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Promoting Positive Sexual Health Behaviors Among Rural College Students: Results of a Targeted STI Prevention Program

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Abstract

Sexually transmitted infections (STIs) are a significant public health concern, with 26 million new cases diagnosed annually in the U.S. Emerging adults aged 18 to 25 years, which are included in the age group of Americans who have the highest rates for the three most common STIs: chlamydia, gonorrhea, and HPV (cdc.gov., 2020). Unfortunately, there is a paucity of research on the effects of STI education interventions on the attitudes and knowledge regarding STIs in this age group, especially in rural youth. While STI rates are high among adolescents and young adults nationally, rural youth have different behavioral risk factors for STI acquisition than their urban peers, such as limited access to care, lower rates of insurance, lower incomes, less education, higher rates of health risk behaviors, and overall poorer health (RHIH, 2017).

This interventional study pilots the use of a self-directed web-based educational intervention for improving college students' knowledge of STIs based on the health belief model of change. Voluntary participants included students of 18 to 25 years old from a rural Tennessee university. After the participants had reviewed a series of five web-based STI educational videos, the participants' knowledge and attitudes regarding sexual behavior and safer sex self-efficacy were measured using the STD-KQ and subsets of the MSQS Attitude and Value Inventory, and their responses were compared to their responses prior to the intervention. Analysis of the participants' response data revealed that there was a statistically significant improvement in their overall knowledge of STIs as a result of this learning intervention and that the variables of age and rurality did not correlate with this increase in knowledge. The results of the statistical analysis also indicated a significant improvement in safer sex self-efficacy scores but no change in sexual attitude scores. Further statistical analysis indicated that there was a strong correlation

between the knowledge gained from STI intervention and changes in sexual attitudes but not with safer sex self-efficacy scores. This latter finding might be due to the limitations of the current study. The results of this study suggest that there is an improvement in knowledge following a brief web based STI prevention program; this improvement correlated with an improvement in attitudes toward STIs and sexual health behaviors. It further supports the addition of educational interventions in a college setting to enhance the knowledge of positive sexual health behaviors and their subsequent implementation to mitigate the risk of STIs in this age group.

Introduction

Sexually transmitted infections (STIs) remain a significant public health concern. Estimates from the Centers for Disease Control (CDC) report *Sexually Transmitted Disease Surveillance, 2020* (cdc.gov., 2020) suggest that about 20% of the U.S. population—approximately one in five people in the United States—have an STI on any given day, totaling 26 million new cases annually. While they affect individuals of all ages, STIs take a particularly heavy toll on young people. ("STD Prevention for Adolescents | Georgia Department of Public Health") The CDC estimates that youth aged 15 to 24 years, who represent only 25% of the sexually active population in the United States, account for almost half of the newly diagnosed STIs. Rural populations face many challenges that may impact STI risk in the emerging adult, including limited access to care, lower rates of insurance, and higher rates of health risk behaviors when compared to their urban counterparts (McMann & Trout, 2021). College students from small, rural settings, in particular, lag behind the national college estimates for practicing safe sex and contraceptive use (McMann & Trout, 2021).

When left untreated, STIs cause many harmful, often irreversible, and costly clinical outcomes. Women often suffer from pelvic inflammatory disease and experience infertility or ectopic pregnancies because of undetected infections and delayed treatment. Untreated STIs in men cause long-term consequences such as sterility, prostatitis, and epididymitis. In pregnant women, gonorrhea and chlamydia can result in neonatal ophthalmia, leading to blindness in nearly 4,000 infants annually and pneumonia in neonates if they are infected during labor or at the time of delivery (cdc.gov., 2020).

Background of the Problem

Emerging adulthood is a developmental stage that is neither adolescence nor young adulthood but is theoretically and empirically distinct from them both, spanning the late teens through the twenties, with a focus on the ages 18 to 25 years (apa.org., n.d.). It is a unique and pivotal period marked by physical maturation, psychological and social changes, increased independence, and the experimentation with or establishment of new behaviors (Berlan & Holland-Hall, 2010). It is also a period of vulnerability, defined as the "susceptibility to harm which results from an interaction between the resources available to individuals and communities and the life challenges they face" (Mechanic & Tanner, 2007). Vulnerability is the result of the complex interactions of many factors, such as socioeconomic status, interpersonal support, and physical environmental factors over the course of one's life (Mechanic & Tanner, 2007).

As this developmental period provides the opportunity for exploration, skill attainment, and support for some segments of the population, those without this opportunity may become even more vulnerable. Côté (2006) argues that given the lack of environmental and institutional resources to guide youth through the transition to adulthood, personal resources become even more important. Specific to emerging adulthood, an additional set of characteristics, mainly autonomy, future motivation, adult support, and coping skills, provides additional support and resources to guide one through a successful transition to adulthood regardless of the risks in childhood (Côté, 2006).

In general, emerging adulthood is associated with frontolimbic neurodevelopment and increases in future-oriented behavior (Taber-Thomas & Perez-Edgar, 2015). Young people of this age group experience significant brain development that results in "incentive-motivated" behavior, which is crucial for healthy development and promotes learning for future behaviors

(Victor & Hariri, 2016). Yet, as evidenced by an increase in risky behaviors, the path toward more mature decisions is not always a steady path from adolescence to adulthood. While most emerging adults are capable of making mature decisions related to their sexual health, including being able to precontemplate and prepare for sexual encounters, many are unable to translate these rational forethoughts into actions "in the moment" (Victor & Hariri, 2016). The existing literature suggests that this may be due to the emerging social context outpacing neural development, leading to a vulnerability to risky behavior (Taber-Thomas & Perez-Edgar, 2015).

Socioeconomic factors, particularly geographic location, and poverty, contribute heavily to the vulnerability of this age group. Economic factors that create social disadvantages, including poverty, are linked to poor academic achievements, which potentially influence adult achievements. This disadvantage does not necessarily occur immediately but emerges later in life with persistent socioeconomic adversity (Rowling, 2006). Earning a college degree leads to a higher-paid and more prestigious job, while early parenthood, an unsuccessful marriage at a young age, and involvement in crime or problematic substance use predict future difficulties in finances, family relationships, and beyond (Chen & Kaplan, 2003).

Purpose of the Study

The purpose of this pilot study is to assess the knowledge, attitudes, and practices regarding STIs and sexual health practices of college students attending a rural Tennessee university. This knowledge of STIs and attitudes toward sexual health practices will be assessed prior to and following a brief, tailored web-based STI education intervention with a pre- and postintervention survey using the Sexually Transmitted Disease Knowledge Questionnaire (STD-KQ) and subsets of the Mathtech Sexuality Questionnaire for Adolescents (MSQS). Analysis of the survey results provides insight into the degree of improvement in knowledge of

STIs, along with associations between the independent variables of gender, age, and rurality and the dependent variables of sexual attitudes and safer sex efficacy. Additionally, this pilot study serves to examine the feasibility of applying this intervention on a larger, more coordinated scale within the university and for future studies assessing the impact of STI education in a college setting.

The implementation and evaluation of this targeted web-based STI prevention program in a rural college setting provide an exploration of the influence of this type of programming on the attitudes and knowledge regarding sexual behaviors of rural college-aged students. This study contributes to the growing body of evidence supporting the improvement in the health and well-being of rural college students and advances efforts to improve their knowledge of sexual health and disease prevention.

Significance of this Study

This DNP Project is significant in three ways and is relevant to addressing the risk of STIs in the rural emerging adult college student by (1) improving the knowledge of STIs and the personal assessment of risk factors, (2) assessing the attitudes and perception regarding safer sex self-efficacy, and (3) improving access to sexual health care and reducing the social stigma of consulting sexual health services in a college setting.

Improving the Knowledge of STIs and Personal Assessment of Risk Factors

Emerging adults are included in the age group of Americans who have the highest rates for the three most common STIs: chlamydia, gonorrhea, and HPV (cdc.gov., 2020). Reasons for the increased rates include biologic susceptibility, risky sexual behaviors, and limited access to health care (cdc.gov., 2020). In addition, the sociocultural context of the rural environment can present challenges to the health of adolescents. Valentine et al. (2022) report that social

determinants of health, such as poverty, access to health services, racism (often manifested as residential segregation), and social stigma as a consequence of community norms and attitudes, are associated with poorer health status among rural Americans.

While STI rates are high among adolescents and young adults nationally, rural youth may have different behavioral risk factors for STI acquisition than their urban peers. Victor and Hariri (2016) relate that negative sexual health behaviors in this age group are likely the result of the low rate of condom use and the high number of new sexual partners. For example, 39%–44% of sexually active rural youth reported engaging in sexual intercourse before the age of 14 years, half of those sexually active youth reported inconsistent or no condom use, and one third reported four or more lifetime partners (Valentine et al., 2022). These results indicate that rural college students lag behind the national averages of their age group regarding safe sex practices and contraceptive use (McMann & Trout, 2021).

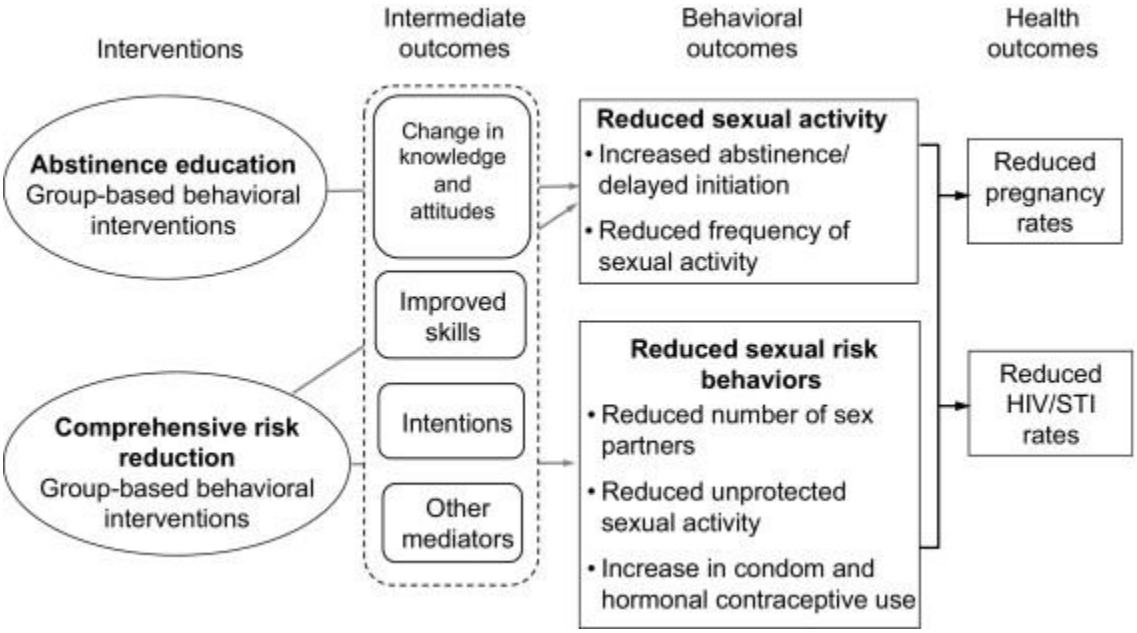
According to CDC surveillance data (cdc.gov., 2022), the state of Tennessee ranks in the top ten of reported cases of STIs in the United States. Even more disturbingly, in the year 2020 within the state of Tennessee, there were 10,315 new chlamydia cases diagnosed among young adults aged 15 to 25 years, as well as 3,206 new gonorrhea cases (cdc.org., 2022). In their report *Sex and HIV Education* (2023), the Guttmacher Institute states that most southern American states, including Tennessee, do not mandate sexual health education at any level of schooling. In fact, the state of Tennessee mandates sexual education in a county only if the pregnancy rate is at least 19.5 or higher per 1,000 young women aged 15–17 years old (Guttmacher, 2021). Additionally, the majority of states in the southeastern United States, including Tennessee, require that if these programs are employed, the curriculum excludes information on

contraception, includes instruction on the importance of engaging in sexual activity only within marriage, and stresses abstinence (Guttmacher, 2023).

Jozkowski and Crawford (2016) synthesized data on the current state of sexual and reproductive health among five southern U.S. states. They found that abstinence-only sex education programs in secondary schools did not delay sexual initiation and were not effective in reducing the number of teens' sexual partners (Kirby, 2007; Trenholm et al., 2007; Underhill et al., 2007). Additionally, abstinence-only programs were not effective in increasing teens' use of condoms and contraception when they did engage in sexual intercourse. Furthermore, researchers found that some of the material covered in abstinence-only programs was scientifically inaccurate, misleading, and dishonest (Trenholm et al., 2007; Waxman, 2004). The American Medical Association (2015) opposes the sole use of abstinence-only sexual education and supports sexual health education that is holistic and teaches comprehensive topics that include developmentally appropriate physiologic and relational aspects of sexuality. Continued research on the efficacy of comprehensive sexuality education programming is paramount to generating any positive change in sexual health outcomes of the emerging adult population.

Figure 1

Analytic Framework Showing the Effects of Group-Based Abstinence Education and Comprehensive Risk-Reduction Interventions



Chin et al. (2012) conducted a meta-analysis of 66 studies on comprehensive risk reduction and 23 studies on abstinence education to assess the effects of group-based interventions that address the sexual behavior of adolescents. They utilized an analytic framework (Figure 1) to identify the ways in which sexual health education and comprehensive risk reduction are expected to influence pregnancy and HIV/STI rates (Chin et al., 2012). The results of this meta-analysis show that the effects were favorable and significant for most primary outcomes, with approximate decreases of 12% in sexual activity (risk ratio [RR] = 0.88), 14% in number of sex partners (RR = 0.86), 25% in unprotected sexual activity (RR = 0.75), and 31% in prevalence of STIs (RR = 0.69). Their conclusions indicate that group-based comprehensive risk reduction interventions are an effective strategy to reduce adolescent pregnancy, HIV, and STIs (Chin et al., 2012). The CDC recognizes the benefits of sexual health

education, including the positive impact on students to delay the initiation of sexual intercourse, to reduce the number of sexual partners, and to increase the use of safer sex practices, including condom use (cdc.gov., n.d.).

Assessing the Attitudes and Perception Regarding Safer Sex Self-Efficacy

The consistent and correct use of safer sex practices is shown to dramatically reduce the likelihood of contracting an STI. Yet many sexually active emerging adults do not consistently use safer sex practices. Data from the 2017–2019 National Survey of Family Growth (NSFG) show that only 38.7% of women aged 15–19 years and 60.9% of women aged 20–29 years use any type of contraception (Daniels & Abma, 2020). A greater understanding of the attitudes that contribute to safer sex self-efficacy will enhance sexual health promotion and intervention efforts for this age group.

Various models of behavior, including the health belief model (HBM), have shown some utility in predicting safe sex practices among college students (Addoh et al., 2017). A factor that has been found to promote the use of safer sex practices is self-efficacy: the individual's belief about his/her ability to obtain, discuss, and use safer sex practices in the presence of barriers to this behavior (Beckmeyer & Jamison, 2015). For example, self-efficacy for condom use refers to the confidence a college student has in his/her ability to use a condom appropriately in the presence of situation-specific barriers, such as the influence of alcohol, partner disapproval, or the "heat of the moment." Addoh et al. (2017) utilized the Condom Use Self-Efficacy Scale and observed significant associations between constructs of self-efficacy (including assertiveness and partner approval) and utilizing safer sex practices. In their research, Beckmeyer and Jamison (2015) determined that safer sex self-efficacy is an appropriate target for STI intervention programs as it is a key motivational factor in this age group.

Despite the importance of STI prevention, little is known about the best educational strategies for STI prevention among this emerging adult age group, particularly among rural emerging adults. Also, despite the evidence supporting a lack of knowledge about STIs in this particular age group (Barandouzi & Cong, 2019; Ford et al., 2004; Goldsberry et al., 2017), emerging adults often inappropriately perceive themselves as knowledgeable about STIs (Ford et al., 2004; Hickey & Cleland, 2005; Kilween & Looby, 2018), thus putting them at greater risk. "Ruralness" presents an additional compounding risk to this age group, further adding to the vulnerability of rural emerging adults. Targeting this vulnerable age group with STI prevention programming may be part of an effective strategy to reverse this alarming trend.

Improving Access to Sexual Health Care in a College Setting

Of the over 30 million 18–25-year-olds in the United States, approximately 17 million are enrolled in an institute of higher education (U.S. Census Bureau, 2020). In 2011, the College Health Surveillance Network (CHSN) reported that during the 41-month study period, 802,255 individual students used the health centers of the universities studied, compiling 4.17 million patient encounters; over 6.3% (50,292 visits) of these were classified as related to an STI (Turner & Keller, 2015). College health centers are in a unique position to play a pivotal role in the delivery of sexual health services to emerging adults. Habel et al. (2018) report that 70.6% of colleges reported having a student health center, of which almost three quarters offered STI diagnosis and treatment. They also found that sexual health education programming on college campuses was not robust enough to impact behavior change (Habel et al., 2018). They suggest that the most common ways to raise awareness of sexual health, such as flyers, pamphlets, and posters, are inadequate and that one-on-one peer education modalities may be useful for increasing awareness (Habel et al., 2018).

The American College Health Association (ACHA, 2020) provides guidelines and best practices for sexual health promotion and clinical care in a college health setting. These guidelines serve to assist colleges and universities in the provision of sexual health services both in health promotion and in clinical care. The ACHA recognizes that a function of college-based health care is to provide comprehensive, evidence-informed sexuality education directly to students. But they also state that their greatest impact is achieved through primary prevention and health promotion, aiming to "expand protective factors and campus strengths, and reduce personal, campus, community and environmental health and well-being factors" (ACHA, 2019). The *Standards of Practice in Health Promotion in Higher Education* (2019) provide several strategies to support and guide this work. On a student level, this could include providing skill-building activities about safer sex techniques and recruiting and training peer educators to engage in outreach to provide sexuality education across campus. On an organizational level, it suggests developing comprehensive sexual health services, including STI screening, on campus and developing campus-wide sexual health campaigns. At the community level, it stresses collaborating with stakeholders and community partners to advocate policies that enhance sexual health and improve sexual equity (ACHA, 2019).

The nursing profession has a rich history in health promotion and disease prevention in public health, including the management of STIs. Part of the nursing role in public health is providing a critical link between epidemiological data and a clinical understanding of health and illness as it is experienced in people's lives. There are over 16,183 public health nurses currently employed in the United States (zippia.com., 2023), and they are critical to the delivery of health services to those at risk of or living with STIs. This understanding translates into action, including developing specific ways of empowering young people by providing factual

information, creating opportunities for building life skills, and increasing access to resources that will give them the tools and freedom to be active participants in their sexual health and wellness. The contemporary college health nurse practitioner is in a unique position to meet the college student's need for holistic care and resources, especially in sexual health promotion and clinical care.

Clinical Question

Among 19–25-year-old students at a rural Tennessee university, can a targeted web-based STI education intervention improve their knowledge of STIs, and what, if any, are the effects on attitudes and self-efficacy in promoting safer sex practices and prevention of these infections?

Review of the Literature

Examining emerging adults' perceptions of STI prevention strategies provides crucial insights that can be used by health care providers to improve sexual health education in a college setting. Sexual health of rural young adults has been little studied and is virtually nonexistent in the literature. Despite a lack of research related to this topic, three main themes guide this project: (a) emerging adults' knowledge and attitudes regarding STI prevention, (b) characteristics of successful STI prevention programs, and (c) areas for improvement in STI prevention programs.

Search Terms in the Literature Review

Due to a paucity of robust research on this population and their knowledge of sexual health topics, an integrated literature review was conducted to include relevant topics from 2010 through to the present. The objective of this review was to examine the evidence for factors that influence and strategies that support the use of STI prevention programs in college-aged students. Keyword search terms included *emerging adulthood, STI, sexual education, STI*

prevention, academic health care, student health, and *community health.* The review was conducted utilizing the following databases: Cumulative Index of Nursing and Allied Health (CINAHL), PubMed, Google Scholar, and Medline. After the application of exclusion criteria to capture peer-reviewed research literature on young adults aged 18–25 years old from the United States between 2012 and 2012, 48 articles were selected. After a full-text review, 24 articles were discarded because they did not examine the effects on this demographic group, leaving a final yield of 24 articles. One article (Jaworski & Carey, 2007) was included as it provided support for the STD Knowledge Questionnaire, a validated and reliable tool for measuring sexual health knowledge that was utilized in the research arm of this project.

Knowledge and Attitudes Regarding STIs

The assessment of STI knowledge among emerging adults is essential for developing effective strategies for STI prevention interventions. Although college students often perceive that they are generally knowledgeable regarding STIs (Rouner & Lindsey, 2006), evidence refutes this perception. For example, when evaluated, college students are not able to describe the symptoms of STIs, nor do they know that STIs can present asymptomatically, demonstrating that they may have less knowledge than they believe (Rouner & Lindsey, 2006). Additionally, multiple studies document that college students are frequently unsure of how STIs are transmitted or diagnosed, which can make it difficult for college students to protect themselves or discourage them from engaging in risky sexual behavior (Barandouzi & Cong, 2019; Goldsberry et al., 2016; Moore & Smith, 2012; Rouner & Lindsey, 2006). Goldsberry et al. (2016) reported statistically significant positive changes in attitude and knowledge scores of college fraternity and sorority members using the STD Knowledge Questionnaire (STD-KQ) following an STI programming intervention. There was a significant difference in the pre- and

postintervention scores between the group that completed the study (M = 13.03, SD = 6.46) and the group that did not complete the study (M = 10.99, SD = 6.60), $t(256) = -2.51$, $p = .013$, $r = .15$ (Goldsberry et al., 2016). This study established an increase in knowledge after a single, 30-minute educational session, adding to previous research showing that a single-session educational intervention is beneficial to increasing STI knowledge in college students (Goldsberry et al., 2016).

Evidence shows that emerging adults do not recognize the actual risk of acquiring an STI. Analysis of data from the National Longitudinal Study of Adolescent Health found that 86% of participants, especially women aged 20 to 24 years, did not consider themselves at risk of contracting an STI (Ford et al., 2004). It is well-documented that condom use reduces the risk of contracting STIs. Hickey and Cleland (2012) examined sexual activity and condom use of female college students to determine the perceived risk of acquiring an STI. They found that sexually active female students were less likely to perceive the risk of contracting STIs if they always used condoms or had only one sexual partner. The belief that a single sexual partner confers a low risk may be mistaken, and overreliance on personal attributes and "just knowing" a partner as a determining factor in risk perception is similarly ill-advised. They recommended that greater emphasis on sexual health risk reduction be available on college campuses, including information on STI risk and prevention strategies and screening services in student health centers (Hickey & Cleland, 2012).

Drawing on both prospect theory and protection motivation theory, Mccullock and Perrault (2020) studied college students to determine whether coping and threat appraisals mediated the effects of source credibility and health message framing on behavioral intentions to get screened for STIs. They evaluated the effect of health message framing (negative vs.

positive) and source type (expert vs. nonexpert) on credibility perceptions of sexual health recommendations via Facebook posts. The results reveal that both highly credible sources and negatively framed messages influenced behavioral intentions to screen for STIs (Mccullock & Perrault, 2020).

Risky sexual behaviors—including sex without protection against pregnancy or STIs, sexual coercion, and sex with unknown partners—are common among college students (Kilween & Looby, 2018). Excessive alcohol use is also a factor linked to high-risk sexual health practices in this age group. Alcohol use often diminishes inhibitions and rational decision-making, thereby increasing the incidence of unprotected sex (Kirby, 2001). Common practices such as binge drinking, drinking rituals, and drinking games often contribute to students' increased risk of unprotected sex, sexual assault, and abuse (Maney et al., 2003). To effectively decrease these behaviors, it is necessary to further understand the factors associated with their occurrence. Kilwein and Looby (2018) reported that risky sexual behavior was positively correlated with increased alcohol consumption in the college-age group and that social motivation was one of the more significant reasons for drinking alcohol. To effectively decrease these risky behaviors, it is recommended that college health professionals work to develop and implement effective sexual education and prevention strategies that also address college students' alcohol use patterns.

Characteristics of Successful STI Prevention Programs

Emerging adults access sexual health information from various sources, including health care providers, parents, schools, community organizations, and digital media. Multiple studies indicate that participating in comprehensive sexuality education is linked to declines in STI risk behaviors, including delays in first intercourse, reductions in number of sexual partners, and decreases in unprotected sex (Chin et al., 2012). To reverse recent increases in STIs and improve

sexual and reproductive health outcomes in this age group, sexual health education approaches should reach beyond clinics and classrooms and instead capitalize on innovative, youth-friendly technologies.

Jaramillo et al. (2017) examined the association between receiving sex education before the age of 18 years and contraceptive use of 15–20-year-old males in the United States. They reported that increased exposure to sex education topics, specifically how to "say no" and where to obtain birth control, was associated with a threefold increase in the use of dual contraceptives, which is the use of both a barrier method (e.g., male condoms) and a method that is more effective at pregnancy prevention (e.g., intrauterine devices, implants, hormonal methods, and sterilization). These findings imply that formal educational settings such as colleges would benefit the emerging adult male population and their female partners by teaching a comprehensive number of topics through sex education programming (Jaramillo et al., 2017).

Lustria et al. (2016) reported significant findings regarding the characteristics of a successful STI program, including tailoring the intervention to create individualized messages. As opposed to messages that contain general information, tailored messages were found to achieve more attention from the participants in the program due to a higher personal relevance. Innovative programming, including the use of motion comics (Willis et al., 2018) and graphic images (Jain et al., 2017), as opposed to statistical messaging about STIs, is associated with an advanced perception of risk.

Studies have shown positive outcomes using online resources, social media, and web-based forms of sexual health education, which provide the opportunity to target educational interventions for specific geographical locations and at-risk populations, including rural populations (Friedman, Kachur, Noar & McFarlane, 2016; Hover & Bertke, 2017). Web-based

sexual health campaigns have the potential ability to reach large segments of at-risk populations at low or no cost. Hoffman et al. (2020) found that web-based sexual health interventions provide college students with more sexual health knowledge about how to decrease the transmission of STIs. They determined that directing emerging adults to online sexual health education augments and substantiates the sexual health education provided in person (Hoffman et al., 2020). Friedman et al. (2016) report that when strategically designed, implemented, and evaluated, web-based health communication campaigns, which use communication messages and tools to inform and influence individual decisions, can effectively promote STI prevention and influence behaviors among at-risk audiences. Utilizing these technologies, colleges and universities, especially in rural areas, can provide an important platform to bridge the gap in sexual health education.

The setting and timing of programming also affect the success of STI prevention programs. The school setting provides an appropriate venue for direct health education as it can offer a range of health services and connect students to health and social services (Wilkins et al., 2020). School-based programs that offer preventative sexual health services are important for increasing student access to specific services, such as STI testing, contraception, and condom provision, in a familiar and supportive clinical environment for the student. Adebayo et al. (2021) reported that it is beneficial to offer STI programming and testing around periods associated with higher risk sexual behavior, such as Valentine's Day, Spring Break, and large-scale social events. This strategy requires a partnership with school administrations and organizations, ideally directed by a student-led advisory council, to gain broad support and facilitate effective communication.

Areas for Improvement of STI Programming

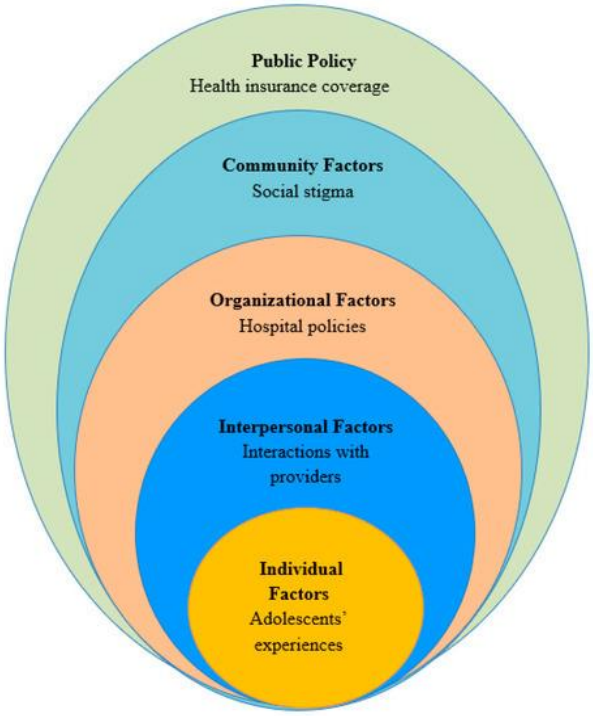
There is a paucity of research on areas for the improvement of STI programming. The current literature supports positive outcomes and behavior change after STI prevention programing in a college setting. Habel et al. (2018) suggest that health education efforts on college campuses are not robust enough to impact behavior change. They suggest that improvements should entail STI testing, increased access to long-acting reversible contraception (LARC) and emergency contraception, offering e-communication with providers through patient portals, and expanded clinic hours (Habel et al., 2018). This aligns with Goal 1.2 of the National STI Strategic Plan (hhs.gov., 2021)—"to expand the implementation of quality, comprehensive STI primary prevention activities"—and aligns with its vision that "the United States will be a place where sexually transmitted infections are prevented, and every person has high-quality STI prevention, care, and treatment while living free from stigma and discrimination" (hhs.gov., 2021, p. 26). This literature review provides support for developing and implementing an STI prevention program for emerging adults in a rural college setting.

To better understand why U.S. college students often forgo sexual health care during a period of high sexual risk, it is important to understand the perceived social, psychological, and logistical barriers that challenge them. The social-ecological model, which posits that individual health behavior influences and is influenced by characteristics within the environment and that individuals are positioned within multiple hierarchical levels of influence (e.g., intrapersonal, interpersonal, organizational, community, and policy) (Figure 2), was utilized by Garney et al. (2021) in their review of the published empirical research on barriers to health care access and utilization of services by young adults in the United States. They found that of all barriers identified, structural barriers at the organization level were noted as the most significant ones

impeding young adults' access to health care services. These barriers prohibited young adults from accessing timely, quality health services. A lack of organizational resources for providing prevention and treatment (drugs, space, technology), long waiting times, poor organizational policies, and a lack of coordinated care contributed to these structural barriers (Garney et al., 2021).

Figure 2

Factors Influencing Adolescent Access to Sexual Health Care



In their study of a northern California state university, Bersamin et al. (2017) found that 27.6% of the survey respondents visited the university-sponsored clinic for reproductive care,

and 27.9% visited primary care office settings. Since college students are more likely to seek reproductive health care from a primary care or college university campus clinic (Bersamin et al., 2017), campus health clinics play a key role in developing interventions that aim to increase the rates of birth control use, educate students on sexual health, and deliver STI testing. It is suggested that student health/wellness centers that offer reproductive health care, ensure that both male and female students know what services are available, and that provide content aimed at reducing perceived barriers (e.g., low costs, flexible hours, patient confidentiality) could result in increased use of services (Bersamin et al., 2017). This study underscores an opportunity for colleges and universities to actively engage their students in health education and risk reduction through information campaigns.

Edison et al. (2021) studied students' experiences with campus resources, sexual health communication, consent, self-efficacy, and confidence in obtaining consent. They found that sexual communication is low and that effective STI programming should address ways to improve communication with partners to gain confidence in addressing condom use and STI prevention (Edison et al., 2021). Mahat and Scoloveno (2018) suggest that peer education, which consists of interventions by individuals to a characteristically similar cohort group, is effective in changing adolescent sexual risk behaviors and should be integrated into sexual health programming. Carey et al. (2015) found that brief, purely informational videos were effective at reducing sexual risk behavior and STI rates of young adult patients attending an STI clinic.

This literature review provides support for developing and implementing an STI prevention program for emerging adults, including those in a rural college setting. The scant research on STIs in rural college settings suggests that rural college students may be more vulnerable to increased STI rates and unintended pregnancy, largely due to absent or inadequate

sexual health education (Boonstra, 2014; Koehler et al., 2008). McMann and Trout (2021) studied the knowledge, attitudes, and practices regarding sexual health and STIs of college students attending a college in rural Nebraska. They found that their study population had a greater proportion of sexually active students than the national average (McMann &Trout, 2021). They also found that over half (52%) of the students did not seek STI screening when they had new partners, which is recommended per CDC guidelines for women over 25 years old to mitigate the increased risk of chlamydial and gonococcal infections (cdc.gov., n.d.). Compared to the national population of college students, the survey participants at the rural Nebraska university also reported lower use of conceptive methods, including the use of an IUD or implant (8% vs. 19.5%) or the use of birth control pills (23.2% vs. 50.2%) (McMann & Trout, 2021). These results indicate that rural college students lag behind the national averages of their age group regarding safe sex practices and contraceptive use (McMann & Trout, 2021).

While STI rates are high among adolescents and young adults nationally, rural youth may have different behavioral risk factors for STI acquisition than their urban peers. Victor and Hariri (2016) mention that negative sexual health behaviors in this age group are likely the result of a low rate of condom use and a high number of new sexual partners. For example, 39%–44% of sexually active rural youth reported engaging in sexual intercourse before the age of 14 years, half of those sexually active youth reported inconsistent or no condom use, and one third reported four or more lifetime partners (Valentine et al., 2022). Addoh et al. (2017) studied the association of safe sex self-efficacy with safe sex practices in a southern U.S. college. They found a significant association between intoxicants and safe sex practices, with 32% of the participants reporting having unprotected sexual intercourse while drinking alcohol within the past year (Addoh et al., 2017). While southern states have the highest reported intensity of binge

drinking in the United States (cdc.org., 2021), it is suggested that targeted approaches to fostering safe sex behavior in the presence of intoxicants be developed for the rural college setting (Addoh et al., 2017).

In summary, the review of the current literature indicates that there are knowledge gaps about STIs and general sexual health in the emerging adult population. Colleges and universities, especially in rural areas, provide an important platform to bridge the gap in sexual health education. College students, especially in rural areas, currently demonstrate a lack of knowledge about risky sexual behaviors, STI symptoms, and effective methods to prevent STIs. There is a significant perception of low risk of STIs, which tends to encourage engaging in risky sexual behaviors. The literature suggests that participating in a comprehensive program of sexual health is linked to a decrease in STI risk behaviors. Appropriate web-based sexual health interventions provide college students with sexual health knowledge, which is similarly shown to decrease the transmission of STIs. Although research in this area is scarce, studies have found that brief, purely informational videos were effective at reducing risky sexual behavior and STI rates of young adults, especially if they are tailored to the population.

Theoretical Framework

Health Belief Model (HBM) of Change

The health belief model (HBM), along with strategies outlined by the STI National Strategic Plan (hhs.gov., 2021), provides a foundation for my research within a rural college setting. The STI National Strategic Plan (hhs.gov., 2021) sets forth a vision for the nation with goals, objectives, and meaningful strategies to prevent and control STIs in the United States. It is intended to serve as a roadmap for federal and nonfederal stakeholders at all levels to reverse the

upward trends in STI rates, especially in the emerging adult population. The STI National Strategic Plan recognizes that increasing awareness of STIs, expanding STI prevention programs, and engaging health care providers, schools, families, and communities to promote sexual health are all critical to enhancing the primary prevention of STIs.

The HBM provides specific constructs, which will guide the development of realistic, impactful goals and interventions for my population of interest. The HBM is rooted in Bandura's social cognitive theory and shares many of the constructs of Pender's health promotion model (Butts & Rich, 2018). The HBM is an explanatory theory that describes an individual's health-seeking behavior through five steps: (1) perceived susceptibility to a health problem, (2) perceived seriousness of that health problem, (3) perceived benefits of participating in a specific behavior, (4) perceived costs and barriers of participating in a behavior, and (5) cues to action (Montgomery, 2002). The model uniquely addresses the individual's knowledge and attitudes regarding their health and the benefits of taking preventive measures. The HBM is particularly useful for nursing research because it integrates goal setting, decision-making, and social learning (Polit & Hungler, 1991). Montgomery (2002) identifies the HBM as the second most frequently used theoretical framework for guiding adolescent health promotion research. This model is suitable for health promotion research in the emerging adult population because its focus is health motivation. This makes it a "good fit" for this population, especially when addressing high-risk behaviors (Hickman & Schaar, 2018). The knowledge gained from the intervention will assist the participant in making healthy choices and will impact behavior change. Upon completion of the intervention, the participants will gain confidence in their ability to make healthy sexual choices and avoid high-risk behaviors.

The applicability of the HBM to adolescent sexual behaviors has been disputed in the literature. Downing-Matibag and Geisinger (2009) report that researchers of earlier studies relied on quantitative survey data and were limited in their understanding of young adults' perceptions of risky sexual behaviors and the relationship to STIs. Young adults' culturally informed cognitions must be considered in quantitative measures of their health beliefs regarding sexual risk-taking to yield meaningful results. Therefore, stakeholders are encouraged to focus on activities that strongly resonate with the needs of the populations they serve and the services they provide (Downing-Matibag & Geisinger, 2009).

In a meta-analysis of the effectiveness of the HBM, Carpenter (2010) determined that the goal of preventing a negative health outcome is the strongest predictor of behavior change. However, the young adult population tends to think that they are unsusceptible to negative health issues—this "sense of invincibility" is a significant barrier to overcome. The use of cues to action, which are external stimuli that serve to stimulate or prompt health-related behaviors (e.g., social media, peer relationships, and personal experiences with friends and family members), is a strategy that has been shown to have a positive effect on the emerging adults' perception of susceptibility (Noar, 2005).

The HBM has provided a theoretical framework for numerous studies examining a variety of health behaviors, including condom use (Hiltabiddle, 1996), communication regarding adolescent alcohol use (Boekeloo et al., 2003), and perceived risk of STIs in college-aged women (Hickey & Cleland, 2013). Its use in preventive health care research is especially compelling. Scarinci et al. (2012) utilized the HBM to develop a theory-based, culturally relevant intervention focusing on primary (sexual risk reduction) and secondary (Pap smear) prevention of cervical cancer among Latina immigrants. In their study examining perceived barriers to

vaccines, Jones et al. (2015) state that the HBM "posits that messages will achieve optimal behavior change if they successfully target perceived barriers, benefits, self-efficacy, and threat" (p. 566).

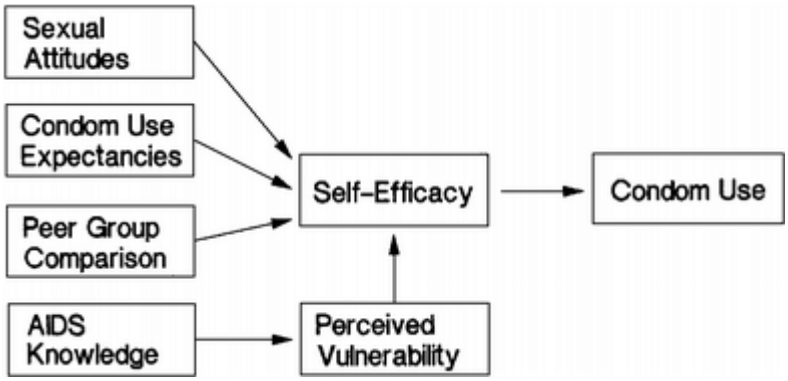
Self-Efficacy

Self-efficacy is defined as a person's judgment of his/her capabilities to organize and execute courses of action required to attain desired outcomes (Bandura, 1986). It is concerned not only with the skills one has but also with the perception of what can be done with these skills (Bandura, 1986). The basic tenets of self-efficacy theory are that the expectations of personal mastery and success will determine whether the person will engage in a particular behavior. Since health behaviors are complex and not always influenced by knowledge alone, some HBM scholars suggest that self-efficacy theory should be added to the HBM (Rosenstock et al., 1988).

One study (Wulfert & Wan, 1993) applied Bandura's self-efficacy theory to condom use. The study was guided by a conceptual model (Figure 3) that renders self-efficacy as the final common pathway, integrating the effects of several cognitive variables, such as sexual attitudes, knowledge, and outcome expectancies, which have been thought to play a role in safer sex behavior (Wulfert & Wan, 1993). They hypothesized that positive expectancies would motivate individuals to practice safer sex by enhancing their sense of self-efficacy. By contrast, negative expectancies would be related to risk behavior by decreasing self-efficacy. The results of this study indicate that the self-efficacy paradigm is a useful conceptual framework for understanding the factors involved in sexual risk behavior.

Figure 3

Path Model Linking Cognitive Process Variables to Self-Efficacy and Condom Use



Self-efficacy functions as a central mediator through which other cognitive factors, including expectancies and self-comparison with one's peers, exert their influence on sexual behaviors, such as condom use (Wulfert & Wan, 1993). As a result, one can assess self-efficacy using the traditional measurement of rating confidence on a point scale, with the sum of the scores indicating the strength of self-efficacy (the greater the sum, the higher the level of self-efficacy). The instrument I chose, MSQS Attitude and Value Inventory, has a specific subset of questions that measure safer sex self-efficacy using a 5-point scale (1 = *strongly disagree* to 5 = *strongly agree*). It has been used in prior research on emerging adults and has been deemed a reliable tool for quantifying safer sex self-efficacy (Beckmeyer & Jamison, 2015).

Previous studies (Ghimire et al., 2011; Latifi et al., 2017; Semple et al., 2010) show that low self-efficacy is associated with sexual risk behavior. People learn how STIs are transmitted or learn how to talk to their sexual partners about using a condom, but they are still involved in high-risk sexual behaviors because behaviors are not directly and solely influenced by knowledge and skills. Social support, positive outcome expectation, and self-efficacy are the three main factors affecting healthy behavior and continuation of actions. Negative expectations

and a lack of social support have been shown to reduce self-efficacy in changing a particular behavior. Behavioral interventions that focus on skill-building methods and that involve the participants actively can be more effective in the context of STI prevention (Latifi et al., 2017).

Limitations of the HBM

The limitations of using the HBM in adolescent research, especially in developing sexual health initiatives, are documented in the literature. In her research using the HBM with adolescents, Hiltabiddle (1996) states that merely providing information about safer sex practices to adolescents is an inadequate intervention. Adolescents are receiving and retaining the facts, but the gap between knowledge and practice remains wide. Hiltabiddle (1996) recognizes that the HBM does not incorporate peer group influence, emotional factors, or the cognitive level of adolescents, which impairs their ability to evaluate personal risks objectively. The adolescent's preoccupation with the immediate consequences of his or her actions hinders the rational decision-making skills on which this model is based. Hiltabiddle (1996) has not found significant changes in behavior without stressing interventions that include targeting misconceptions of personal vulnerability and assisting adolescents in making a more realistic assessment of their personal risk.

Most research has not shown significant changes in behavior without addressing the developmental needs and perceptions of adolescents (Brown et al., 1991). Brown et al. (1991) cite limitations of using the HBM as a well-defined model for predicting change regarding the prevention of STIs. At the core of understanding health behaviors, especially in the emerging adult population, is the influence of factors such as emotions, self-appraisal, and peer groups, which play a major role in influencing behavior in this age group (Brown et al., 1991). They

report that without consideration of these factors, the HBM more closely resembles a “loosely constructed framework” for studying behavior change (Brown et al., 1991).

Lollis et al. (1997) studied the ability of the HBM to predict condom use and high-risk sexual behaviors in their survey of 122 U.S. college students aged 17–35 years. They found that the HBM did not significantly explain condom use in the 58 men and 64 women surveyed. Rather, it partially explained a small proportion of the variance in sexual risk behaviors, including the likelihood of being high on drugs or intoxicated during sex and a history of multiple sexual partnerships (Lollis et al., 1997). They concluded that unless the HBM is expanded to include other behavior-specific cognitive factors (e.g., benefits and barriers associated with multiple sexual partnerships), its ability to explain more than a small proportion of the variance in sexually risky behaviors is limited (Lollis et al., 1997).

Despite its limitations, the HBM provided specific constructs that guided the development of realistic, impactful goals and interventions for my population of interest. The goal of assessing emerging adults’ knowledge and attitudes regarding STI prevention is determined by the survey instruments and the analysis of pre- and postintervention scores for statistically significant changes. This aligns with the HBM constructs of perceived susceptibility (a person’s subjective perception of the risk of acquiring an STI) and perceived benefit (a person’s perception of the effectiveness of the actions necessary to reduce the threat of an STI). The goal of determining characteristics of successful STI prevention programs and improving STI prevention programs aligns with the constructs of cues to action, focusing on both the internal and external cues that trigger the decision-making process to make positive decisions

regarding sexual health. This coincides with self-efficacy: the individual's belief about their ability to perform certain behaviors—in this case, to use safer sex practices.

Project Framework

Project Design

This DNP project is an interventional pilot study, a type of clinical study in which participants receive an intervention so that the effects can be evaluated based on statistically significant changes in scores of a preintervention survey compared to the same survey offered following the intervention. Interventional studies are particularly suitable for evaluating the direct impacts of disease treatments or preventive measures with specific outcome measures based on the data obtained. A series of five tailored STI prevention intervention videos were provided to student volunteers daily. Knowledge changes were measured using the STD Knowledge Questionnaire (STD-KQ) (Jaworski & Carey, 2007). Changes in attitudes toward safe sex behavior were measured using the subsets of the Mathtech Sexuality Questionnaire (MSQS) Attitude and Value Inventory (Kirby, n.d.). Through the pre- and post-test administration of the STD-KQ and statistical analysis of the responses, this pilot study assesses the impact of the intervention on the participant's knowledge of STIs and their prevention. A bivariate correlational analysis was conducted on the responses to the MSQS subsets to determine whether safer sex self-efficacy is associated with demographic and attitudinal variables. This study has a preexperimental design, which is appropriate for this purpose as it does not require randomization or a control group. Moran et al. (2020) state that the preexperimental design is practical, as the study measures changes in health-related outcomes and intervention when it is not feasible to use a true experiment.

DNP Project Plan

Project Setting

The project was conducted at Lincoln Memorial University (LMU), which is a private university in Harrogate, Tennessee. LMU's 1,000-acre (4.0 km^2) campus borders Cumberland Gap National Historical Park. LMU lies in the Appalachian region of the United States, which includes 420 counties across 13 states: Alabama, Georgia, Kentucky, Maryland, Mississippi, New York, North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee, Virginia, and West Virginia. With only 25.7% of Appalachian adults aged 25 to 64 holding a bachelor's degree, considerably less than the national average of 32.9% (prb.org., 2022), higher educational opportunities are limited. LMU is committed to enriching the lives of people and communities in the Appalachian region.

Other than educational attainment, this region consistently lags behind the rest of the United States in a variety of measures, such as household income, population growth, health care access, and labor force participation (prb.org., 2022). The median household income is $49,747 annually compared to $60,293 (prb.org., 2022). Health care in this region is considered underserved, with the supply of primary care physicians being 12% lower and the supply of mental health providers being 35% lower than the national average (prb.org., 2022).

In fall 2019, the LMU student population totaled 4,885 students, of whom 1,305 were undergraduate and 2,706 were graduate students (lmunet.edu., 2022). The full-time LMU undergraduate population is made up of 67% women and 33% men. Graduate programs, including those of the schools of osteopathy, physician assistant, law, veterinary medicine, and dentistry, report that 59.4% are female and 40.59% are male (collegefactual.com., 2022). The undergraduate population consists of 86% White students and 6.7% African American students

(collegefactual.com). Graduate programs at LMU are more diverse, with 68.9% of students identifying themselves as White, 15.1% as African American, and 10.9% as Asian (collegefactual.com., 2022). The majority of LMU undergraduates report their home state as Tennessee (69.4%,), with the remainder being from 14 other geographically different states (collegefactual.com., 2022). Students from 36 countries are represented at this school, with most of the international students coming from Canada, the United Kingdom, and Brazil (collegefactual.com, 2022). Students were asked to give their home zip code on the demographic form, which was entered into the *Am I Rural?* screening tool. This tool determines whether a specific location is considered rural based on various definitions of rural, including definitions that are used as eligibility criteria for federal programs (ruralhealthinfo.org., n.d.).

Human Subject Protections and Recruitment of Participants

Institutional Review Board (IRB) approval was obtained before the start of this project and included permission to survey LMU faculty, staff, and students (Appendix A.). The participants recruited are currently registered students aged 18 to 25 years, and recruitment was accomplished through flyers distributed throughout the university. Per LMU policy, permission to post the flyers and distribute them throughout the LMU campus common buildings, dorms, and classroom areas was obtained (Appendix B.) The recruitment survey remained active from January 23, 2023, until February 4, 2023, which made it possible to obtain an adequate response and robust sample size.

Interested students were directed to sign up with a QR code and/or hyperlink. Once the students gain access, they are instructed to complete the demographic information survey on the Qualtrics platform. (Appendix C). This information included age, gender, level of education, ethnicity, race, and home zip code. No personal identifying information was collected, and a

numbering system was used to match pre- and postintervention responses with the demographic information. At that time, the participants also signed a consent form (Appendix D), including background information about the study, such as duration, eligibility, procedures, risks/benefits, compensation, and confidentiality of the study. An Amazon gift card and two community service hours, a requirement for undergraduate and graduate programs, was offered to everyone completing the postintervention questionnaire as compensation for their time and effort.

The ethical protection of the participants involved in this scholarly project was ensured by taking steps that are suggested by the American Psychological Associations Science Directorate (APA, 2002) principles to avoid ethical quandaries. First, as a researcher, I avoided relationships that could impair the participants' professional performance or could exploit or harm others. As the Director of the LMU Student Health Center, I could potentially encounter student participants in my research as patients. I was especially cautious about the potential power difference between the students and myself in the roles of health care provider and researcher.

Informed-consent rules were followed as indicated by the LMU IRB policies. When done properly, the consent process ensures that individuals are voluntarily participating in the research with full knowledge of relevant risks and benefits. APA's Ethics Code (APA, 2002) mandates that researchers should inform participants about the purpose of the research, expected duration, and procedures. Upon their access to the QR code from the recruitment flyer, the student volunteers completed the demographic survey and consent form on the Qualtrics platform. At this point, a random numerical identifier was assigned that coordinated each survey. These identifiers and the corresponding data were confidentially maintained on an Excel spreadsheet that is password protected and stored on a secure laptop computer.

The Qualtrics secure platform facilitated the consent forms, surveys, and data processing for this study. The servers of Qualtrics maintain high-end firewall systems to protect their data, and the servers regularly conduct scans to ensure that any vulnerabilities are quickly found and patched. Access to Qualtrics is restricted to specific individuals (principal investigators) and is password protected. I did not generate or maintain any physical copies of protected data. I analyzed all the data without any personal identifiers and aggregated the data based solely on the volunteer demographics. Student survey responses are stored on a password-protected laptop for 3 years, and access is limited to the principal investigator only.

Project Tools

In this study, measuring STI knowledge as an independent variable is necessary in order to quantify sexual health risk behaviors. Knowledge is not a distinct construct of the HBM but is incorporated into perceived susceptibility and is evaluated by individuals in terms of its personal relevance to risk reduction (Jaworski & Carey, 2007). In this DNP project, STI knowledge is measured using Jaworski and Carey's Sexually Transmitted Disease Knowledge Questionnaire (STD-KQ) (2007) (Appendix E.). The author granted permission for its use in the project (Appendix F).

The STD-KQ identifies knowledge deficits, evaluates risk reduction programs, and serves as a measure of knowledge in basic research (Jaworski & Carey, 2007). Its reliability has been supported by its use in doctoral theses and clinical research with emerging adults and, with some modifications, older adults (Matthew et al., 2020). For example, Goldsberry et al. (2016) used the STD-KQ to measure the effects of a single, brief STD educational intervention on the overall sexual knowledge of college students in Greek organizations. Barandouzi and Cong (2019) used the STD-KQ to determine the correlation between the knowledge level of STIs and specific

demographic data of the subjects in a large public university. Allen (2017) used the STD-KQ to determine the increase in knowledge of preventing STIs in adult college students through video education.

In this DNP project, the variables of safer sex attitudes and self-efficacy are measured using a subset of questions of the Mathtech Sexuality Questionnaire for Adolescents (MSQS) Attitude and Value Inventory. Beckmeyer and Jamison (2014) used these scales to measure safer sex self-efficacy in a Midwestern university. They determined that greater self-efficacy plays a role in ensuring that those who are motivated to use safe sex practices to prevent STIs are confident that they will be able to do so during sexual encounters (Beckmeyer & Jamison, 2014). These findings of safe sex self-efficacy are consistent with the HBM construct of perceived susceptibility to a health problem and with the notion that increased emphasis on the importance of safer sex practices will increase one's confidence in being able to enact these behaviors in a sexual situation.

Project Timeline

Beginning in June 2022, steps were taken to obtain IRB approval, including completion of the Collaborative Institutional Training Initiative (CITI) training, permission to use research tools, and permission to survey LMU students. In January 2023, the IRB declared this project exempt from most requirements of human subject protection regulations as described in 45CFR46.104. From January 23, 2023, through February 4, 2023, recruitment flyers were placed in strategic areas of the LMU campus. This flyer directed the student with a QR code to complete the consent form and demographic questionnaire; 55 students were recruited. Then, from February 6, 2023, through February 10, 2023, daily STI intervention videos, which included the preintervention surveys, were sent via LMU emails to consenting participants; 35 students

completed the preintervention surveys. February 17, 2023, was the deadline for submitting the postintervention survey and for qualifying for participation incentives; 28 students completed the postintervention surveys. In March 2023, the aggregate data were statistically analyzed using IBM's Statistical Package for Social Sciences (SPSS).

Results

Demographic Data Analysis

Demographic data were analyzed and included self-reported age, gender, highest level of schooling, and race (Table 1). Thirty-five participants, ranging in age from 18 to 25 years, completed the initial demographic survey; descriptive statistics were used to analyze the demographic data collected. The mean age of the participants was 21.5 years. A weighted mean was calculated to illustrate the relative importance of each value, resulting in an average age of 22.5 years. This value provides a more accurate representation of the average age of the respondents, especially due to the more robust responses from the older range of the population. The majority (37.14%) of the individual program responses were from the DeBusk College of Osteopathic Medicine (DCOM); this does not include participants from the Occupational Therapy or Physical Therapy professional programs housed within DCOM. The collective undergraduate responses represented 40% of the total, with the majority of the responses being from sophomores. There were no responses from the Duncan School of Law (DSOL), the Caylor School of Nursing, or the School of Dental Medicine. Three fourths of the respondents (74.28%) were female, and no respondents identified themselves as nonbinary and/or did not choose to respond. The most common ethnicity was White/Caucasian (65.71%), followed by Hispanic/Latino (17.14%), Asian (8.57%), Black/African American (2.86%), and other (5.72%).

The *Am I Rural?* tool was used to determine whether a specific location is considered rural based on the home zip code reported by the participant. This tool identifies a geographic zip code as rural if it does not meet the definition of an urban area. To be identified as an urban area, a territory must encompass at least 2,000 housing units or have a population of at least 5,000 people (census.gov., 2023). Twelve respondents (34.29%) had a rural home zip code, 16 respondents had a nonrural home zip code (45.71%), three (8.57%) respondents had an international home zip code, and four respondents did not provide a home zip code (Table 1).

Table 1

Demographic Characteristics of the Study Participants

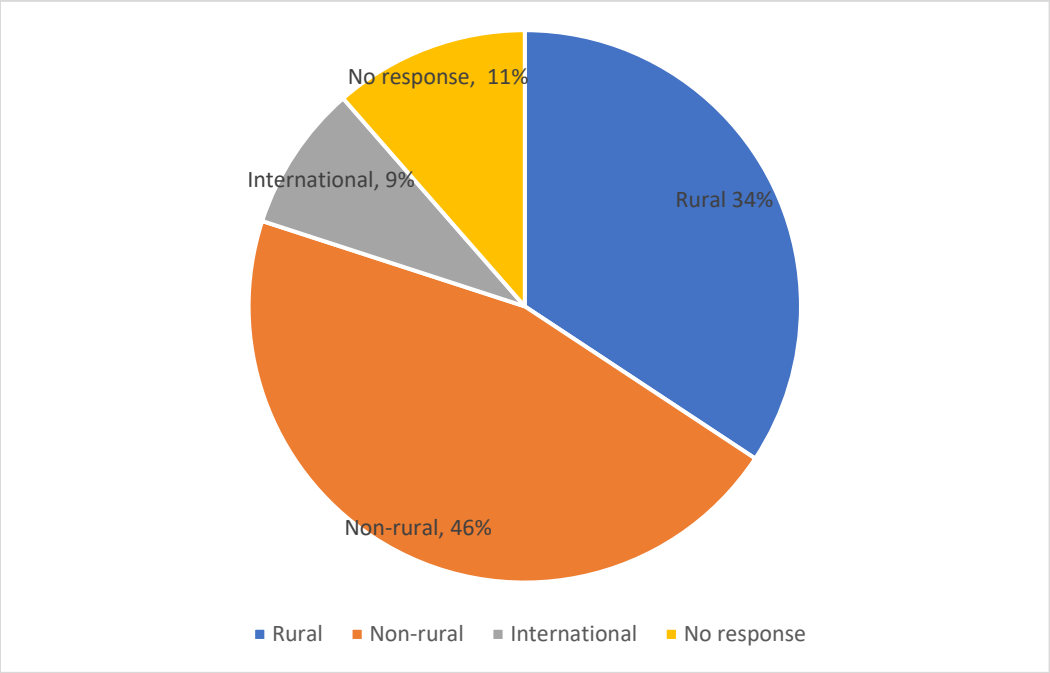
Age	**%**	**Count**
"What is your year of birth?"		
2005 (18 years)	11.43%	4
2004 (19 years)	5.71%	2
2003 (20 years)	20.00%	7
2002 (21 years)	8.57%	3
2001 (22 years)	14.29%	5
2000 (23 years)	5.71%	2
1999 (24 years)	11.43%	4
1998 (25 years)	22.86%	8
Mean age	21.5	
Weighted mean age	22.48	
Highest level of schooling	**%**	**Count**
"What is the highest grade or level of school that you are currently registered in?"		
Undergraduate freshman	11.43%	4
Undergraduate sophomore	17.14%	6
Undergraduate junior	8.57%	3
Undergraduate senior	2.86%	1
DCOM	37.14%	13
CVM	5.71%	2
PA	14.29%	5
Other	2.86%	1

Total	100%	35
Gender	**%**	**Count**
“What is your gender?”		
Male	25.72%	9
Female	74.28%	26
Nonbinary	0%	0
Prefer not to answer	0%	0
Total	100%	35

Race/ethnicity	**%**	**Count**
“What race do you consider yourself to be?”		
White/Caucasian	65.71%	23
Black/African American	2.86%	1
Hispanic/Latino	17.14%	6
American Indian/Alaska native	0%	0
Asian	8.57%	3
Other	5.72%	2
Total	100%	35

Table 2

Rurality Based on Reported Home Zip Codes



Statistical Analysis of the Survey Results

Each study participant was asked to complete a preintervention survey, including the STD-KQ to measure STI knowledge and subsets of the MSQS to measure the participant's attitudes toward safe sex and sexual health self-efficacy. The same surveys were completed at the conclusion of the intervention. The obtained data were downloaded from Qualtrics and analyzed using SPSS.

STI Knowledge

The STD-KQ survey was developed by Jaworski and Carey (2007) to measure the respondents' knowledge of six sexually transmitted infections, including HIV, genital herpes, chlamydia, gonorrhea, hepatitis B, and human papilloma virus. The STD-KQ is a brief, internally

consistent, and stable measure that is sensitive to educational interventions and has been demonstrated to be adequate with a Cronbach's alpha of .86 (Jaworski & Carey, 2007). The STD-KQ consists of items used to measure knowledge of STIs by including up-to-date, comprehensive questions that focus on some of the primary STIs that currently present public health concerns. It consists of 27 questions on the types, symptoms, treatments, and prevention strategies of STIs. To avoid bias, the developers use an alternative choice format (i.e., true/false) with a "don't know" option. The answer to each item of the questionnaire is scored as 0 or 1, with 0 being assigned to the "false" or "don't know" responses and 1 assigned to the "true" answers. The overall highest score is 27, which represents a summation of the correct answers. A higher score indicates a greater knowledge about STIs.

The questions on the STD-KQ are designed to evaluate STI knowledge and can be categorized as knowledge of symptoms, knowledge of causes, knowledge of prevention, and knowledge of treatment of STIs. A total of 28 students participated in this study, completing both the pre- and postintervention surveys. Table 3 indicates the percentage of correct answers ranked from the highest percentage to the lowest percentage. For example, Question 15, "A man must have vaginal sex to get genital warts," got the most correct responses. Question 17, "A woman can tell if she has chlamydia if she has a bad smelling odor from her vagina," and Question 13, "Using a natural skin (lambskin) condom can protect a person from getting HIV," got the fewest correct answers. The highest ranked correct answers on both the pre- and postintervention surveys focused on STI causes (Questions 14, 11, 9, 18, and 12), STI symptoms (Questions 15 and 10), STI prevention (Questions 24 and 8), and STI treatment (Question 27) (Table 3).

Table 3

STD-KQ Pre- and Postintervention Survey Results (Ranked in Order of Correctly Answered)

Question	Average % of correct preintervention	Average % of correct postintervention
15. "A man must have vaginal sex to get genital warts"	96.30%	96.43%
14. "Human papillomavirus (HPV) can lead to cancer in women"	95.83%	89.29%
24. "If a person had gonorrhea in the past, he or she is immune (protected) from getting it again"	95.65%	89.29%
27. "There is a vaccine that can protect a person from getting hepatitis B"	95.45%	85.71%
11. "The same virus causes all of the STIs"	93.33%	92.86%
9. "A woman who has genital herpes can pass the infection to her baby during childbirth"	92.86%	96.43%
18. "If a person tests positive for HIV, the test can tell how sick the person will become"	92.86%	78.57%
8. "There is a cure for chlamydia"	92.59%	89.29%
12. "Human papillomavirus (HPV) can cause genital warts"	91.67%	92.86%
10. "A woman can look at her body and tell if she has gonorrhea"	90.91%	78.57%
3. "There is a cure for gonorrhea"	88.46%	85.71%
5. "Human papillomavirus (HPV) is the same virus that causes HIV"	84.62%	75.00%
19. "There is a vaccine available to prevent a person from getting gonorrhea"	82.61%	92.86%
16. "STIs can lead to health problems that are usually more serious for men than women	80.95%	69.24%
2. "Frequent urinary infections can cause chlamydia"	78.26%	82.14%
1. "Genital herpes is caused by the same virus as HIV"	78.26%	66.76%
22. "There is a vaccine that prevents a person from getting chlamydia"	77.78%	82.14%
23. "A man can tell by the way his body feels if he has hepatitis B"	73.68%	75.00%
4. "It is easier to get HIV if a person has another STI"	71.43%	78.57%
6. "Having anal sex increases a person's risk of getting hepatitis B"	70.59%	64.29%

26. “A man can protect himself from getting genital warts by washing his genitals after sex”	69.23%	82.14%
20. “A woman can tell by the way her body feels if she has an STI”	66.67%	59.26%
25. “Human papillomavirus (HPV) can cause HIV”	65.00%	60.71%
7. “Soon after infection with HIV a person develops open sores on his/her genitals (penis/vagina)”	62.96%	46.43%
21. “A person who has genital herpes must have open sores to give the infection to his/her partner”	51.72%	64.29%
17. “A woman can tell if she has chlamydia if she has a bad smelling odor from her vagina”	50.00%	53.57%
13. “Using a natural skin (lambskin) condom can protect a person from getting HIV”	41.18%	64.29%
Grand total	**78.92%**	**77.47%**

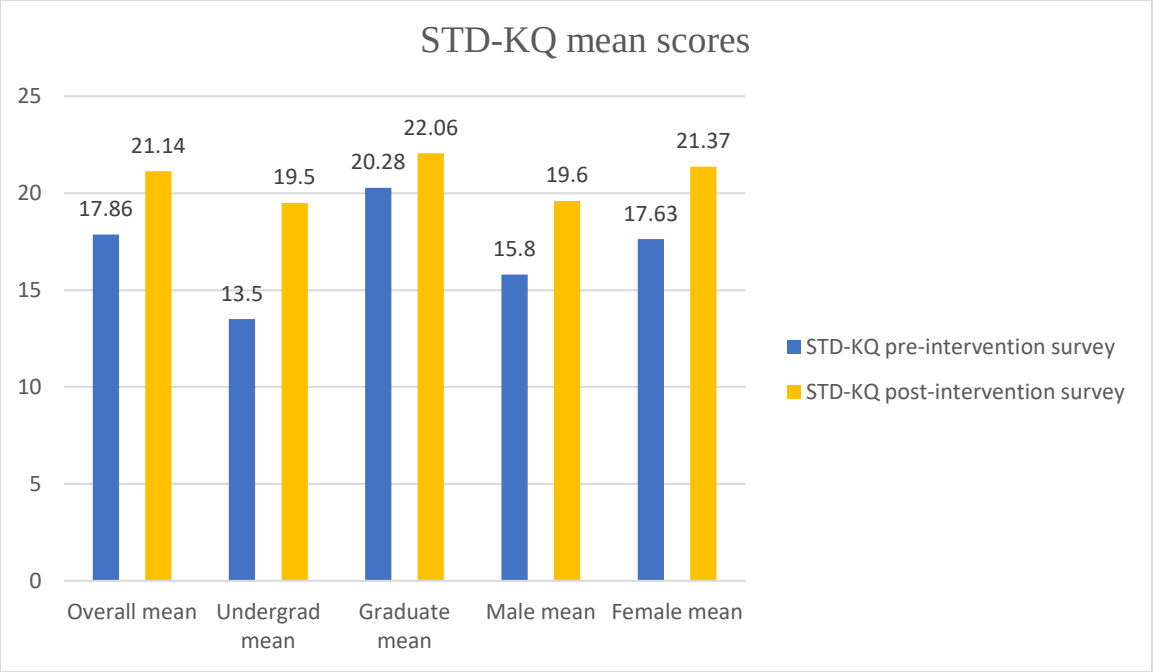
The respondents’ knowledge was deficient in STI symptoms and causes, based on the lowest ranked correct answers. Questions 23 (“A man can tell by the way his body feels if he has Hepatitis B”), 20 (“A woman can tell by the way her body feels if she has an STI”), 7 (“Soon after infection with HIV a person develops open sores on his/her genitals [penis/vagina]”), and 21 (“A person who has genital herpes must have open sores to give the infection to his/her partner”) were answered the most incorrectly with minimal improvement in overall postintervention scores (Table 3).

Descriptive Statistics (STD-KQ). As indicated in Table 4, the overall mean score of the correct answers of the STD-KQ administered as a preintervention survey was 17.86 (*SD* = 5.73), with a range of 6 to 24 correct answers. The mean score of the correct answers of the STD-KQ administered as a postintervention survey was 21.14 (*SD* = 3.33), with an average of 13 to 26 correct answers (Table 4).

Table 4

Descriptive Statistics and Comparative Mean Scores of STD-KQ

		Mean	*N*	*SD*
Overall score	STD-KQ pretest	17.86	28	5.73
	STD-KQ posttest	21.14	28	3.33
Undergraduate scores	STD-KQ pretest	13.50	10	5.97
Undergraduate scores	STD-KQ posttest	19.50	10	3.27
Graduate scores	STD-KQ pretest	20.28	18	3.99
Graduate scores	STD-KQ posttest	22.06	18	3.08
Gender: female scores	STD-KQ pretest	17.63	20	5.73
Gender: female scores	STD-KQ posttest	21.37	20	3.06
Gender: male scores	STD-KQ pretest	15.80	8	6.38
Gender: male scores	STD-KQ posttest	19.60	8	4.10



The mean scores of the undergraduate (age 18–22 years) preintervention survey responses were compared to those of the graduate (age 23–25 years) students, with the undergraduate score being 13.50 (*SD* = 5.97) and the graduate score being 20.28 (*SD* = 3.99). The undergraduate mean scores of the postintervention results were compared to those of the graduate student responses, which indicated an increase in both groups, with scores of 19.05 (*SD* = 3.27) and 22.06 (*SD* = 3.08), respectively. The mean score of the pretest for females was 17.63 (*SD* = 5.73), and the mean score for males was 15.80 (*SD* = 6.38). In the postintervention survey, females responded with an average score of 21.37 (*SD* = 3.06), and males responded with an average score of 19.60 (*SD* = 4.10) (Table 4).

Paired *t* test (STD-KQ). A paired *t* test was calculated to compare the overall mean scores of the STD-KQ questionnaire taken as a preintervention survey and taken as a postintervention survey. The analysis produced a significant *t* value ($t = -3.97$, $p < 0.001$; $d = -0.32$) with a small to moderate effect size. An examination of the overall means, showing a small

improvement in the postintervention survey scores compared to the preintervention scores, reveals that the participants in the study improved their overall knowledge of STIs as a result of this learning intervention (Table 5).

Table 5

Paired t *Test (STD-KQ)*

				95% Confidence interval of the difference					
	Mean	*SD*	*SEM*	Lower	Upper	*t*	*df*	*p*	Cohen's *d*
STD-KQ pretest/posttest	-3.286	4.379	.828	-4.984	-1.588	-3.971	27	<0.001	-0.32

Analysis of Variance (ANOVA) (STD-KQ). An analysis of variance (ANOVA) test was conducted to assess differences between the responses of the STD-KQ of the undergraduate- and graduate-level age groups. The analysis revealed that the age of the students (undergraduate vs. graduate) did not have a significant impact on the scores of the preintervention STD-KQ ($F(14, 13) = 2.056$, $p = 0.10$) or the scores of the postintervention STD-KQ ($F(9, 18) = 0.862$, $p = 0.58$) (Table 6).

Table 6

ANOVA Table Comparing STD-KQ Responses and Age Groups

		SS	*df*	Mean square	*F*	*p*
STD-KQ pretest	Between groups	4.429	14	0.316	2.056	0.10
	Within groups	2.00	13	0.154		
	Total	6.429	27			
STD-KQ posttest	Between groups	1.937	9	0.215	0.862	0.58
	Within groups	4.492	18	0.250		
	Total	6.429	27			

An analysis of variance (ANOVA) test was conducted to assess differences between the responses of the STD-KQ with respect to the variable of rurality. The analysis revealed that the rurality of the students (as determined by their reported home zip code) did not have a significant impact on the scores of both the preintervention STD-KQ ($F(3, 24) = 1.06$, $p = 0.38$) and the postintervention STD-KQ ($F(3, 24) = 1.75$, $p = 0.18$) (Table 7).

Table 7

ANOVA Table Comparing STD-KQ Responses and Rurality

		SS	*df*	Mean square	*F*	*p*
STD-KQ pretest	Between groups	104.30	3	34.77	1.06	0.38
	Within groups	783.13	24	32.63		
	Total	887.43	27			
STD-KQ posttest	Between groups	53.73	3	17.91	1.75	0.18

	Within groups	245.70	24	10.24		
	Total	299.43	27			

Attitudes Toward Safe Sex and Sexual Self-efficacy

The sum of items from the subsets of the MSQS (Appendix G): Importance of Safer Sex Practices (α = .65) and Importance of Sexual Relationships (α = .80) is used to determine safer sex attitudes and values (Kirby, 1998). Safer sex self-efficacy scores are analyzed by summing seven items from a subset of the MSQS (Appendix H): Safer Sex Self-Efficacy Scale (α = .79) (Kirby, 1998). All items are rated on a 5-point scale (1 = *strongly disagree/very uncomfortable* to 5 = *strongly agree/very comfortable*).

Descriptive Statistics (MSQS). As indicated in Table 8, the mean score of the preintervention MSQS self-efficacy questions was 29.61 (*SD* = 4.80), and the postintervention mean score was 30.82 (*SD* = 3.80). The mean score of the MSQS attitude preintervention questions was 35.50 (*SD* = 2.97), and the postintervention mean score was 35.86 (*SD* = 3.12). There is also a high level of variance as demonstrated by *SD* > 3.0 in all categories of responses.

Table 8

Descriptive Statistics of MSQS Subsets (Attitudes, Self-Efficacy)

N = 28 Valid	MSQS attitude pretest	MSQS attitude posttest	MSQS self-efficacy pretest	MSQS self-efficacy posttest
Mean	35.50	35.86	29.61	30.82
Median	36.00	37.00	30.70	32.00
Mode	35[a]	37	31	32[a]

SD	2.975	3.124	4.80	3.801
Variance	8.852	9.757	23.06	14.448
Range	12	11	24	19
Minimum	28	29	11	16
Maximum	40	40	35	35

a. Multiple modes exist. The smallest value is shown.

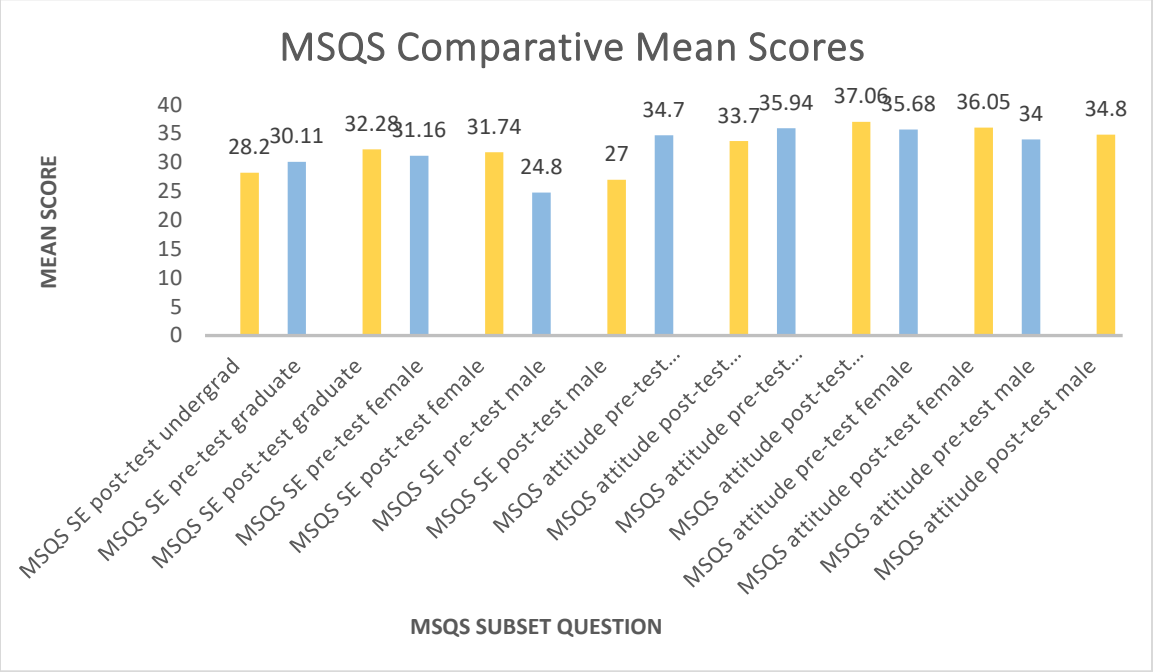
Comparative Means (MSQS). The mean scores of the undergraduate (age 18–22 years) preintervention survey responses were compared to those of the graduate (age 23–25 years) students. The undergraduate student mean scores of both the subset of the MSQS self-efficacy (SE) and attitude tests were lower in both the pre- and postintervention as compared to the graduate student scores (Table 9). The female participants scored consistently higher than the male participants in both subsets of questions, although the sample sizes were clearly different (female = 20; male = 8).

Table 9

Comparative Mean Scores of MSQS Subsets

MSQS Subset	Mean	*N*	*SD*
MSQS SE pretest undergrad	28.07	10	6.40
MSQS SE posttest undergrad	28.20	10	4.76
MSQS SE pretest graduate	30.11	18	3.77
MSQS SE posttest graduate	32.28	18	2.16
MSQS SE pretest female	31.16	20	2.56
MSQS SE posttest female	31.74	20	2.47
MSQS SE pretest male	24.80	8	8.84
MSQS SE posttest male	27.00	8	6.63
MSQS attitude pretest undergrad	34.70	10	3.13
MSQS attitude posttest undergrad	33.70	10	3.16
MSQS attitude pretest graduate	35.94	18	2.88
MSQS attitude posttest graduate	37.06	18	2.44
MSQS attitude pretest female	35.68	20	2.79
MSQS attitude posttest female	36.05	20	3.30

MSQS attitude pretest male	34.00	8	4.06
MSQS attitude posttest male	34.08	8	3.42



Paired *t* Test (MSQS). A paired *t* test was calculated to compare the overall mean scores of the MSQS attitude and self-efficacy questionnaires taken as a preintervention and taken as a postintervention survey. The analysis of the MSQS self-efficacy scores produced a slightly significant *t* value (t = -2.00, p = 0.03–0.06; d = 3.21) and corresponding *p* value. This indicates that the differences between the pre- and postintervention scores were slightly improved following the learning intervention. The analysis of the MSQS attitude scores produced a modest *t* value with $p > 0.05$ (t = -0.71, p = 0.25–0.49; d = 2.74). This indicates that the null hypothesis is true and that the probability that the observed differences in the pre- and postintervention scores are not due to a statistically significant change in attitude toward STIs (Table 10).

Table 10

Paired t *Test (MSQS)*

				95% Confidence interval of the difference					
	Mean	*SD*	*SEM*	Lower	Upper	*t*	*df*	*p*	Cohen's *d*
MSQS self-efficacy pretest/posttest	-1.21	3.21	0.61	-2.46	-2.00	-2.00	27	0.03 1-sided *p* 0.06 2-sided *p*	3.21
MSQS attitude pretest/posttest	-0.36	2.74	0.52	-1.42	0.71	-0.69	27	0.25 1-sided *p* 0.49 2-sided *p*	2.74

Pearson Correlation (MSQS). A Pearson correlation analysis was conducted to determine whether the knowledge gained from STI intervention, as measured by the postintervention STD-KQ scores, was correlated with the postintervention scores of the MSQS subsets of attitude and self-efficacy. As the correlation coefficients (*r*) presented in Table 11 reveal, the correlation between the corresponding goal values of postintervention STD-KQ scores and postintervention MSQS attitude scores is quite strong and highly significant ($r = 0.458$). The variation in the scores of the MSQS self-efficacy questions is not positively correlated with the postintervention STD-KQ knowledge scores, as $r = 0.224$, which is below the correlation that would be significant at the 0.05 level (Table 11).

Table 11

Pearson Correlation Between STD-KQ and MSQS Postintervention Survey Scores

		STD-KQ posttest	MSQS attitude-posttest
STD-KQ posttest	Pearson correlation (*r*)	1	.458*
	p (2-tailed)		.014
	N	28	28
MSQS attitude posttest	Pearson correlation (*r*)	.458*	1
	p (2-tailed)	.014	
	N	28	28
STD-KQ posttest	Pearson correlation (*r*)	1	.224
	p (2-tailed)		.251
	N	28	28
MSQS self-efficacy posttest	Pearson correlation (*r*)	.224	1
	p (2-tailed)	.251	
	N	28	28

* Correlation is significant at the 0.05 level (2-tailed).

Discussion

The purpose of this project was to determine whether a targeted STI education intervention can improve the knowledge of STIs in rural college-aged students and what, if any, effect this has on the attitude and self-efficacy regarding safer sex practices and disease prevention. The current study examined the knowledge levels of STIs among this population, and the results obtained reflected insufficient awareness among the students in some crucial areas, including STI prevention and treatment.

The findings indicate that STI education intervention significantly improved the knowledge of STIs in this cohort, as supported by a statistically significant improvement in the responses to the postintervention survey questions compared to the preintervention responses (*t* =

-3.97, $p < 0.001$; $d = -0.32$). The highest ranked correct answers on both the pre- and postintervention surveys focused on STI causes, STI symptoms, STI prevention, and STI treatment. The majority of the participants had knowledge about STI causes, particularly questions regarding viral STIs, such as "A man must have vaginal sex to get genital warts" and "HPV can lead to cancer in women." Yet just a little over half of the respondents (50%, 53.5%) answered the question "A woman can tell if she has chlamydia if she has a bad smelling odor from her vagina" correctly, both in the preintervention and in the postintervention survey. Prior to the educational intervention, knowledge about prevention of STIs was also consistently low. For example, prior to the intervention, 51.7% answered correctly "A person who has genital herpes must have open sores to give the infection to his/her partner," but after the intervention, 64.3% answered this question correctly. Three fourths of the respondents correctly answered questions regarding vaccines for the prevention of STIs ("There is a vaccine that prevents a person from getting chlamydia"), but questions regarding other ways of preventing STIs were frequently answered incorrectly prior to the intervention ("A man can protect himself from getting genital warts by washing his genitals after sex": 63%; "Using a natural skin [lambskin] condom can protect a person from getting HIV": 41%). Both responses improved following the educational intervention.

The mean scores of the STD-KQ were significantly higher in females than in males, both in the pre- and postintervention responses. These results are consistent with previous research findings. Weinstein et al. (2008) conducted a survey among college students in the United States regarding STI knowledge and found that females had higher awareness about STI causes and transmission than male respondents. Other studies also report that, in general, sexual health knowledge and STI awareness are greater in females than in males (Newton-Levinson et al.,

2016; Samkange-Zeeb et al., 2013). Another study (McMann & Trout, 2020) with demographic data similar to those of this study indicated that false perceptions of being able to detect STIs based on recognition of STI symptoms are more common among females than among males. This factor, coupled with social pressure from parents and social groups, hinders the likelihood that emerging female adults would seek STI screening (McMann & Trout, 2020). This is supported in the current study by the fact that only two thirds of the respondents correctly answered the question "A woman can tell by the way her body feels if she has an STI."

When comparing STI knowledge scores between the undergraduate responses and the graduate responses, an ANOVA analysis indicated that there was no statistically significant difference in preintervention scores ($F(14, 13) = 2.056$, $p = 0.10$) or postintervention scores ($F(9, 18) = 0.862$, $p = 0.58$) between the two age groups. This indicates that baseline education about STIs varies with age and previous sexual education but that an improvement in knowledge is likely due to participating in the educational intervention. This is supported by previous studies, including Weinstein et al. (2008), who investigated the connection between young adults' sexual health knowledge and their prior sex education and current sexual communication, confidence, and condom use. Their study reported significant correlations between sex education content focusing on mainstream reproductive health issues and newer contraception methods. Their results suggested that women who had been exposed to greater amounts of sex education appeared to be no more knowledgeable than women reporting less exposure. Among men, however, receiving any sex education seemed to increase their knowledge of almost all sexual health domains (Weinstein et al.,2008).

The results of the ANOVA analysis indicated that there was also no significant difference in STI knowledge scores with respect to the variable of rurality based on correlational data comparing preintervention scores ($F(3, 24) = 1.06$, $p = 0.38$) and postintervention scores ($F(3, 24) = 1.75$, $p = 0.18$). This is somewhat surprising in that current research indicates that rural college students lag behind in practicing safe sex and contraceptive use. When compared to data from the Youth Risk Behavior Surveillance System (YRBSS), the rates of contraceptive use are more closely aligned with national high school estimates than with college estimates (McMann & Trout, 2020). Of the rural college population they surveyed, only 38.4% responded that they had used a condom the last time they had sexual intercourse, which is well below the 54.1% in the 2019 National College Health Assessment (ACHA, 2020). The key to bridging this knowledge gap is to determine the factors that contribute to it, especially in rural settings. College health centers should aspire to implement sexual health education interventions outside of what is mandated by public education curricula to reduce the perceived barriers to care and to mitigate disease risk among emerging adults.

Following the STI intervention, the statistical analysis comparing the overall mean scores of the MSQS indicates that the opinions about safer sex practices and self-efficacy slightly improved ($t = -2.00$, $p = 0.03$–0.06; $d = 3.21$). Responses to self-efficacy statements, as indicated by a reported increase in the level of comfort, regarding contraceptive use, such as “If you are having sex, going to a doctor or clinic for contraceptives” and “If you are having sex, insisting on using some form of contraceptive,” improved following the educational intervention. These findings are consistent with research recognizing that many sexually active young adults do not use safer sex practices consistently (Reece et al., 2010) and that they are more likely to implement safe sex practices when they have greater perceived self-efficacy. Research by

Beckmeyer and Jamison (2015) and Addo et al. (2017) support these findings. They found that safer sex self-efficacy is associated with demographic characteristics as well as sexual attitudes and values and that a greater degree of safer sex self-efficacy is associated with increased odds of utilizing safer sex practices. Improving safer sex self-efficacy is key to ensuring that those who are motivated to use these practices to prevent unintended health consequences (e.g., STIs or pregnancy) gain the confidence to do so during sexual encounters.

In contrast, the overall mean scores of the MSQS survey questions measuring the changes in attitudes toward safer sex practices and disease prevention following the STI educational intervention are not statistically significant (t = -0.71, p = 0.25–0.49; d = 2.74). Responses to statements about the value of sexual relationships, such as "Sexual relationships make life too difficult" and "Sexual relationships provide an important and fulfilling part of life," were scored almost identically in the pre- and postintervention surveys. Therefore, it can be assumed that there is little change in the participants' attitudes toward sexual health as a result of the educational intervention. These findings are consistent with research indicating that there are several factors that influence sexual attitudes, including cultural norms, family structure, previous sexual experiences, and relationship history (Kim et al., 2018; West et al., 2012; Yazidi et al., 2012). Young adults' reproductive health behavior is related to sexual attitudes, which are formed from the intrinsic values about sex and sexuality and include personal ideas, perceptions, and expressions of sexuality (Mercer et al., 2013). Kim et al. (2018) were able to confirm the relationship between sexual knowledge, sexual attitudes, and reproductive health behavior among college-aged women in Korea but found that sexual knowledge indirectly affected reproductive health behavior with sexual attitude as a mediator, which is highly variable among individuals. Further studies should adopt a longitudinal approach to examine how cultural and

demographic variables and family or peer factors related to college students' sexual attitudes and reproductive behaviors develop and change over time.

The current study determined a positive correlation between the STI intervention and improved scores on the MSQS attitude subset of survey questions ($r = 0.458$). It was surprising that the correlation between STI education and self-efficacy scores of the MSQS subset was not strong ($r = 0.224$). Prior research suggests that education about safer sex practices is positively associated with the use of these strategies by emerging adults (Burns & Dillon, 2005; Chariya et al, 2012; Noar et al., 2006). It is possible that the limitations of the educational intervention of this project, including the online platform and limited focus on STIs, contributed to the lack of statistical strength of the resulting data. Also, the relatively small sample size of this project may not have enough statistical power to identify weak effects of the educational intervention. Beckmeyer and Jamison (2015) suggest that successful college sexual health programs should move beyond discussions of accessing condoms and contraceptives. They stress that it is critically important for building safer sex self-efficacy that young adults be actively engaged in sex education curricula (e.g., role-playing, and hands-on activities). This would be a consideration for future studies in this area.

Limitations of this Study

There are several limitations of the current study that could affect the interpretation of the obtained results. First, the study sample was relatively small, and a large enough sample size is critical for reliable, reproducible, and valid results. Evidence generated from small sample sizes is especially prone to error, both false negatives (Type II errors) due to inadequate power and false positives (Type I errors) due to biased samples. In addition, a convenience sampling

method was used, which is not representative of the university's student population. The preponderance of graduate students (60%) over undergraduate students (40%) in the study population could potentially lead to sampling bias. Most of the respondents were women (75%), and 65.7% reported their ethnicity as Caucasian. Although the sample was proportionally similar to the campus population regarding gender (67% female) and race (86% Caucasian), this study does not adequately recognize gender and racial minority students, who may have different preferences for STI education that were not identified, which could limit the generalizability of the results.

In the current study, there was no significant association between STI knowledge and the variable of rurality. This contributes little to the body of knowledge on the rural health disparity that has been identified in previous studies. This limitation is likely due to the small sample size of this project and the sampling bias. More research is needed with larger cohorts to determine the association between sexual health knowledge and attitudes and the factors that significantly impact safer sex behaviors in the rural college setting.

Another limitation is the online implementation of the STI education intervention and surveys. The time from the initial recruitment period to the start of the online intervention was two weeks, which may have contributed to the study's rate of attrition (n = 50 to n = 28). There is also the potential for skewed responses to the survey questions due to the opportunity to consult online resources for assistance. Also, the survey responses were self-reported by the participants, who could potentially either under- or overreport their sexual behaviors.

Conclusion

The findings of this research project provided insights into the knowledge level of college students as it pertains to STI causes, symptoms, prevention, and treatment. The results support an improvement in this level of knowledge following a brief web-based STI prevention program. This statistically significant increase in knowledge was correlated with an improvement in attitudes toward STIs and sexual health behaviors but did not correlate with a change in sexual health self-efficacy. The addition of educational interventions in a college setting is a crucial step to enhancing the knowledge of positive sexual health behaviors and their subsequent implementation. These interventions could address this important rural health disparity by, for example, improving access to sexual health services, such as access to contraceptives and STI screening.

Since college students are more likely to seek reproductive health services from a college health setting, campus health clinics play an important role in developing interventions to prevent some of the common infectious diseases that are entirely preventable and to promote a positive, healthy sexual life. The addition of STI education interventions to the college curricula could prove to have lasting and positive effects on the well-being of these emerging adults. The implementation of a coordinated, multidimensional approach to enhancing the awareness of positive sexual health behaviors should be a prime concern for college administration, faculty, and staff. This strategy should include applying educational programming and interventions for cultivating reliable information that reduce the risk and rate of STIs in the student population.

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Appendix A

IRB Approval Letter

LINCOLN MEMORIAL UNIVERSITY

VALUES • EDUCATION • SERVICE

6965 Cumberland Gap Parkway
Harrogate, Tennessee 37752
423.869.3611
www.lmunet.edu

Federal-Wide Assurance Number FWA00012543 Institutional Organization Research Group (IORG) IORG0005225

Date: January 12, 2023

To: Julie Loyke

From: Dr. Lori McGrew, Chair Institutional Review Board

Project Title: Promoting Positive Sexual Health Behaviors Among Rural College Students: Results of a Targeted STI Prevention Program

Exemption Date: January 12, 2023

The project referenced above has been declared exempt from most requirements of the human subject protections regulations as described in 45 CFR 46.104 because it meets the following federal requirements for exemption:

2018 – 2: Research that only includes interactions involving educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures, or observation of public behavior (including visual or auditory recording).

The determination of exemption means that:

You do not need to submit an application for continuing review. Instead, you will receive a request for a brief status update at a time determined by the IRB. The status update is intended to verify that the study is still ongoing, however, please submit a closure form to officially close the project once the study has been completed.

You must carry out the research as described in the IRB application. Review by the IRB is required prior to implementing modifications that may change the exempt status of the research. In general, review is required for any modifications to the research procedures (e.g., method of data collection, nature or scope of information to be collected, nature or duration of behavioral

interventions, use of deception, etc.), any change in privacy or confidentiality protections, modifications that result in the study, any change that may increase risk or discomfort to participants, and/or any change such that the revised procedures do not fall into one or more of the regulatory exemption categories. The purpose of review is to determine if the project still meets the federal criteria for exemption.

All changes to key personnel must receive prior approval.

Detailed information about requirements for submitting modifications for exempt research can be found on our website. For modifications that require prior approval, an amendment to the most recent IRB application must be submitted. A determination of exemption or approval from the IRB must be granted before implementing the proposed changes.

Non-exempt research is subject to many regulatory requirements that must be addressed prior to implementation of the study. Conducting non-exempt research without IRB review and approval

Additionally:

All research involving human participants must be submitted for IRB review. Only the IRB can make the determination of exemption, even if you conduct a study in the future that is exactly like this study.

Please inform the IRB if the Principal Investigator and/or Supervising Investigator end their role or involvement with the project with sufficient time to allow an alternate PI/Supervising Investigator to assume oversight responsibility. Projects must have an eligible PI to remain open.

Immediately inform the IRB of (1) all serious and/or unexpected adverse experiences involving risks to subjects or others; and (2) any other unanticipated problems involving risks to subjects or others.

The goal of the IRB is to prevent negative occurrences during any research study. However, despite our best intent, unforeseen circumstances or events may arise during the research. If an unexpected situation or adverse event happens during your investigation, please notify the LMU IRB as soon as possible. If notified, we will ask for a complete explanation of the event and your response. Other actions also may be required depending on the nature of the event.

Should you have additional questions or require clarification of the contents of this letter, please contact me.

Sincerely,

Lori McGrew, PhD

Chair, Institutional Review Board irb@lmunet.edu

Appendix B

Approval of Flyers

Ms. Jones,

I have attached a copy of the campus flyer I intend to use for my DNP research project.
I hope to have approval to use this before I present my project proposal during the first week of January 2023.
I realize this is not much time, but if you could provide me with some preliminary feedback before then, I would appreciate it.
Then when we come back to campus, I will bring the hard copy to your office and have it stamped for distribution.
Please contact me with any questions you may have.
All the best and Merry Christmas!!

Julie A. Loyke, MSN, APRN, CPNP, FNP-C
Nurse Practitioner, LMU Student Health Center

To: Loyke, Julie

Thu 12/22/2022 12:59 PM

The flyer has been approved.

I will be back in the office on January 3rd at 8AM.

Thank you and have a Merry Christmas!

Kasey Jones | Administrative Assistant for Academic & Student Support Services
kasey.jones@lmunet.edu

Lincoln Memorial University
423.869.7002
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Appendix C

Demographic Survey

Q1 What is the highest grade or level of school that you are currently registered?

Undergraduate:

- Freshman
- Sophomore
- Junior
- Senior

Graduate:

- DCOM
- DSOL
- CVM
- Nursing
- PA
- Dentistry
- OTD
- DPT
- Other

Q2 What is your gender?

- Male
- Female
- Nonbinary
- Choose not to answer.

Q3 What is your year of birth?

- 2005
- 2004
- 2003
- 2002
- 2001
- 2000
- 1999
- 1998

Q4 Are you Hispanic/Latino or none of these (select one):

- Hispanic/Latino
- Not Hispanic/Latino

Q5 Choose one or more races that you consider yourself to be:

- White
- Black or African American
- American Indian or Alaska Native
- Asian
- Native Hawaiian or Pacific Islander
- Other

Q6 What is your home zip code?

Thank you in advance for your participation. Please complete the consent form to follow.

Appendix D

Consent Form

Promoting Positive Sexual Health Behaviors Among Rural College Students: Results of a Targeted Sexually Transmitted Infection Prevention Program

You are being recruited to participate as a volunteer in a research study conducted at Lincoln Memorial University about the sexual health behaviors among rural college students. You are selected as a possible volunteer participant because you are a registered LMU student between the ages of 18 and 25 years old. Please read the following information and at the bottom, click to consent to participate in the learning activities starting in early February 2023.

BACKGROUND INFORMATION

The purpose of this research is to examine the effects of a targeted sexually transmitted infection (STI) prevention program on the attitudes and knowledge of sexual behaviors of rural college students with the goal of increasing knowledge of STIs.

DURATION

The study commences in January 2023 and will end in February 2023. The recruitment stage will start in January 2023. The intervention will take place over five consecutive days, beginning in early February 2023. The post-intervention survey will remain open for one week following the final day. The estimated time commitment will be less than 2 hours total.

ELIGIBILITY

You must be currently registered as an LMU student between the ages of 18 and 25 years of age to participate.

PROCEDURES

If you agree to be a participant in this research, we ask you to do the following things.

- Complete the demographic information and consent form.
- Open the email link in your LMU inbox in February 2023, to complete the pre-intervention survey. This will be the first day of the intervention stage of the study.
- Then view the videos that present in your inbox daily over the course of five consecutive days. The videos will last no more than 10 minutes each.
- Complete the post-intervention survey at the conclusion of the fifth video. Complete another survey with your name and email to claim your incentive for participation.

RISKS AND BENEFITS

- There are no known risks associated with this research.
- The benefits of participating in this study is that the cumulative data will contribute to the body of knowledge about the sexual health behaviors of college aged students.

COMPENSATION

You will receive the following compensation for your participation:

- An Amazon gift card and 2 LMU community service hours will be offered to those who complete the 5-day series of videos and the pre and post surveys. You will be directed to complete a survey with your name and email to facilitate the distribution of the gift certificate and service hours (if applicable).

PRIVACY/CONFIDENTIALITY

- Upon access to the QR code from the recruitment flyer, you will be directed to the Qualtrics platform to complete the consent form and demographic survey.
- At this point, your survey will be assigned a random number so that the data provided will be confidential and you will not be identifiable.
- You will then be notified that you will be sent a link to view a daily 10-minute sexual health video over the course of five consecutive days starting February 2023; the pre-intervention surveys will be included as a separate link/QR code in the first day's video.
- The consent forms, surveys and data processing for this study will be facilitated through Qualtrics secure platform. No physical copies of protected data (survey responses) will be generated. Data will be analyzed without any personal identifiers and will be aggregate data only based on the volunteer demographics.

CONTACTS and QUESTIONS

The researcher(s) conducting this study is Julie A. Loyke, MSN, RN, FNP-C. If you have questions, you may contact her at (423)869-6249 or julie.loyke@lmunet.edu

If you have questions about the rights and welfare of research participants please contact the Chair of the Lincoln Memorial University Institutional Review Board, Dr. Lori McGrew at or lori.mcgrew@lmunet.edu.

VOLUNTARY PARTICIPATION STATEMENT

You should not sign this form (electronically) unless you have read it and understand the scope of this study. A copy of this consent form is available upon request.

Participation in this study is voluntary. You may refuse to answer any question or discontinue your involvement at any time without penalty. Your decision will not affect your relationship with Lincoln Memorial University. Your consent below indicates that

you have read the information in this consent form and have had a chance to ask questions that you have about the study.

IF YOU HAVE QUESTIONS
If you have any comments, concerns, or questions regarding the conduct of this research please contact the research team listed above (Contacts/Questions)

If you are unable to reach a member of the research team listed at the top of this form and have general questions, or you have concerns or complaints about the research study, research team, or questions about your rights as a research subject, please contact the Chair of the LMU IRB, Dr. Lori McGrew at or lori.mcgrew@lmunet.edu.

I have read and understand the information above, and I willingly give my consent to participate in this research study.

Please select one of the following:

○ *OptionButton1* *Yes, I consent to participate in this research study.*

○ *OptionButton2* *No, I do not consent to participate in this research study.*

Appendix E

Sexually Transmitted Disease Knowledge Questionnaire (STD-KQ)

(**Questionnaire format only** will be modified and applied to Qualtrics Survey platform)

The Sexually Transmitted Disease Knowledge Questionnaire
(STD-KQ; Jaworski & Carey, 2007)

Instructions: For each statement below, please circle true (T), false (F), or I don't know (DK). If you don't know, please do not guess; instead, please circle DK.

		True	False	Don't Know
1.	Genital Herpes is caused by the same virus as HIV.	T	F	DK
2.	Frequent urinary infections can cause Chlamydia.	T	F	DK
3.	There is a cure for Gonorrhea.	T	F	DK
4.	It is easier to get HIV if a person has another Sexually Transmitted Disease.	T	F	DK
5.	Human Papillomavirus (HPV) is caused by the same virus that causes HIV.	T	F	DK
6.	Having anal sex increases a person's risk of getting Hepatitis B.	T	F	DK
7.	Soon after infection with HIV a person develops open sores on his or her genitals (penis or vagina).	T	F	DK
8.	There is a cure for Chlamydia.	T	F	DK
9.	A woman who has Genital Herpes can pass the infection to her baby during childbirth.	T	F	DK
10.	A woman can look at her body and tell if she has Gonorrhea.	T	F	DK
11.	The same virus causes all of the Sexually Transmitted Diseases.	T	F	DK
12.	Human Papillomavirus (HPV) can cause Genital Warts.	T	F	DK
13.	Using a natural skin (lambskin) condom can protect a person from getting HIV.	T	F	DK
14.	Human Papillomavirus (HPV) can lead to cancer in women.	T	F	DK
15.	A man must have vaginal sex to get Genital Warts.	T	F	DK
16.	Sexually Transmitted Diseases can lead to health problems that are usually more serious for men than women.	T	F	DK
17.	A woman can tell that she has Chlamydia if she has a bad smelling odor from her vagina.	T	F	DK
18.	If a person tests positive for HIV the test can tell how sick the person will become.	T	F	DK
19.	There is a vaccine available to prevent a person from getting Gonorrhea.	T	F	DK
20.	A woman can tell by the way her body feels if she has a Sexually Transmitted Disease.	T	F	DK
21.	A person who has Genital Herpes must have open sores to give the infection to his or her sexual partner.	T	F	DK
22.	There is a vaccine that prevents a person from getting Chlamydia.	T	F	DK
23.	A man can tell by the way his body feels if he has Hepatitis B.	T	F	DK
24.	If a person had Gonorrhea in the past he or she is immune (protected) from getting it again.	T	F	DK
25.	Human Papillomavirus (HPV) can cause HIV.	T	F	DK
26.	A man can protect himself from getting Genital Warts by washing his genitals after sex.	T	F	DK
27.	There is a vaccine that can protect a person from getting Hepatitis B.	T	F	DK

Appendix F

Permission to Use STD-KQ

Loyke, Julie
To:

- Michael_Carey@brown.edu <michael_carey@brown.edu>

Wed 10/12/2022 10:13 AM

Good morning, Dr. Carey:

I am requesting permission to use the Sexual Disease Knowledge Questionnaire (STD-KQ) for the purpose of collecting pre-and post-intervention data for my Doctoral project. The title of my project is *Promoting Positive Sexual Health Behaviors Among Rural College Students: Results of a Targeted STI Prevention Program* and it will commence in January 2023.

Thank you in advance for your help with this.

Julie A. Loyke, MSN, APRN, CPNP, FNP-C
Nurse Practitioner, LMU Student Health Center
423.869.6022

julie.loyke@lmunet.edu

To:

- Loyke, Julie

Wed 10/12/2022 10:34 AM

STD Knowledge Questionnaire (Jaworski & Carey, 2007).pdf
505 KB

Dear Julie, Permission granted. Good luck!
Best wishes,

Michael P. Carey, PhD
Emeritus Professor of Psychiatry and Human Behavior, Alpert Medical School
Emeritus Professor of Behavioral and Social Sciences, School of Public Health
Brown University

Appendix G

MSQS Attitude and Value Inventory

Subsets: ***Safer Sex Self-Efficacy, Importance of Safer Sex Practices, Importance of Sexual Relationships***

(**Questionnaire format only** will be modified and applied to Qualtrics Survey platform)

In this section, we want to know how comfortable you are in situations involving safer sex practices. For each of the following items, circle the number that indicates how comfortable you are doing each of the following:

1 = if you are very **un**comfortable.

2 = if you are somewhat **un**comfortable.

3 = you have no opinion or are neutral

4 =If you are somewhat comfortable

5 = If you are very comfortable

Talking about sex with a romantic partner.

1 2 3 4 5

Talking about sex with a friend.

1 2 3 4 5

Telling a partner, you are not interested in having sex.

1 2 3 4 5

If you are having sex, using some form of safe sex practices.

1 2 3 4 5

If you are having sex, going to a doctor or clinic for contraceptives.

1 2 3 4 5

If you are having sex, buying contraceptives at a drug store.

1 2 3 4 5

If you are having sex, insisting on using some form of contraceptives.

1 2 3 4 5

For the following questions, please rate each statement according to how much you agree or disagree with it as follows:

1=strongly disagree

2=somewhat disagree

3=neutral

4=somewhat agree

5=strongly agree

Sexual relationships create more problems than they are worth.

1 2 3 4 5

A sexual relationship is one of the best things a person can have.

1 2 3 4 5

Sexual relationships make life too difficult.

1 2 3 4 5

Sexual relationships provide an important and fulfilling part of life.

1 2 3 4 5

Safe sex is not as important as some people say.

1 2 3 4 5

Two people having sex should use some form of birth control if they are not ready to have a child.

1 2 3 4 5

More people should be aware of the importance of safe sex practices.

1 2 3 4 5

Safe sex and birth control is not very important.

1 2 3 4 5

Appendix H

Permission to Use MSQS Self-Efficacy Scale

On Sat, Oct 15, 2022, at 7:30 AM, Julie Loyke <julie.loyke@lmunet.edu> wrote:
First name: Julie
Last name: Loyke
Email: julie.loyke@lmunet.edu
Subject of your question: Permission to use MSQS.
Please help us get started by answering this first question.: I have a question about a product.
How can we help you? Please describe your issue here.: I am requesting permission to use the Mathtech Sexuality Questionnaire for Adolescents (MSQS) for the purpose of collecting pre-and post-intervention data for my nursing doctoral project. The title of my project is Promoting Positive Sexual Health Behaviors Among Rural College Students: Results of a Targeted STI Prevention Program and it will commence in January 2023.

I appreciate your guidance about how to attain this for my purpose.

Thank you in advance for your help with this.
Julie A. Loyke, MSN, RN, FNP-C
Director, Student Health Services
Lincoln Memorial University
6965 Cumberland Gap Parkway
Harrogate, TN 37752
julie.loyke@lmunet.edu
Hide message history.

To:

- Loyke, Julie

Mon 10/17/2022 11:36 AM

Hello again Julie,

ETR can grant you permission to use Mathtech Sexuality Questionnaire for Adolescents (MSQS) for your project.

I will be closing this ticket but please don't hesitate to reach out if you have any other questions.

Thank you so much,
Karrie

Appendix I

Now that I have your attention, we need your help!

Please consider volunteering for a research project to determine your knowledge and attitudes about Sexually Transmitted Infections (STIs)

The project will require you to view 5 10-minute videos and then take a brief post-test. Your participation is completely *confidential* and *voluntary.*

You will receive a $10 Amazon gift card and/or 2 community service hours for your participation.

If interested, scan the QR code to sign up today!! Call Julie Loyke, APRN (Student Health Center) with any questions: (423)869-6249.