers, and provides recommendations for future research in the area of sexual health intervention design.

9.1 STRENGTHS AND LIMITATIONS

This study is strengthened by the use of a comprehensive behaviour change theory to systematically develop intervention strategies to improve university students' use of sexual health services. Previous literature suggests that factors related to students' knowledge, emotions, beliefs about consequences, social influences and environmental context and resources influence their use of sexual health services. Building on this previous literature, the application of the COM-B and TDF to university student sexual health service use is novel and illustrates the relationship between students' capability, opportunity, and motivation for accessing sexual health services. The mix of quantitative and qualitative data helped to provide a better understanding of students' use of sexual health services and contextualize the findings in the university setting. Further, the study of student, health care provider, and university administrator perspectives ensures the intervention strategies address barriers and enablers at the individual, interpersonal, and health service levels.

Despite these strengths, the findings from this three-phased study are presented with the following limitations. First, the results from this study represent the self-report of a predominantly Caucasian student sample (87.9%) and perspectives of students, health care providers and university administrators at two universities in Nova Scotia. As a result, the findings may not be applicable to the diverse population of university students across Canada, including Aboriginal and International students. However, this research is the first Canadian study of its kind, thus enhancing its transferability to other universities in the country. Second, due to the sensitive nature of sexual health service use, social desirability bias may have led to student participants responding to questions

in the focus groups in a socially acceptable direction. To mitigate this bias, separate focus groups with male, female, and LGBTQ students were conducted. Third, future work is needed to examine differences between the three focus groups to understand the unique barriers and enablers among men, women, and students of the LGBTQ community and tailor intervention strategies to these sub-groups. Fourth, the key informant interview data may have benefitted from a more in-depth examination of context using an organizational-level theory or framework. While the TDF and COM-B helped to identify context-specific barriers and enablers, efforts are needed to examine how these mechanisms function in more detail. Fifth, some of the barriers and enablers identified in this study could overlap with multiple TDF domains (e.g., peer influence, social influences and environmental context and resources). This perceived overlap between domains has been previously identified as a challenge to using the TDF, as complex behaviours do not always fit cleanly into distinct domains (Phillips et al., 2015). However, by using a systematic deductive and inductive approach to data analysis with two independent coders, we identified domains that had the most dominant influence on students' behaviour. Future evaluation of the intervention strategies identified in this study may help to reveal additional domains that influence behaviour. Sixth, this study illustrated relationships between multiple domains in the TDF. However, the TDF does not explicitly describe linkages between the 14 distinct domains. This lack of clear theoretical guidance on linkages between domains is a limitation of the TDF that has also been identified in previous studies (Boscart, Fernie, Lee, & Jaglal, 2012; Mc Sharry, Murphy, & Byrne, 2016). Nonetheless, the use of the COM-B model and member checking exercises with student participants helped to strengthen the understanding of

these linkages. These findings may inform future theory-refinement efforts on the TDF. Lastly, although the university stakeholders were supportive of the study, there were limitations with recruitment. For example, due to the limited number and part-time nature of the clinicians at University B, there were challenges in recruiting physicians for the key informant interviews. Similarly, in phase three, there were difficulties recruiting stakeholders to participate in the final consensus meetings. Nonetheless, the stakeholder participants that were present provided rich contextual data and helped to elaborate on the results.

9.2 Study Implications

The findings from this research have the potential to inform university sexual health care practice and policy. This study provides health care providers (nurses and physicians) with a comprehensive understanding of the barriers and enablers to university students' sexual health service use. These findings may assist health care providers who interact with students on a daily basis to better understand the factors that help and/or hinder their access of sexual health services. More specifically, our results highlight the value students place on building a trusting relationship with their health care provider. The study findings illustrate the need to increase the visibility of the nursing role in sexual health promotion in the university setting. Nurses are often the first point of contact for students, and as a result, they play an important role in health promotion in the university setting. Due to the holistic nature of nursing care, nurses are in an ideal position to promote positive sexual health and well-being (East & Hutchinson 2013). Nurses have the opportunity to champion the use of the intervention strategies in the toolbox to address the barriers and enablers to university students' use of sexual health

services. Further, nurses often have more time to spend with students to build a trusting relationship and as a result, may be able to operationalize many of the BCTs. For example, to improve student-health care provider interaction, nurses can employ BCTs that enhance students' social opportunity, including *goal setting, problem solving, action planning,* and *social support.* Nurses are also in an ideal position to target the barriers and enablers within the capability component by using BCTs, such as *information about health consequences, information about social and environmental consequences, feedback on behaviour* and *feedback on outcomes of behaviour*. Lastly, nurses are viewed as *credible sources* and can employ this BCT to enable students to access sexual health services. These examples are a starting point for expanding the nursing role to promote students' sexual health and well-being. Future efforts are needed to explore how and to what effect can nurses deliver these BCTs to improve students' use of sexual health services.

The toolbox provides a range of theory- and evidence-based resources for administrators in university health care settings to strengthen current services and plan for the delivery of future sexual health services. The toolbox can be used to identify where existing strategies are addressing the barriers to students' use of sexual health services and identify areas for future program planning. Decision-makers can select intervention functions and BCTs to design tailored, multi-component interventions based on their context and the resources available to them. Ideally, this will enhance administrators' use of research evidence in decision-making and support a shift from interventions designed based on personal preference towards theory- and evidence-based intervention development. Further, the findings from all three phases may be valuable for

administrators when advocating for funding and resources for the design of future sexual health services.

The findings have several implications for sexual health and behaviour change researchers. First, the COM-B model and TDF provided a clear framework for understanding the barriers and enablers to sexual health service use. Researchers can draw from these findings to help understand students' sexual health service use in their research setting. Second, this research lays the groundwork for future theory-driven testing of sexual health service interventions. Researchers can test the effectiveness of different combinations of BCTs and intervention functions from the toolbox. Third, this study builds on the shared language used in the behaviour change literature and contributes to the paucity of literature on BCTs for addressing sexual health service use. By continuing to explicitly report BCTs, researchers will have greater success at replicating sexual health interventions and testing the mechanisms of action. Lastly, the results highlight the importance of context and how the environment and resources can influence the feasibility of intervention options. This study offers a guide for designing a toolbox of theory- and evidence-based strategies for multiple contexts, as opposed to one, fully designed intervention.

9.3 Recommendations for Future Research

Results from this study highlight several directions for future research related to sexual health service utilization, behaviour change, and intervention design, including: 1. Examine factors influencing sexual health service use using the COM-B model and TDF; 2. Investigate the role of organizational context and its influence on individual-level behaviour; 3. Examine the utility of a toolbox to design interventions; 4. Test the

effectiveness of the BCTs and intervention functions; and, 5. Apply the toolbox to other health care settings.

9.3.1 Quantitative Examination of Theory-based Factors Influencing Sexual Health Service Use

This study identified predictors of university students' sexual health service use using an existing dataset that was not developed using the COM-B model or the TDF. Future quantitative research in this area would benefit from a similar theory-based approach as outlined in the qualitative phase of this study. A quantitative theory-based measure, such as a survey or questionnaire, is needed to identify statistically significant TDF domains related to university students' use of sexual health services. This would provide a more robust triangulation of the quantitative and qualitative data to link directly to the COM-B model and the TDF.

9.3.2 Investigate the Role of Organizational Context

Additional research is needed to investigate the role of the organizational context within the TDF and COM-B model when examining individual-level behaviours. Context-specific interview guide questions or survey items would be a useful addition to the existing TDF and COM-B literature. Squires et al. (2015) are leading extensive work in this area, and aiming to develop, refine, and validate a framework that identifies the key domains and features of context that are important to consider when designing interventions. Results from their work will inform the design of sexual health service interventions. Furthermore, we found the system-level BCTs identified in this study lacked sufficient detail in their definitions. Additional guidance on system-level BCTs, such as *Restructuring the social environment, Restructuring the physical environment,* and *Adding objects to the environment*, may enhance the utility of the BCW. Overall,

these theory-building initiatives would strengthen the existing literature on designing individual-level interventions embedded within a multi-level context.

9.3.3 Examine the Utility of a Behaviour Change Toolbox

Many studies have used the BCW as a step-by-step guide to design interventions and implementation strategies in a variety of settings (L. Craig et al., 2017; Gould et al., 2014; Mc Sharry et al., 2016; Webster et al., 2016). To my knowledge, this study is the first to use the BCW to develop a toolbox of intervention functions and BCTs for administrators, program planners, and researchers to use in the design of sexual health interventions. Further research is needed to identify implementation strategies for using the BCT toolbox in practice. It will be important to examine the conditions needed to support the use of the toolbox to design sexual health service interventions. Next steps include working with universities to examine these conditions and develop implementation strategies. This should include a clear roadmap for implementing the intervention functions and BCTs to maximize effectiveness and sustainability of the interventions. Furthermore, additional research is needed to test the utility of providing decision-makers with a toolbox of BCTs to design multiple interventions that fit within their context, compared to one, fully designed intervention to be used in multiple university settings.

9.3.4 Test the Effectiveness of the BCTs and Intervention Functions

Results from this study outline clear mechanisms of action that need to be tested to build our understanding of what intervention mechanisms work in the context of university sexual health care. Investigating the effectiveness of the six intervention functions and 15 BCTs described here requires a rigorous evaluation study with multiple

university health centres. A pragmatic randomized controlled trial design is recommended to evaluate the effect of the BCTs on sexual health outcomes, such as: rates of service use, clinic re-attendance rates, intentions to access sexual health services, beliefs and attitudes related to sexual health service use, and health outcomes (Brown, Newby, Caley, Danahay, & Kehal, 2016; Burns, Keating, & Free, 2016; Wolfers, Kok, Looman, de Zwart, & Mackenbach, 2011). A process evaluation is also recommended to assess the fidelity of intervention implementation, describe causal mechanisms, and identify contextual factors associated with variation in outcomes (Craig et al., 2013; Presseau et al., 2016). These research efforts are needed to advance the science on sexual health behaviour change interventions.

9.3.5 Application of the Behaviour Change Toolbox to Other Health Care Settings

The comprehensive intervention development work described in this study offers sexual health researchers a strong evidence-base to apply to other university health care settings. The detailed behavioural analysis on students' use of sexual health services helps to contextualize this phenomenon and allows readers to assess potential transferability of the findings to other settings. This study focused primarily on university students and their experience accessing university health services; however, our Phase 1 results highlighted that many university students interact with other health care settings in the community (e.g., sexual health centres). University health centres offer primary care services that differ in their accessibility to students and structure of care delivery. As such, future research is needed to examine the applicability of the toolbox for designing sexual health service interventions in community-based primary care contexts.

9.4 CONCLUDING STATEMENT

This study advances what is known about university students' sexual health service use and intervention design. The quantitative and qualitative methods employed in this research provided a more comprehensive understanding of the barriers and enablers to sexual health service use among university students. The BCW helped to illustrate the relationship between students' capability, opportunity, and motivation to sexual health service use and how these interact with their developmental stage and university experience. This detailed behavioural analysis provided a strong foundation to identify theory- and evidence-based components for designing sexual health service interventions. Furthermore, few studies provide sufficient detail on sexual health intervention components and the active ingredients that make up the intervention. This research addresses this gap and adds to our understanding of relevant BCTs for sexual health promotion behaviours. In doing so, this study builds on the work of the BCW in health research and intervention design.

This study addresses a critical gap in the literature on sexual health interventions by using theory throughout the development process. The BCW provided a systematic and pragmatic framework for developing an intervention to improve students' use of sexual health services. To my knowledge, this study is the first to use the BCW to create a toolbox of intervention functions and BCTs for university administrators, program planners, and researchers to use to design sexual health service interventions. Overall, this study provides theory- and evidence-based strategies for improving the uptake of sexual health service use among university students and promotes further research in this

area to test the effectiveness of sexual health interventions to improve students' health and well-being during their university experience.

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APPENDIX A SEARCH STRATEGIES

Pubmed Search Strategy for Factors that Influence Sexual Health Service Use

Database search strategy (Pubmed)	***Emerging Adulthood concept***	***University concept***	***Factors concept***	***Sexual Health Services Concept***
	#1 Young Adult [MeSH] #2 Students [MeSH] #3: #1 OR #2	#4: College* #5: Universit* #6: #4 OR #5	#7: factor* #8: Predictor* #9: Influenc* #10: #7 OR #8 OR #9	#11: Papanicolaou Test [MeSH] #12: Student Health Services [MeSH] #13: Reproductive Health [MeSH] #14: Sexual health service* #15: STI test* #15: STI test* #16: HIV test* #17: #11 OR #12 OR #13 OR #14 OR #15 OR #16
				#17: #11 OR #12 OR #13 OR #14 OR #15 OR #16
	#19- #3 AND #6 AND #10 AND #17			
Limits	English language; published between 1995-2016			
Grey literature	Public Health Agency of Canada Statistics Canada			

Pubmed Search Strategy for Sexual Health Service Interventions

Database search strategy (Pubmed)	***Emerging adulthood concept***	***University concept***	***Sexual Health Services Concept***	***Interventions Concept***
	#1 Young Adult [MeSH] #2 Students [MeSH] #3: #1 OR #2	#4: College* #5: Universit* #6: #4 OR #5	#7: Papanicolaou Test [MeSH] #8: Student Health Services [MeSH] #9: Reproductive Health [MeSH] #10: Sexual health service* #11: STI test* #12: HIV test* #13: #7 OR #8 OR #9 OR #10 OR #11 OR #12	#15: Intervention* #16: Improv* #17: Evaluation*
	#18- #3 AND #6 AND #13 AND #17			
Limits	English language; published between 1995-2016			
Grey literature	Public Health Agency of Canada Statistics Canada National Health Services UK Centre for Disease Control and Prevention Google scholar			

APPENDIX B PHASE 1 SURVEY QUESTIONS

Undergraduate Health Survey Questions (Steenbeek et al., 2014)

2. What is your age in years? _____

3. What ethnic/racial background do you consider yourself to be? (*Check all that apply.)*
- ☐ White (Caucasian)
- ☐ African descent
- ☐ Aboriginal (*specify*) _____
- ☐ Asian
- ☐ Middle Eastern
- ☐ Other (*describe*) _____

4. What year of your undergraduate program are you in?
- ☐ First
- ☐ Second
- ☐ Third
- ☐ Fourth
- ☐ Other

7. Who do you live with?
- ☐ I live alone
- ☐ I live with one or both of my parent(s)
- ☐ I live with my partner (i.e., sexual or romantic partner, spouse or girlfriend/boyfriend)
- ☐ I live with a roommate(s) (not a sexual or romantic partner)

10. What is your sex?

☐ Male ☐ Female ☐ Transgendered ☐ Other (*describe*) _____

11. People have different feelings about themselves when it comes to questions of being attracted to other people. Which of the following best describes your feelings?
- ☐ 100% heterosexual (attracted to persons of the opposite sex)
- ☐ Mostly heterosexual
- ☐ Bisexual (attracted to both males and females)
- ☐ Mostly homosexual
- ☐ 100% homosexual (gay/lesbian, attracted to persons of the same sex)
- ☐ Transgendered
- ☐ Not sure

21. Read the following definition of heterosexual vaginal intercourse and then answer the question below. “Heterosexual vaginal intercourse occurs when a male’s penis enters a female’s vagina. When this happens, both people are having vaginal intercourse.” Have you ever had heterosexual vaginal intercourse? (Check one.)

- ☐ I prefer not to answer
- ☐ No
- ☐ Yes

Sexual Health Knowledge

14. Please indicate whether you believe each of the following statements are true or false by checking the appropriate response. If you do not know the answer, please do not guess, but answer “Don’t Know”.

	True	False	Don’t Know
If you know a person’s sexual history and lifestyle before you have sex with them, you don’t need to use condoms	☐	☐	☐
Men with chlamydia always have symptoms	☐	☐	☐
Women with chlamydia always have symptoms	☐	☐	☐
Chlamydia infection in women can result in being unable to have children	☐	☐	☐
If a guy or girl aged 18 – 24 gets chlamydia and is treated properly, he or she can never get chlamydia again	☐	☐	☐
If both are used properly, condoms are just as effective as birth control pills in preventing pregnancy	☐	☐	☐
Emergency contraceptive pills are available at pharmacies	☐	☐	☐
Emergency contraceptive pills always prevent pregnancies	☐	☐	☐
To be effective, emergency contraceptive pills must be taken within 12 hours of unprotected sex	☐	☐	☐
Emergency contraceptive pills are more effective the earlier they are taken after unprotected sex	☐	☐	☐
Doctors will always test for STIs when they do a PAP test	☐	☐	☐
The time in the monthly menstrual cycle during which a female is most likely to become pregnant is about two weeks before her period begins	☐	☐	☐

Social Support

17. Please describe how true you believe each of the following statements about your social relationships and support networks, where 1 = not at all true and 5 = completely true

	1	2	3	4	5
I participate in volunteer/service projects	□	□	□	□	□
I have meaningful conversations with my parents and or/siblings	□	□	□	□	□
I have a mentor(s) in my life I can go to for support/advice	□	□	□	□	□
I seldom invite others to join me in my social and or/recreational activities	□	□	□	□	□
There is at least one person I feel a strong emotional tie with	□	□	□	□	□
There is no one I can trust to help solve my problems	□	□	□	□	□
I take time to visit my neighbours	□	□	□	□	□
If a crisis arose in my life, I would have the support I need from family and/or friends	□	□	□	□	□
I belong to a club (e.g., sports, hobbies, support group, special interests)	□	□	□	□	□
I have friends from work that I see socially (movie, dinner, sports etc)	□	□	□	□	□
I have friendships that are mutually fulfilling	□	□	□	□	□
There is no one I can talk to when making important decisions in my life	□	□	□	□	□
I make an effort to keep in touch with friends	□	□	□	□	□
My friends and family feel comfortable asking me for help	□	□	□	□	□
I find it difficult to make new friends	□	□	□	□	□
I look for opportunities to help and support others	□	□	□	□	□
I have a close friends(s) who I feel comfortable sharing deeply about myself	□	□	□	□	□
I seldom get invited to do things with others	□	□	□	□	□
I feel well supported by my friends and/or family	□	□	□	□	□
I wish I had more people in my life that enjoy the same interests and activities as I do	□	□	□	□	□
There is no one that shares my beliefs and attitudes	□	□	□	□	□

Barriers to Help-Seeking

18. Please indicate how much you disagree or agree with the following statements by checking the appropriate number on the 5 point scale, where 1 = “Strongly disagree” and 5 = “Strongly agree”.

	1	2	3	4	5
I would think less of myself for needing help	□	□	□	□	□
I don’t like other people telling me what to do	□	□	□	□	□
Nobody knows more about my problems than I do	□	□	□	□	□
I’d feel better about myself knowing I didn’t need help from others	□	□	□	□	□
I don’t like feeling controlled by other people	□	□	□	□	□
It would seem weak to ask for help	□	□	□	□	□
I like to make my own decision and not be too influenced by others	□	□	□	□	□
Asking for help is like surrendering authority over my life	□	□	□	□	□

General Health Service Use

36. Have you ever seen a doctor or a nurse at your university health centre for any reason?

□ No
□ Yes

Sexual Health Service Use

47. Have you ever seen a health professional in order to obtain the following services? If you answer ‘Yes’ for a particular service, please indicate the location where you access that service.

Service:	**Accessed?**		**If yes, please indicate location**	
	Yes	**No**	**University health centre**	**Other**
STI testing	□	□	□	□
PAP testing	□	□	□	□
HIV/AIDS testing	□	□	□	□
Pregnancy testing	□	□	□	□

APPENDIX C FOCUS GROUP SCREENING QUESTIONNAIRE

Focus Group Participant Screening Questionnaire

1. Name: _____

2. Age:_____

3. Are you an undergraduate student?
   ___Yes
   ___No

4. Year of Study:
   ___First
   ___Second
   ___Third
   ___Fourth
   ___Fifth
   ___Other

5. What is your current gender identity? (Please check all that apply)
   ___Male
   ___Female
   ___Other (e.g. transgender, non-binary, gender-fluid, etc.)
   ___Prefer not to disclose

6. i) Do you consider yourself to be a member of the LGBTQ community?
   ___Yes
   ___No
   ___Prefer not to disclose

   ii) If yes: I will be hosting three student focus groups, one for LGBTQ students, one for students who identify as women/female, one for students who identify as men/male. Would you prefer to participate in a gender-specific group OR a group with other LGBTQ students?
   ___Gender-specific focus group
   ___LGBTQ focus group

APPENDIX D FOCUS GROUP CONSENT FORM

DALHOUSIE UNIVERSITY

CONSENT FORM

Project title: Using a Mixed Methods Approach to Design an Intervention to Improve Sexual Health Service Use Among University Undergraduate Students in Nova Scotia

Lead researcher: Christine Cassidy, RN BScN PhD(c), Dalhousie University School of Nursing
ccassidy@dal.ca, 902-456-7123

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Dr. Ruth Martin-Misener, RN-NP, PhD (Committee Member)
Professor
School of Nursing Dalhousie University
ruth.martin-misener@dal.ca

Funding provided by: CIHR Doctoral Research Award (2015-2018); Dalhousie University School of Nursing Research Fund Operating Grant (2016-2017)

Introduction
We invite you to take part in a research study being conducted by Christine Cassidy, a student at Dalhousie University PhD in Nursing program. Choosing whether or not to take part in this research is entirely your choice. There will be no impact on your studies or the health care you receive if you decide not to participate in the research. The information below tells you about what is involved in the research, what you will be asked to do and about any benefit, risk, inconvenience or discomfort that you might experience.

You should discuss any questions you have about this study with me. Please ask as many questions as you like.

Purpose and Outline of the Research Study
The purpose of this study is to explore university students' use or non-use of sexual health services at university health clinics. First, we will examine the results from a large online survey that was conducted with Dalhousie and Acadia University students in 2012. This will describe the rates of sexual health service use on campus. Second, we will conduct focus groups with groups of students, as well as separate focus groups with health care providers and administrators. The focus groups will help us to better understand the barriers and facilitators of sexual health service use among students. Lastly, we will use this information and meet with students, health care providers, and administrators for a second time to design an intervention to help improve the use of sexual health services among students at Dalhousie and Acadia Universities.

Who Can Take Part in the Research Study
You may participate in this study if you are an undergraduate student aged 18 to 25 at Dalhousie or Acadia University. You may participate if you have used sexual health services in the past OR if you have never accessed sexual health services.

What You Will Be Asked to Do
You will be asked to participate in one focus group session. The group session will last approximately 45-60 minutes and will be audio-recorded. We will discuss your perceived barriers and facilitators to sexual health service use among university students.

Possible Benefits, Risks and Discomforts
You may not receive any direct benefit from participating in the study. You will be helping to design an intervention that will hopefully improve students' use of sexual health services.

There are some risks with this, or any study. You may find the questions you are asked during the course of the study upsetting or distressing. You may not like all of the questions that you will be asked. You do not have to answer any questions you find uncomfortable or that make you feel uneasy. As with any group discussion, breach of confidentiality may be a concern. To protect your privacy and the privacy of the other participants, we ask that you do not share names of participants or anything that was discussed during the focus group outside the focus group session. The researcher has been trained and will use all appropriate measures to protect your privacy.

Compensation / Reimbursement
To thank you for your time, we will give you a $30 Sobey's gift card.

How your information will be protected:
We want to make sure your information remains protected. Your name and contact information will be kept secure by the research team. It will not be shared with others without your permission. We will only send study communications directly to you without carbon copying (cc) other participants. There will be other students involved in the focus group discussion. We ask that you do not share names of participants or anything that was discussed during the focus group outside the focus group session but there is no guarantee that other participants will maintain confidentiality. We also advise that you do not disclose any personal information about your sexual health, sexual orientation etc. If we learn about current or ongoing abuse or neglect of a child or adult in need of protection, we will need to report this to the appropriate authorities. This disclosure of information will not be included in the analysis.

Information that you provide to us will be kept private. Only the research team at Dalhousie University will have access to this information. We will describe and share our findings in a PhD dissertation, conference presentations, public media, and journal articles. We will be very careful to only talk about group results so that no one will be identified. This means that ***you will not be identified in any way in our reports***. The people who work with us have an obligation to keep all research information private. Any identifying information shared during the focus group (e.g. names, specific locations, etc.) will be removed when the focus group is typed up. Each participant will be given a pseudonym (a fake name). The transcripts will be coded based on the phrases you use in the group discussion. All electronic records will be kept secure in an encrypted file on the researcher's password-protected computer.

If You Decide to Stop Participating
If you chose to participate and later change your mind, you can say no and stop the research at any time. If you wish to withdraw your consent please inform the Primary Investigator. All data collected up to the date you withdraw your consent will remain in the study records, to be included in study related analyses.

How to Obtain Results
We will provide you with a short description of group results when the study is finished. You can obtain these results by including your contact information at the end of the signature page.

Questions
We are happy to talk with you about any questions or concerns you may have about your participation in this research study. Please contact Christine Cassidy (at 902-456-7123 or ccassidy@dal.ca) at any time with questions, comments, or concerns about the research study. We will also tell you if any new information comes up that could affect your decision to participate.

If you have any ethical concerns about your participation in this research, you may also contact Research Ethics, Dalhousie University at (902) 494-1462, or email: ethics@dal.ca (and reference REB file #2016-3968).

Signature Page

Project title: Using a Mixed Methods Approach to Design an Intervention to Improve Sexual Health Service Use Among University Undergraduate Students in Nova Scotia

Lead researcher: Christine Cassidy, RN BScN PhD(c), Dalhousie University School of Nursing
ccassidy@dal.ca

I have read the explanation about this study. I have been given the opportunity to discuss it and my questions have been answered to my satisfaction. I understand that I have been asked to take part in one focus group that will occur at a location acceptable to me. I agree to take part in this study. My participation is voluntary and I understand that I am free to withdraw from the study at any time.

_____	_____	_____
Name	Signature	Date

I understand that the focus group discussion will be audio-recorded. I understand direct quotes of things I say may be used without identifying me. I agree to being audio-recorded.

_____	_____	_____
Name	Signature	Date

In the next phase of our study, we will be conducting follow-up focus groups with students, health care providers and administrators. At this focus group, we will discuss the results from the first round of focus groups and use the findings to design an intervention to improve students' use of sexual health services.

I give permission to be re-contacted for a follow-up focus group with the research team.

_____	_____
Signature	Date

I wish to receive a summary of the results of this study upon completion.

_____	_____
Name	Email

APPENDIX E INTERVIEW CONSENT FORM

DALHOUSIE UNIVERSITY

CONSENT FORM

Project title: Using a Mixed Methods Approach to Design an Intervention to Improve Sexual Health Service Use among University Undergraduate Students in Nova Scotia

Lead researcher: Christine Cassidy, RN BScN PhD(c), Dalhousie University School of Nursing
ccassidy@dal.ca, 902-470-2659

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donald.langille@dal.ca

Dr. Ruth Martin-Misener, RN-NP, PhD (Committee Member)
Professor
School of Nursing Dalhousie University
ruth.martin-misener@dal.ca

Funding provided by: CIHR Doctoral Research Award (2015-2018); Dalhousie University School of Nursing Research Fund Operating Grant (2016-2017)

Introduction
We invite you to take part in a research study being conducted by Christine Cassidy, a student at Dalhousie University PhD in Nursing program. Choosing whether or not to take part in this research is entirely your choice. There will be no impact on your employment if you decide not to participate in the research. The information below tells you about what is involved in the research, what you will be asked to do and about any benefit, risk, inconvenience or discomfort that you might experience.

You should discuss any questions you have about this study with me. Please ask as many questions as you like. If you have questions later, please contact the lead researcher.

Purpose and Outline of the Research Study
The purpose of this study is to explore university students' use or non-use of sexual health services at university health clinics. First, we will examine the results from a large online survey that was conducted with Dalhousie and Acadia University students in 2012. This will describe the rates of sexual health service use on campus. Second, we will conduct focus groups with groups of students, as well as separate telephone interviews with health care providers and administrators. The focus groups and interviews will help us to better understand the barriers and facilitators of sexual health service use among students. Lastly, we will use this information and meet with students, health care providers, and administrators for a second time to design an intervention to help improve the use of sexual health services among students at Dalhousie and Acadia Universities.

Who Can Take Part in the Research Study
You may participate in this study if you are a health care provider at Dalhousie or Acadia University Health Centre or if you are a health clinic manager/administrator at Dalhousie or Acadia University.

What You Will Be Asked to Do
You will be asked to participate in one telephone interview. The interview will last approximately 20 minutes and will be audio-recorded. We will discuss your perceived barriers and facilitators to sexual health service use among university students. You do not have to answer a question if you do not know the answer or choose not to answer. In fact, you do not have to participate at all, and this decision will not impact your employment.

You will be asked to participate in one telephone interview. The interview will last approximately 20 minutes and will be audio-recorded. We will discuss your perceived barriers and facilitators to sexual health service use among university students. You do not have to answer a question if you do not know the answer or choose not to answer. In fact, you do not have to participate at all, and this decision will not impact your employment.

Compensation / Reimbursement
To thank you for your time, we will give you a $10 Tim Horton's gift card.

How your information will be protected:
We want to make sure your information remains protected. Your name and contact information will be kept secure by the research team in Nova Scotia. It will not be shared with others without your permission. We will only send study communications directly to you without carbon copying (cc) other participants. If we learn about current or ongoing abuse or neglect of a child or adult in need of protection, we will need to report this to the appropriate authorities. This disclosure of information will not be included in the analysis.

Information that you provide to us will be kept private. Only the research team at Dalhousie University will have access to this information. We will describe and share our findings in a PhD dissertation, conference presentations, public media, and journal articles. We will be very careful to only talk about group results so that no one will be identified. This means that ***you will not be identified in any way in our reports***. The people who work with us have an obligation to keep all research information private. Any identifying information shared during the interview (e.g. names, specific locations, etc.) will be removed when the interview is typed up. Each participant will be given a pseudonym (a fake name). The transcripts will be coded based on the phrases you use in the group discussion. All electronic records will be kept secure in an encrypted file on the researcher's password-protected computer.

If You Decide to Stop Participating
If you chose to participate and later change your mind, you can say no and stop the research at any time. If you wish to withdraw your consent please inform the Primary Investigator. All data collected up to the date you withdraw your consent will remain in the study records, to be included in study related analyses.

How to Obtain Results
We will provide you with a short description of group results when the study is finished. You can obtain these results by including your contact information at the end of the signature page.

Questions
We are happy to talk with you about any questions or concerns you may have about your participation in this research study. Please contact Christine Cassidy (at 902-470-2659 or ccassidy@dal.ca) at any time with questions, comments, or concerns about the research study. We will also tell you if any new information comes up that could affect your decision to participate.

If you have any ethical concerns about your participation in this research, you may also contact Research Ethics, Dalhousie University at (902) 494-1462, or email: ethics@dal.ca (and reference REB file # 2016-3968).

Interviews - Telephone Consent Process

I will now turn on the audio-recorder to go through the consent process. Is this okay?

(TURN ON AUDIO-RECORDER)

Please note that I have turned on the audio recorder for the consent process.

Do you agree to participate in the study?

Participant Name:_____
Date:_____
Time:_____

Researcher Name:_____
Date:_____
Time:_____

Thank you. I will now start with my questions.

(GO THROUGH INTERVIEW GUIDE)

Thank you for answering my questions. I am now going to turn off the audio-recorder.

(TURN OFF AUDIO RECORDER)

I have a couple follow-up questions for you.
In the next phase of our study, we will be conducting follow-up focus groups with students, health care providers and administrators. At this focus group, we will discuss the results from the first round of focus groups and interviews use the findings to design an intervention to improve students' use of sexual health services.

Would you like to be re-contacted for a follow-up focus group with the research team.

Yes_____ No_____

Do you wish to receive a summary of the results of this study upon completion?
Yes_____ No_____

We would also like to mail you a $10 Tim Horton's gift card to thank you for your time. Would you like to provide an address for us to mail it to you? If so, what is the best address to send the gift card to?

Address:_____

APPENDIX F FOCUS GROUP AND INTERVIEW GUIDES

University Undergraduate Student Focus Group Guide

A. **Knowledge**

1. Tell me about the sexual health services that are offered at your university? What do you know about these services? (Prompt- have you used the services?; what services exist, how do you make an appointment, what is the process for service use?)
2. How do you find out information about sexual health services offered at your university?
3. Do you or your friends use other sexual health services (not at your university)?

B. Skill

4. In your opinion, what knowledge or resources do you need to access sexual health services at your university? (i.e., communicating with receptionist, finding the information online, etc.)
5. Do you feel you and other undergraduate students have the knowledge or resources to access sexual health services at your university?

(prompt –are there any other skills that you need?)

C. Social/Professional Role

6. Do you feel like you have a responsibility to access sexual health services? Tell me about this. (prompt- Is there a responsibility to yourself? To others?)

D. Beliefs about capabilities

7. How easy or difficult is it to access sexual health services at your university? (prompt – what would make it easy or difficult for you?)
8. How confident do you feel in your ability to access sexual health services at your university?
9. What problems have you encountered (or do you foresee encountering) in accessing sexual health services?

E. Beliefs about consequences

10. How useful do you find the sexual health services offered at your university? (prompts- what are the benefits of university services?; Has your view on sexual health services changed over time?)
11. Are there any harms that can occur from using the sexual health services at your university? Are there any harms that can occur from NOT using the sexual health services at your university?

F. Optimism

12. How optimistic are you that students will use university sexual health services?

G. Reinforcement

13. Are there any incentives for you to access sexual health services at your university? What are they?

H. Intentions

14. On a scale of 1 to 10 and 10 being very important, how important do you think it is for you to access sexual health services at your university or in another setting (e.g. primary health care clinic)? Why?

I. Goals

15. Is accessing sexual health services at your university part of your health and wellness goals? (Prompt – why or why not?)

J. Memory, attention and decision process

16. Can you anticipate forgetting (or do you forget) that sexual health services are offered at your university? When do (would) you forget?
17. What would help make it easy to remember to use the sexual health services offered at your university?
18. What influences or triggers (what would influence or trigger) you to use the sexual health services at your university?

K. Environmental context and resources

19. What factors in the campus environment/student life would influence your decision or ability to access the sexual health services at your university? (location? Confidentiality/privacy?
20. What factors outside of the campus environment/student life influence your decision or ability to access the sexual health services at your university?
21. Are there competing tasks or time constraints that would influence your ability to access the sexual health services at your university?

L. Social influences

22. Do you ever discuss access sexual health care services with your family, friends, or sexual partners? (prompt-does their support influence your decision to access services?)
23. Would your family, friends, or sexual partners influence your decision to access sexual health services? How would they influence your decision? To what extent?

M. Emotion

24. Does discussing sexual health services ever evoke an emotional response in you? (prompt – would you feel worried or concerned about accessing sexual health services at your university?)
25. Thinking about yourself and how you normally feel as an undergraduate student to what extent do you feel motivated to access sexual health services? To what extent to you feel nervous to access sexual health services?
26. Would your family, friends, or sexual partners' emotions ever affect your decision to access sexual health services at your university?

N. Behavioural regulation

27. Is discussing sexual health care matters something you do regularly in your daily life? (something you feel comfortable with)
28. What do you think is needed to ensure that you consistently access sexual health services at your university? (prompt –things specific to you, your university health centre, the university administration)

Key Informant Interview Guide

CAPABILITY	
Psychological Capability	
Knowledge	Are you familiar with any guidelines or policies that university students and sexual health services? Can you describe what the guidelines or policies say?
	PROMPT: Do you use any guidelines or policies to try to improve university students' use of sexual health services?
Behavioural Regulation	Is discussing sexual health care matters something you do automatically in your practice or profession?
	What do you think is needed to ensure that you consistently provide effective sexual health services to students? (prompt – things specific to you, your health centre, the administration)
Memory, Attention, and Decision Process	Are there situations when you think it would be difficult to provide sexual health services to students? (prompt – can you tell me what it is about these situations that make it difficult)
	What influences or triggers (what would influence or trigger) you to provide sexual health care to students or advance the sexual health service policies?
Physical Capability	
Skills	What skills are needed to provide effective sexual health care to university students? Or what skills are needed to improve sexual health care to university students?
	Do you feel you have the skills to provide effective sexual health care to university students? Do you feel you have the skills to advance sexual health care policy for university students? (prompt –are there any other skills that you need?)
OPPORTUNITY	
Social Opportunity	
Social influences	Do you ever discuss sexual health services or policies with other physicians, nurses, or administrators in your clinic?
	Would other clinicians in your clinic influence your decision to provide sexual health care services to students? How would they influence your practice? To what extent?
	PROMPT: Do your colleagues value providing effective sexual h ealth care services to students or improving sexual health service policy?
Physical Opportunity	
	What factors outside of your professional/practice environment would influence your ability to provide more effective sexual

Environmental Context and Resources	health care services or improve sexual health service policies? (Prompt – other departments in the university?)
	Are there competing tasks or time constraints that would influence your ability to provide more effective sexual health care services or improve sexual health service policies?
MOTIVATION	
Automatic Motivation	
Reinforcement	Are there any incentives for you to provide sexual health services to students at your health centre? What are they?
	When you provide sexual health care to students do you feel like you are making a difference? Why or why not?
Emotion	Does discussing sexual health services for university students ever evoke an emotional response in you? (prompt – would you feel worried or concerned about providing sexual health services?)
	Thinking about yourself and how you normally feel as a professional that works with university students, to what extent do you feel inspired to provide sexual health services or advance policy? To what extent to you feel nervous to provide sexual health services or advancing policy?
Reflective Motivation	
Social/Professional Role and Identity	What responsibilities do you have as a health care provider or university administrator to provide sexual health care services?
	How is sexual health care provision and/or policy development consistent or inconsistent with your profession?
	How compatible is the provision of sexual health care with your profession?
Beliefs About Capabilities	How confident do you feel in your ability to provide sexual health services to university students?
	How easy or difficult is it to provide sexual health care services to university students or focus on advancing sexual health service policy for university students? How easy or difficult is it to improve provide sexual health care services to university students? (prompt – what would make it easy or difficult for you?)
Beliefs about Consequences	Do you find the university health clinics' sexual health services useful?
	In the socio-political context of your clinic, is there sufficient financial support to provide sexual health services?
	What do you think are the benefits of these types of services? (prompts – Are there any particular patient benefits, financial benefits, HCP benefits or administration benefits? Is there enough time to provide effective sexual health care?)

	Are there any harms that can occur from providing sexual health services to university students? (prompts – is there any potential harm for the patient, health care professional or the campus health clinic?)
Optimism	How optimistic are you about the future of sexual health services at university health centres?
Intentions	On a scale of 1 to 10 and 10 being very important, how important do you think it is for you to provide sexual health care services to university students at your health clinic? Why?
Goals	Would the goal of improving sexual health services be compatible with your usual practice? (Prompt - why?)
	Generally, how often does covering something else on your agenda take precedence of sexual health service provision or policy development? (What usually takes precedence?)

APPENDIX G JOURNAL COPYRIGHT FORMS

Manuscript 1 – Chapter 3

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Publication Form for JMIR Publications Authors

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Please scan a copy of the signed form and upload to our management system (upload using the "Upload new Figure, Appendix or Supplementary file" functionality in the Editing tab and choose "License to publish" in the dropdown). If multiple authors across different institutions need to sign this, we suggest to sign the form electronically using resources like http://www.hellosign.com.
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The manuscript with the title

Development of a behaviour change intervention to improve sexual health service use among university undergraduate students: a mixed methods study protocol

authored by

Christine Cassidy, Audrey Steenbeek, Donald Langille, Ruth Martin-Misener, Janet Curran

("authors")

has been accepted for publication by JMIR Publications ("publisher"). A signed copy of this form must be on file with JMIR Publications before the manuscript can be published.

Manuscript #: 8326

Corresponding author: Christine Cassidy
5869 University Avenue
PO BOX 15000 Halifax, Nova Scotia, Canada B3H 4R2
(w) 902-470-2659 (f) 902-405-4232

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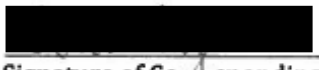

Signature of Corresponding Author

Manuscript 2 – Chapter 4

07 March 2018

University of Toronto Press
5201 Dufferin St.
Toronto ON M3H 5T8

I am preparing my PhD in Nursing thesis for submission to the Faculty of Graduate Studies at Dalhousie University, Halifax, Nova Scotia, Canada. I am seeking your permission to include a manuscript version of the following paper(s) as a chapter in the thesis:

Cassidy, C., Steenbeek, A., Langille, D., Martin-Misener, R., Curran, J. (accepted). Sexual health service use among university undergraduate students in Nova Scotia. Canadian Journal of Human Sexuality.

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Full publication details and a copy of this permission letter will be included in the thesis.

Yours sincerely,

[redacted]

Christine Cassidy RN PhD (c)
School of Nursing, Dalhousie University
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