GENDERED SOCIAL TRENDS:
INFLUENCING FACTORS OF SEXUAL HEALTH OUTCOMES IN WOMEN

by

Leslie M. McKee

A dissertation submitted to the faculty of
The University of North Carolina at Charlotte
in partial fulfillment of the requirements
for the degree of Doctor of Philosophy in
Health Services Research

Charlotte

2023

Approved by:

_____
Dr. Yvette Huet

_____
Dr. Reuben Howden

_____
Dr. Jeanette Bennett

_____
Dr. Trudy Moore-Harrison

ABSTRACT

MCKEE, LESLIE. Gendered Social Trends: Influencing Factors of Sexual Health Outcomes in Women. (Under the direction of DR. YVETTE HUET)

Sexually transmitted infections (STIs) affect an estimated 347 million people worldwide. These diseases can be spread asymptomatically, and can potentially incur significant long-term negative health outcomes, including lifetime treatment regimens, cancer, or infertility. The severity of these outcomes, clinical manifestations, and overall acquisition rates show a sexually dimorphic variability, with women experiencing a higher burden of these diseases than men. While the exact mechanism for this disparity is unknown, it is likely due to a combination of biological and social influences. This study investigates several of these gendered variables, particularly those involving birth control and sexual healthcare, and their relationship with STI acquisition.

We investigated sexual dimorphism in STI rates, along with different self-reported factors regarding sexual and reproductive health experiences and preferences, social demographics, and sexual behaviors using two sources for data analysis, the National Health and Nutritional Examination Survey (NHANES), and a cross-sectional sexual health survey disseminated to college women in North Carolina. NHANES analysis did correspond with what had been stated in previous literature. We concluded that women in the United States follow the classic gendered trend with higher rates of STIs than men ($p<0.0001$). The sexual health survey results included information from women (n=522), 18-53 years old, who were sexually active. We found significant associations regarding a positive self-reported STI history with birth control type ($p=0.0386$), contraceptive hormone type ($p=0.0200$), frequency of STI screening ($p<0.0001$), and the number of previous sexual partners ($p<0.0001$), however interaction analysis limited the significance to sexual partner number (OR 1.098, CI [1.065-1.131]) and inconsistent screening frequency (OR 0.194, CI [0.057-0.664]). We also found initial associations between women who use some form of hormonal contraceptive with condom use ($p<0.0001$), STI screening frequency ($p=0.0003$), and age ($p<0.0001$). Multivariate analysis corresponded with these initial assessments in regards to

women who consistently use condoms (OR 0.253, CI [0.155-0.413]), demonstrate inconsistent screening (OR 0.261, CI [0.155-0.704]), and age (OR 0.827, CI [0.778-0.878]). Our free-response questions also gave us insight into personal opinions of several aspects of sexual health and STIs, including qualitative discussion regarding overall comfort with sexual health medical personnel, their feelings regarding positive STI diagnosis, and their interpretation of the physician's approach toward the positive STI history.

This study addressed several variables associated with women's sexual health care and outcomes and was able to identify several risk factors that may influence the sex disparity seen in STI prevalence. Continued research is necessary to develop more personalized treatments, prevention strategies, and interventions to improve sexual health education, provider-patient relationships, and overall health outcomes.

Note: We sometimes use “women” and “female” when referring to people who intrinsically produce the sex steroid hormones estrogens and progestogens and “men” or “male” to those who primarily produce androgens. We acknowledge that not all people who produce estrogen and progestogens identify as “woman” or “female,” and not all people who produce androgens identify as “man” or “male.”

DEDICATION

To my family, husband, advisor, and friends who encouraged and supported me to start this journey, but most of all to my daughters, who gave me a reason and the dedication to complete it.

ACKNOWLEDGMENTS

I would like to thank my advisor, Dr. Yvette Huet, for EVERYTHING. You gave me a chance when I had nowhere else to go, and on the verge of giving up. Throughout my academic career, you have been there for me. My advisor, my mentor, and my friend. No matter how long it took, how far away I moved, or how much life has changed, you have kept me in your sights, and made sure I didn't give up. I couldn't have done this, or anything close to this, without you.

I would also like to express my gratitude to my committee members, Dr's Reuben Howden, Jenette Bennett, and Trudy Moore-Harrison. I owe much of my academic and professional success to you all, as each of you has been there to mentor me in different ways.

Dr's Janice Kofsky, Christopher Burcal, and Alicia Sorgen, you have been there for me practically since the first day of graduate school. You all provided me with friendship that can never be matched, regardless of disagreements, distance, and different life directions. You have pushed and pushed for me to finish this, while still supporting me personally in every way possible, especially regarding my husband and kids. I would not have survived the last ten years without you.

I am beyond grateful for my babies, Rosie and Selina, without whom I would have given up long ago. Your snuggles and kisses fueled me to keep going.

Finally, Mom, Dad, Jocie, KB, and Renato… thank you for everything. I cannot even begin to describe everything you have done for me.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF ABBREVIATIONS

ACA	Affordable Care Act
BIPOC	Black, Indigenous, and People of Color
CD8	Cytotoxic T Cells
CDC	Center for Disease Control
DMPA	Depomedroxyprogesterone Acetate
E_2	Estradiol
EE	Ethinyl Estradiol
FSH	Follicle stimulating hormone
HBV	Hepatitis B Vaccine
Hep B	Hepatitis B
HIV	Human Immunodeficiency Virus
HPV	Human Papilloma Virus
HSV	Herpes Simplex Virus
HSV-1	Herpes Simplex Virus Type 1
HSV-2	Herpes Simplex Virus Type 2
IgG	Immunoglobulin G
IUDs	Intrauterine Devices
LARCs	Long Acting, Reversible Contraceptive
LGBTQ	Lesbian Gay Bisexual Transgender Queer
LH	Luteinizing hormone
NHANES	National Health and Nutritional Examination Survey
NKCs	Natural Killer Cells
NSES	National Sex Education Standards
OBGYN	Obstetrics and Gynecology
OC	Oral Contraceptives
P_4	Progesterone
PCOS	Polycystic Ovary Syndrome

PID	Pelvic Inflammatory Disease
SOCs	Synthetic Oral Contraceptives
STI	Sexually Transmitted Infection
T_4	Testosterone
UTI	Urinary Tract Infection

CHAPTER 1: INTRODUCTION

1.1 Statement of Problem

Sexually transmitted infections (STIs) are any type of infectious disease that may be transmitted from person to person through any form of sexual contact. STIs are caused by various pathogens and can result in diverse clinical outcomes. The prevalence, transmission rates, and disease severity of STIs vary significantly between individuals and populations due to a complex interplay of biological factors. Worldwide, it is estimated that over 347 million of people are infected by STIs (Organization, 2016) (Satterwhite et al., 2013). However, that number may be much higher because many cases of these diseases present without any clinical manifestations (symptoms), they are asymptomatic (Marrazzo & Suchland, 2014; Narouz et al., 2003; Waller et al., 2003). The eight most common STIs are Chlamydia, Gonorrhea, Syphilis, Trichomoniasis, Human Papilloma Virus (HPV), Herpes Simplex Virus (HSV), Hepatitis B, and Human Immunodeficiency Virus (HIV) (Gibson et al., 2014; Hunter et al., 2014). In recent years, there has been an increase in the usage of STI services, suggesting an escalation in STI incidence rates (Hall et al., 2012). This increase corresponds with worldwide surveillance estimates, which have shown a consistent overall incline over the past 30 years (Zheng et al., 2022). This increase is especially worrying as there is the concurrent rise of multi-drug antibiotic resistance of many bacteria, including several that cause STIs (Ventola, 2015).

STIs exhibit variations in prevalence, clinical manifestation, and disease progression between females and males. The prevalence of STIs (in general) is higher in women than men (Whitley & Roizman, 2001). Symptoms of certain STIs also tend to be more severe in women (Corey et al., 1983). These diseases can cause much more severe consequences in women than men, due to their ability to cause secondary infections, or sequelae (Wong et al., 2004). For example, HPV has been shown to be a significant factor in the acquisition of cervical cancer (Forman et al., 2012). Chlamydia and gonorrhea can result in a painful sequelae called Pelvic Inflammatory Disease (PID), which can lead to infertility in

women (Marrazzo & Suchland, 2014). Additionally, the overall risk of acquiring certain types of STIs tends to be higher in women than men (Fatahzadeh & Schwartz, 2007; Mertz et al., 1992). However, the reason for these differences is not well understood. Many studies have attempted to pinpoint significant variables that may lead to this sex difference. However, as a result of a wide variety of potential factors, as well as challenges acquiring accurate data, much of the research is conflicting or incomplete (Hoover et al., 2008; Satterwhite et al., 2013; Wong et al., 2004)

1.2 STI Outcome Variability

One of the many potential variables that impact STI acquisition rates lies within the biological differences between men and women. The differing types of sex steroid hormones- most notably testosterone (T_4), estradiol (E_2), and progesterone (P_4) - have been shown to impact overall immune function in a variety of ways (Foo et al., 2017). For example in women, E_2 has demonstrated a consistent immunoenhancing effect, while P_4 tends to act in a more suppressive manner (Beagley & Gockel, 2003). In men, testosterone has shown patterns of immunosuppression (Bouman et al., 2005). These differences in hormone effects correlate with the sexually dimorphic response seen in most infectious disease outcomes; with women having a greater resistance to infections than men(Taneja, 2018). However, as mentioned previously, STI rates tend to show the inverse of this trend, with a higher incidence in women than men, suggesting that the immunomodulating roles of sex hormones may have a differential role in these types of diseases.

STI outcomes are not solely predicted by biological factors; social factors also play a significant role in shaping patterns of transmission and vulnerability. High-risk sexual behaviors, risk perception, and communication patterns can be shaped by social norms, educational availability, and cultural beliefs, all of which have been shown to effect health outcomes (Ghebremichael & Finkelman, 2013; Sychareun et al., 2013). Healthcare disparities and stigmatization alter access to healthcare and STI screening (Garcia et al., 2021) , while partner relations and social support can influence STI transmission

dynamics(Ferguson & Garnett, 2000). Additionally, the patient-healthcare worker relationship plays a crucial role in providing quality healthcare services, or it can act as a barrier to accessing sexual health services for some individuals (O'Malley et al., 2002).

1.3 The Influence of Birth Control

Another potential consequence of unprotected sexual intercourse is pregnancy. There are various methods that women can use to prevent pregnancies, including natural barrier methods, surgical interventions, and the use of synthetic hormones. Worldwide, around 27% of females of reproductive age (15-49) use some form of hormonal contraceptive (Sanjeev Khanth & Maheswari, 2023). Hormonal contraceptives were first introduced in 1961. The use of hormones to regulate ovulation, implantation, or to maintain a quiescent uterus has been studied since the 1930s (Dhont, 2010). Since the introduction of hormonal contraceptives to the general population, a variety of delivery methods and combinations of synthetic hormonal contraceptives have been developed, including daily oral medication, long-acting subdermal implants, vaginal rings, and intrauterine devices (Teal & Edelman, 2021). Additionally, over time, several "off-label" usages of these methods of contraceptives have been used, primarily as treatment for reproductive pathologies in women, such as polycystic ovary syndrome (Forslund et al., 2023). While hormonal birth control methods are consistently effective at preventing pregnancies, they do not provide any protection against the sexual transmission of diseases. Because condoms are the most effective method of reducing STI acquisition and preventing pregnancy (Holmes et al., 2004), the best protection against both pregnancy and disease transmission is to use a dual method, the use of both hormonal contraceptives as well as condoms (Cates & Steiner, 2002). These other uses are largely beneficial, however there are still potential negative consequences to the use of hormonal contraceptives that must be taken into consideration. Synthetic estrogens (especially ethinyl E_2, or EE) are noted to dose-dependently increase the risk of venous thromboembolisms (de Bastos et al., 2014). The lower the dose of EE, found in contraceptives, the lower the risk of pathologic

outcomes, including pulmonary embolisms, ischemic stroke, and myocardial infarction (Weill et al., 2016). These effects of EE are due to increased protein synthesis in the liver, which can lead to hypercoagulability (Forslund et al., 2023). Other types of combination hormonal contraceptives are associated with changes in various aspects of the hemostatic pathways, including levels of coagulation factors and anticoagulant proteins (Group, 2013).

Birth control use can be a predictor of STI outcomes. For example, birth control use can influence sexual behaviors, such as the number of sexual partners, which can impact exposure to STIs (Gullette et al., 2009). As described above, synthetic hormones used to prevent pregnancy also can alter production of a variety of proteins as well as the overall hormonal profile of women who use them, potentially influencing susceptibility and thus acquisition of an STI. Understanding and expanding upon how hormonal birth control methods influence STI outcomes may help us understand how to reduce these negative impacts on women using this type of contraception.

1.4 Research Significance

Many factors, both biological and social, have been shown to contribute to the heterogeneity observed in STI outcomes. Hormonal factors significantly influence the risk and outcomes of sexually transmitted infections. E_2, P4, and testosterone levels in females and males can impact STI susceptibility by altering reproductive physiology and indirectly by changing risk-taking behaviors. Hormones also regulate immune responses, affecting the body's ability to control STI pathogens. Hormonal variations during the menstrual cycle or those incurred by the use of hormonal contraceptives may influence some of these clinical outcomes in females. Understanding the interplay between hormones, other biological variances, social determinants, and STIs is essential for developing targeted prevention strategies. Successful interventions must take into consideration unique hormonal influences as well as situational social influences and behaviors on STI risk and disease progression.

Previous literature reviewed many of the individual impacts of these variables, however, few look at the overall combination of biological and social interaction leaving a number of questions unanswered. In experimental studies, using murine models, E_2, increased susceptibility to gonorrheal infections, and P_4 induced immune protection. Infected mice treated with E_2 were more likely to succumb to infection and die, whereas mice treated with P_4 were more likely to successfully clear the disease (Kita et al., 1985). Human serum studies have also demonstrated that women with increased P_4 levels were more likely to have an asymptomatic infection than those with lower hormone levels (Wu et al., 2011). Many previous studies have demonstrated that the influence of a particular hormone may be disease-specific (Garcia-Gomez et al., 2013) or even species-specific (Teng et al., 1992). In contrast to the apparent protection induced by P_4 in *Neisseria gonorrhoeae* infections, this hormone increases susceptibility to chlamydial infections, while E_2 expresses an inhibitory effect (Kaushic et al., 2000). In further studies, E_2 has a greater influence on the proliferation of other vaginal infections, such as *Candida albicans* (Fidel et al., 2000).

Normal changes in hormone production produce differential effects on STI infection. The introduction of hormonal contraceptives over 40 years ago for pregnancy prevention is considered one of the most successful public health interventions of the 20th century (Blumenthal & Edelman, 2008) . Various methods in the delivery of hormonal contraceptives are available to suit different lifestyles. There are many delivery methods for hormonal contraceptives ranging from oral contraceptives (OCs) taken as a daily pill to a silastic implant that can last 5 or more years (Benagiano et al., 2008). However, hormonal contraceptives are not for everybody. However, there are risks associated with the use of hormonal contraceptives. For example, the incidence of several cancers, including breast cancer and cervical cancer, are slightly increased in persons who use OCs (Cibula et al., 2010; Satish et al., 2023). These hormones can also exacerbate pre-existing conditions, such as chronic migraines, cardiovascular diseases, and hypertension (Yu & Hu, 2013).

Hormonal contraceptive use has been shown to increase the shedding of HSV-2 in women. This may contribute to increased transmission of this disease (Cherpes et al., 2005). However, other studies have demonstrated conflicting results regarding the relationship between this form of contraception and STI acquisition rates. Limitations of these data make it difficult to suggest a valid, literature-based conclusion. One example is the issue of asymptomatic disease. An accurate accounting of the number of STIs within a population is difficult because often testing is not done when no symptoms are present.

Gender differences are also known to impact various social determinants of health with regard to sexual health access and understanding. In addition, education (or lack of) may influence someone's knowledge of screening for disease or understanding transmission or symptoms (Rooney et al., 1986) (Hunter et al., 2014; Waller et al., 2003). Domestic violence is another social determinant that may contribute to STI rates. Previous literature has shown that most rape victims tend to be women (Tjaden & Thoennes, 2006). Victims of domestic violence also happen to have a higher rate of gynecological problems, including sexually transmitted infections (Plichta & Abraham, 1996). However, the lack of conclusive and consistent data underscores the importance of the current proposed research project.

This leaves the actual mechanisms behind these discrepancies unclear. This study will utilize an alternative method to investigate the epidemiological characteristics, as well as the social and biological factors that may influence the rates of 6 of the 8 most prominent STIs in women. The focus will be on the relationships between various forms of birth control methods with the prevalence rates of both symptomatic and asymptomatic reports of Chlamydia, Gonorrhea, Syphilis, Trichomonas, and HSV. As previously mentioned, there are millions of women who use hormonal contraception methods, and the conflicting evidence on contraceptives as a risk factor in the acquisition of STIs makes it difficult to ascertain if there is a positive association between the two. Understanding these associations is essential to providing effective healthcare interventions to address the complexities of sexually transmitted infections in diverse populations.

This retrospective study proposes to recognize new potential risk factors by identifying if *hormonal contraceptive use or other gendered social trends may affect the odds of self-reported STI acquisition and presentation and, thus, healthcare provider diagnoses and treatment of STIs.*

1.5 Specific Aims

This study has the following aims to achieve this purpose:

1. **Aim 1:** To determine sexual disparities seen in the diagnostic history of sexually transmitted infections among women and men.
    a. A significant variance between the two groups suggests that multiple factors are involved in the observed discrepancy.
        i. There are social and biological differences between men and women; identifying a relationship between these and sexually transmitted infections may provide insight as to infection risk.
    b. Research question: Are there differences observed in the diagnostic history between men and women in the United States?
2. **Aim 2:** To determine if there are disparities seen in the diagnostic history of sexually transmitted infections among women who have and have not used hormonal contraceptives.
    a. A positive relationship between women who use hormonal contraceptives and have had some form of medically diagnosed STI suggests a social or biological relationship between contraceptive usage and transmission rates.
        i. A variation in diagnoses of STIs in women who have used different forms of contraceptives would suggest that variations in hormone levels are inducing a biological response, altering acquisition rates.

   b. **Research Question: Is there a relationship between a history of STI acquisition and certain types of birth control?**

3. **Aim 3:** To determine if disparities seen in specific social factors of women influence the odds of having a positive history of STIs.
   a. A positive relationship among social factors, such as education level, sexual history, condom usage, and relationship status, may demonstrate a social influence in women who have had these infections.
   b. **Research Question: What social factors may influence the odds of acquiring an STI?**
4. **Aim 4:** To determine if social factors influence a women's choices and outlook regarding birth control and sexual health.
   a. Perception and self-reflection may be an important barrier to accessing sexual healthcare.
   b. **Research Question: What social factors may influence the choice of taking birth control?**
   c. **Research Question: Are there self imposed barriers to obtaining access to sexual healthcare?**

CHAPTER 2: LITERATURE REVIEW

2.1 An Overview of Sexually Transmitted Infections

2.1.1 Common Sexually Transmitted Infections

The eight most common sexually transmitted diseases are chlamydia, gonorrhea, syphilis, trichomonas, hepatitis B, herpes simplex virus, human immunodeficiency virus, and human papillomavirus. Chlamydia (*Chlamydia trachomatis)*, gonorrhea (*Neisseria gonorrhea)*, syphilis (*Treponema pallidum)* are curable bacterial infections. Trichomonas (*Trichomonas vaginalis*) is a parasitic (protozoan) and is treatable. Hep B, HPV, HIV, and HSV are viral and treatable, but currently uncurable (Garcia et al., 2021). Different STIs may affect men and women differently. For instance, some STIs, such as HPV, can cause cervical cancer in women but may not have severe consequences in men. Bacterial STIs also show sexual health disparities, with most health complications occurring in women (Organization, 2016).

2.1.2 Clinical Presentation and Subclinical Infections

Chlamydia, gonorrhea, and trichomoniasis are among some of the most common curable STIs. These diseases are largely associated with cervicitis, urethritis, and vaginitis, however can also cause infections in the eyes, larynx, and anus (Mohseni et al., 2023; Rowley et al., 2019). Despite the common clinical presentation of these diseases, a majority of infections are asymptomatic, especially in women. Asymptomatic manifestations of chlamydia occur in approximately 70% of female and 50% of male cases. Trichomoniasis is asymptomatic in 50% of women and just over 10% for men. Finally gonorrhea subclinical rates are 80% / 10% in women and men respectively (Organization, 2012; Van de Laar & Morré, 2007). The

lack of obvious symptoms for these diseases is troubling, considering these infections hold the highest risk of developing significant sequalae. For example if left untreated, even these subclinical infections can cause significant pathologies to the cervix and upper genital tract, penis and testes, as well as the anal canal including PID, proctitis, chronic epididymitis, salpingitis, upper genital tract scarring, impotence, and ultimately, the potential for infertility. Despite affecting both sexes, these sequalae are much more frequent and severe in women than men (De Schryver & Meheus, 1990; Edwards & Butler, 2011; Organization, 2012; Stamm, 1999). There is also a possibility of these STIs manifesting into systemic infections, causing septicemia, endocarditis, or meningitis (Looker et al., 2020; Organization, 2012).

Syphilis is unique in its clinical course. This disease can last decades, can remain asymptomatic for extended periods of time, and will generally move through (up to) four different stages, each characterized by unique manifestations (Buder et al., 2019). Primary syphilis is characterized by the presence of a painless, ulcerative lesion, called a chancre. The secondary stage is much more disseminated throughout the body and can cause a rash (particularly on the palms and soles), lymphadenopathy, mucous patches, condyloma lata, and alopecia. The rash can be localized or diffuse, and a variable presentation- non-pruritic macular, maculopapular, papular, or pustular lesions (National Center for HIV/AIDS, 2021). Tertiary syphilis is considered late stage, and can contain cutaneous, cardiovascular (such as aortitis), and neurological manifestations. Gummas, a non-infectious tuberous syphilid lesion, are a common clinical finding. These lesions can cause fatal outcomes if sustained in brain or soft organ tissue. Quaternary syphilis can take

decades to develop. At this stage, neurological symptoms will occur. Some of these presentations include Tabes dorsalis (nerve cell degeneration), nerve pain, impairment of reflexes (including pupillary), and general paresis (syphilitic deterioration of brain function) (Buder et al., 2019) .

While HSV infections can cause outbreaks of recurrent, painful genital and oral ulcerations, the virus is largely latent or episodic. As with the bacterial and protozoal STIs, manifestations tend to be more severe in women than men (Corey et al., 1983). Symptom recurrence is often associated with psychosocial events, such as stress or depression, due to the deregulatory impact these events have on the immune system (Glaser & Kiecolt-Glaser, 2005; Looker et al., 2020). One study reports that over 80% of people who were seropositive for HSV-2 had not received a positive diagnosis (Prevention), 2010). Like many subclinical STIs, HSV is infective when asymptomatic, as it is still shedding viral particles regardless of symptoms, meaning that the latent stage of the virus is still infective (Looker et al., 2020).

As an infection, Papillomaviruses cause growth of benign warts and papillomas, however, depending on type and location, these growths may progress into malignant proliferations (de Villiers et al., 2004). In humans, HPV is known to be oncogenic, and can be attributed to a majority of cervical, penile, vulvar, anal, and oropharyngeal cancers (Workowski et al., 2015). Worldwide, HPV is responsible for estimated over 500,000 cases of cervical cancer (and around 260,000 associated deaths) each year(Organization, 2016).

As many of these infections do present asymptomatically, it is increasingly important to encourage routine screenings of all sexually active persons, especially those in high-risk groups, such as young women (Workowski et al., 2015). However,

increases in genetic diversity can cause difficulties. For example, over the past few years, new variants of *C. trachomatis* have been reported. These new strains of the bacteria are still infective; however, they contain significant genetic variability from the typical STI-causing agent. This can lead to false negatives in many types of STI screening tests (Van de Laar & Morré, 2007) .

2.1.3 Treatment and Reinfection

STIs have an excellent ability to evade host immunity. One way is their high antigenic variation, particularly seen in chlamydial and gonococcal infections (Hill et al., 2016; Lena et al., 2005; Stephens, 2020). The variations in important antigens may contribute to changes in the proliferation of the bacteria in several ways, including an increase in infection duration in the host and facilitation of reinfection (Frank, 2002). These contributions to virulence demonstrate that outside medical intervention is needed in order to effectively eliminate or manage the infections. For the most part, bacterial STIs can be treated with a single dose of traditional antibiotics, such as azithromycin (Van de Laar & Morré, 2007), although in some cases, syphilis is able to spontaneously resolve itself. This can occur prior to the tertiary stage, however, if this resolution does not occur, lack of treatment will ultimately result in death (Buder et al., 2019). One growing problem with antibiotic treatment is that over the past decade, *N. gonorrhea* has developed multidrug resistance. Currently, there are strains that have developed resistance to all known antibiotics, creating reasonable concern of an untreatable infection (WHO, 2018). Trichomoniasis is caused by a eukaryotic parasite, so antimycotic/antifungal drugs (such as metronidazole) are the standard (Van Gerwen et al., 2022). Viral STIs are currently incurable. While vaccine development is a continued area of active

research, few have adequate pre-exposure vaccination success. Viral STIs require lifelong management, with suppressive antivirals, such as valacyclovir (Van Gerwen et al., 2022).

The primary means of protection against STIs is by prevention and pre-exposure strategies. There are prophylactic vaccines for several STIs, such as HPV or HBV. The HPV vaccine is recommended for children as early as 11 years of age (Workowski et al., 2015). Since the introduction of this vaccine initiative, there has been a significant reduction in pre-malignant and malignant cancers associated with HPV (Van Gerwen et al., 2022). Regrettably, not all "interventions" are well informed. There are many word-of-mouth "treatments" that are inaccurately considered to protect against STIs. Post sexual exposure washing or urination does not protect against these diseases; the most effective intervention is prevention through the use of condoms or other complete barrier methods or abstinence (Stone et al., 1986). Prevention is particularly important with the continued increase of antibiotic-resistant strains of bacteria that produce STIs seen worldwide (Workowski & Berman, 2010).

Surprisingly, exposure to certain STIs may also impact infection and reinfection rates. For example, exposure to HSV-1 grants partial cross-protective immunity to HSV-2 infection (Lena et al., 2005). While some of these interactions are protective, overall, past STI exposure tends to increase reinfection rates (Gullette et al., 2009). For example, women exhibit a high reinfection rate, particularly of *C. trachomatis* and *N. gonorrhea*. This is especially true in younger (under 25 years of age) women (Hosenfeld et al., 2009). Additionally, correlational evidence has demonstrated an increase in HSV-1 infection in seminal vesicles in men who have a urethritis

(primarily gonococcal) coinfection(Cohen et al., 1997). Studies have also shown that if a person has been infected with gonorrhea previously, the likelihood of a future gonorrheal Infection is higher than infection rates for those individuals that have never been infected. This is due to the host's immune response to the original exposure. Initial infection induces the production of a particular antibody in the host (Rmp Ab) that reacts to the gonococcal outer membrane proteins (Li et al., 2014). Women who were Rmp Ab positive had a much higher rate of gonorrhea than those negative for the antibody, suggesting higher susceptibility to subsequent infections. Conversely the potential for producing a vaccine that prevents infection by the gonococcal bacteria (and thus gonorrheal infections) is limited because it has been shown that serum containing antibodies to Rmp prevents the killing of *Neisseria gonorrhoeae* (Li et al., 2014). In addition, antigenic variations of other virulence factors of the pathogen, such as the pilus proteins (Boslego et al., 1991) lead to further limitations in vaccine production.

2.2 Biological Involvement in Disease Inconsistencies

2.2.1 Anatomical Variations in Men and Women

The male reproductive system includes the penis (the glans, prepuce, coronal sulcus, and shaft), and the urethra, which play a significant role as the entry points of transmission of certain STIs. The mucosal epithelium of the penile urethra exhibits a variety of antimicrobial mediators, including the presence of multiple toll-like receptors, immune cells, inhibitory proteins and cytokines, and other cellular components of the immune system (Anderson et al., 2011) . Evidence has also shown that the presence of the foreskin (prepuce) increases the incidence of ulcerative STI occurrence (Moses et al., 1998).

Possible entry points of STI pathogens in the female reproductive system are primarily the vagina, and uterus (including the cervix and fornices). The female reproductive system when compared to that of males includes the presence of cervical mucus, a shorter urethra, and a larger surface area of mucosa, all of which may influence STI acquisition (Tuddenham et al., 2021). Women also tend to have longer potential STI exposure time, as semen can stay in the female genital tract for up to three days posticous (Yi et al., 2013).

The mucus that covers the surfaces of the female reproductive tract helps prevent STIs due to its microbicidal activity (Brotman et al., 2014), such as several types of antimicrobial peptides, such as IgG immunoglobulins. The cervicovaginal mucus has also been shown to be able to trap certain viral STI particles by binding them with IgG antibodies, preventing them from contacting the vaginal epithelium(Schroeder et al., 2018) .

Another anatomic variable that acts as an STI risk factor for women is the presence of cervical ectopy(Rocha-Zavaleta et al., 2004).Cervical ectopy, also known as cervical transformation zone, is a common anatomic variation in women. This condition results from extension of the cells of the endocervical channel onto the ectocervix. This variability in cell type creates a vulnerable environment for certain microorganisms that cause STIs, such as *C. trachomatis* and HPV, to readily colonize and propagate (Kleppa et al., 2015).

These same anatomic factors can influence the composition of both the penile and vaginal microbiome, which can impact STI susceptibility. For example, *Lactobacillus* spp. are a common type of vaginal microflora, and critical for maintaining environmental homeostasis. Variations in the

microbiome can alter the vaginal pH, alter the concentration of *Lactobacillus spp.* and increase the risk of acquiring certain STIs (Tuddenham et al., 2021).

2.2.2 Hormonal Variability Between Sexes

Women tend to have higher concentrations of P_4 and E_2 hormones than men (Goodman, 1996). These hormones are involved in the menstrual cycle and embryogenesis (Besse & Garric, 2009) and during puberty (and the onset of adolescence), reproductive hormones are also responsible for the onset and development of secondary sex characteristics (Bordini & Rosenfield, 2011).

Increasing concentrations of E_2 throughout the follicular phase of the menstrual cycle is produced by the growth of the primary follicle (egg cell). This increase is induced by the variation of pituitary gonadotropic hormones, luteinizing hormone (LH), and follicle stimulating hormone (FSH) acting on the follicles of the ovary. Ovulation occurs in response to a surge in LH, and the initiation of the differentiation of follicular cells into luteal cells that primarily produce P_4. As P_4 levels rise, E_2 levels fall. Toward the end of the luteal phase, the concentration of E_2 begins to rise again, and P_4falls. The corpus luteum undergoes apoptosis, and a new cycle begins (Reed & Carr, 2000). Additionally, the amount of hormone present can influence a woman's ability to successfully maintain a pregnancy. In early pregnancy, the corpus luteum does not undergo apoptosis and continues P_4, which is essential to myometrial quiescence and the maintenance of pregnancy (Di Renzo et al., 2016).

Although the primary sex hormones in women are P_4 and E_2, there are small levels of testosterone rises and falls similarly to the release of LH throughout the menstrual cycle as well (Stuckey, 2008).

The primary sex hormones for men are collectively referred to as androgens. Most androgens are secreted by the testes; however, small amounts are also synthesized in the adrenal gland. Higher ratios of testosterone (T_4): estrogen are primarily found in men, where T_4 is the main functional sex hormone (Richmond & Rogol, 2007) . Similar to hormone-dependent development in women, androgens are necessary for the pubertal development of secondary sex characteristics in men (Livadas & Chrousos, 2019) . T_4 synthesis is mediated by the pituitary gonadotropins, LH and FSH (McLachlan et al., 1996).

Another main function of testosterone is the role it plays in male fertility. It is responsible for spermatogenesis, which is the process for the production of the male gamete, spermatozoa (sperm cells). Spermatogenesis occurs in the seminiferous tubules in association with Sertoli cells. Testosterone is required to maintain the blood-testis barrier, Sertoli-spermatid adherence, and the release of mature sperm (Walker, 2009).

2.2.3 Hormonal Distinctions and Immune Involvement

Biologically, the difference seen in disease frequency in males and females may be due to differences in the ratios of circulating hormones (e.g. estrogens, progestins, and androgens); resulting in differing direct and indirect effects of these hormones on immune function (Garcia-Gomez et al., 2013; Klein, 2000).

T_4 and P_4 can depress many steps in immune reactions. This suppression includes a decrease in the innate and adaptive immune response of particular cells, such as Natural Killer Cells (NKCs) and activated cytotoxic T cells (CD8), and a reduction in the production of pro-inflammatory cytokines, which are critical

to the destruction and regulation of many pathogens (Rettew et al., 2008; Su et al., 2009; Szekeres-Bartho et al., 2001; Taneja, 2018). P_4 further causes immunosuppression by inducing the production of anti-inflammatory cytokines (Piccinni et al., 1995). While these two hormones have been shown to act as immunosuppressants, E_2 has been found to have many protective effects by enhancing immunological responses (Garcia-Gomez et al., 2013; Klein, 2000). E_2 has been shown to induce the expression of pro-inflammatory cytokines, such as IFNγ and IL-2 (De et al., 1992). Estrogen has also demonstrated an ability to override adaptive immune tolerance, and induce B-cell proliferation and activation (Verthelyi, 2001).

Hormonally induced immune alterations may also be responsible for the gender disparities observed in the clinical manifestations of these diseases. For example, women's hormonal profiles change throughout their menstrual cycle (Staley & Scharfman, 2005). Previous literature has demonstrated that women exhibit a higher incidence of gonorrheal infections closer to menstruation, as well as an increase in susceptibility of this pathogen pro-estrus in animal models (Sonnex, 1998). Based on the aforementioned episodic flux of female reproductive hormones throughout the different stages of the menstrual cycle, this further supports a correlation between these hormones and immune system involvement, and thus disease status (Wira et al., 2015). The hormonal fluctuations seen during the menstrual cycle also can influence variations in cytokine release, therefore, affecting potential STI susceptibility (Angstwurm et al., 1997). Previous studies have demonstrated that changes in hormone levels

during the menstrual cycle might impact the vaginal microbiome, which would further alter potential immune responses (Gajer et al., 2012) .

These reproductive hormones may also specifically alter the susceptibility to specific STIs. In mouse models, E_2 has been shown to decrease susceptibility to the HSV pathogen. While P_4 did not affect susceptibility, it did increase the progression of the disease compared to that seen in untreated groups, again most likely due to their effects on immune function (Gillgrass et al., 2005).

2.3 Birth Control Types and Use

2.3.1 Overview

Synthetic oral contraceptives (SOCs) are made using mixtures of small amounts of synthetic progestins and estrogens (Liu et al., 2011). Based on their dose-dependent ability to inhibit pregnancy, women have long used synthetic variants of reproductive hormones as a form of birth control. Of the 61 million women in the United States who are of childbearing age (15-44), (Daniels et al., 2014) over 10 million use hormonal birth control methods (Jones et al., 2012). As noted above, hormones are important regulators of immune function, however, do not protect against STIs.

2.3.2 Types of Hormonal Birth Control:

There are various hormonal birth control methods, such as oral contraceptives, patches, injections, vaginal rings, and intrauterine devices (IUDs) (Kavanaugh & Jerman, 2018). These methods release synthetic estrogen and/or progesterone which act in the same way as natural hormones produced by the ovaries. Injections of Depomedroxyprogesterone acetate (DMPA), are used to deliver synthetic P_4

(progestogen) while oral contraceptives use either estrogen alone or a combination of estrogen and P_4 to prevent pregnancy (Mishell, 1996).

2.3.3 Mechanisms of Action:

While each method has different mechanisms of action, all prevent pregnancy through the inhibition of ovulation, changes in cervical mucus, and/or the alteration of the uterine lining. (Festin, 2020). The first is suppression of ovulation. A review done by Rivera et al. (Rivera et al., 1999) describes that oral contraceptives suppress the release of luteinizing hormone (LH) and follicle-stimulating hormone (FSH) from the pituitary gland. This suppression prevents the maturation and release of eggs from the follicles in the ovaries (ovulation), effectively inhibiting fertility. Another method is through changes in cervical mucus. Progestin, delivered through patches and injections, causes thickening of the cervical mucus. The thicker mucus prevents sperm motility, thus inhibiting it from reaching the egg, and reducing the chances of fertilization (Bahamondes et al., 2020). Finally, some hormones are able to alter the growth of the uterine lining. Long-acting reversible hormonal contraceptives (such as IUDs or DMPA) and oral contraceptives impact the growth of the endometrial lining. These synthetic hormones cause the thinning of the endometrium which decreases receptivity to implantation, preventing the successful attachment of a fertilized egg and maintenance of pregnancy (Homminga et al., 2023).

2.3.4 Benefits of Hormonal Birth Control:

When used as directed, hormonal birth control methods exhibit high contraceptive efficacy. Failure rates range from only 0.1% to 3% (Westhoff, 2003), which are comparable to the effectiveness of female sterilization (Mansour et al., 2010). Prophylactic failure is strongly associated with improper practice. Incorrect or

inconsistent use of any contraceptive will increase risk for failure (Trussell, 2011). Hormonal birth control has been shown to regulate menstrual cycles, leading to lighter and less painful periods for many users (Archer, 2006). It is commonly prescribed as one of the first-line pharmacological agents to manage conditions such as polycystic ovary syndrome (PCOS), hyperandrogenism, endometriosis, dysmenorrhea, menorrhagia and other menstrual irregularities (Dhont, 2010; Teede et al., 2019; Teede et al., 2023).

2.4 Influence of Birth Control on Sexually Transmitted Infection Rates

2.4.1 Overview

The choice of birth control method may be a determining factor in rates of sexually transmitted infection. Usage of specific contraceptives may affect the transmission rates of different STIs. For example, observational studies have demonstrated that women who use oral contraceptives are up to 70% more likely to get a bacterial STI (Louv et al., 1989). Cohort studies have established that this method of birth control is significantly more associated with the acquisition of these infections than hormonal contraceptives themselves (Morrison et al., 2004). This suggests that the use of these types of contraceptives may influence sexual behaviors more than the biological response affects the immune response.

2.4.2 Condom Use

It is well established that condoms are an effective method for the prevention and the spread of diseases during sexual contact, as well as the prevention of pregnancy (Baeten et al., 2001). Unfortunately, condoms are not always used during intercourse. There are a number of reasons for nonuse of condoms. A widespread belief is that condoms decrease sexual pleasure which limits their use in casual

sexual encounters (Mabire et al., 2019). Other common reasons for not using condoms relate to lack of preparation, or alterations in perceived STI risk (Rodrigues et al., 2023). Length of relationships and long term commitment tend to decrease condom use, especially if other forms of contraception are used (Civic, 2000; Milhausen et al., 2018). This suggests that another predicator for condom use is the lack of an alternative form of birth control (Stigum et al., 1995). In fact, studies have shown that condom use in women who use another form of birth control is lower than those who do not(Gullette et al., 2009; Santelli et al., 1996). This inconsistent condom use is especially seen in women who use long-term contraceptive devices(Fu et al., 2021).

2.5 Social Determinants of Sexual Health

2.5.1 Gender Differences and Sexual Health

2.5.1a Traditional Gender Roles

Gender role ideology can be an influencing factor in sexual health, i.e. the belief that the female role is one of a caretaker or someone that is emotionally supportive, while the stereotypical male role is that of economic provider, toughness (physically and psychologically), and sexual prowess (Kerrigan et al., 2007). In many societies, these traditional roles tend to distort into other gendered traits, such as women's roles delineated to being clean, well- spoken, and virtuous (Go et al., 2002). This paradigm can affect views on healthcare. For example, these roles also tend to discourage the use of contraceptives, feeding into the stigma of contraception because of the belief that it encourages promiscuity, traditionally unacceptable sexual behaviors (Rehnstrom Loi et al., 2019). Men, however, tend to be less likely to undergo consistent engagement with general healthcare services. This is often

due to the idea that admission and treatment of illness is believed to be a weakness or feminine. Many men, especially those who pride themselves on their dominant, or "alpha" self-image, consider seeking medical help, whether it be preventative or treatment, as inconsistent with their strong/sturdy self-perception. This often leads to negative healthcare outcomes for men, even for preventable and/or treatable conditions (Leone et al., 2011).

The masculine identity also encourages a riskier sexual behavioral outlook, such as in increased number of sexual partners (Pleck et al., 1993). Parts of this trend are very apparent in young men, who tend to demonstrate higher rates of these risky sexual behaviors than women, including higher rates of sexual experiences, the use of alcohol or drugs with sexual intercourse, a younger age of sexual debut, and more numerous sexual partners (Kann et al., 2018). However, even with the increased rate of risky behaviors, there are some more sexually protective behaviors that men will exhibit at a higher degree than women. For example, young men do have a higher rate of condom use during intercourse than young women (Kann et al., 2018). This variability in protective measures implies that women may also be associated with high-risk factors for STI acquisition; as well men potentially shifting away from some of the traditional male gender role ideologies on sexual behavior. Studies have shown that ethnic minority females are a significant high-risk population for these same behaviors (Champion et al., 2013), suggesting that traditional gender role ideology may not be the only factor influencing these types of sexual interaction.

Another gender disparity in sexual health is based on the women being more frequently villainized for sexual behaviors (Smith et al., 2008). In many areas, STIs

are associated with sexual promiscuity, which is considered an unacceptable behavior in women, as it defies the "virtuous" aspect of the traditional female gender role, and can have severe social and physical repercussions. This is especially prominent and stigmatizing in male-dominant societies, where men are understood to have a natural sex drive, therefore it accepted that they engage in pre-marital affairs but not women (Baumeister & Twenge, 2002; Go et al., 2002).

2.5.1b Hormonal Influences

It is well documented that the prominent male sex-steroid hormone, testosterone, has a significant mood-altering ability. Increases in testosterone are associated with increases in aggressive and risk-taking behaviors (Zitzmann, 2020). There are many behaviors that can influence an increase in testosterone concentration, one notable example being activities related to sexual activity (Geniole & Carre, 2018). With the relationship of a sexual trigger with testosterone influx and subsequent increased risky, aggressive behaviors associated, it is possible that there is an association between sexually active men and an increased likelihood of engaging in high-risk sexual activities. This relationship between behavior and biological response could ultimately lead to potentially higher STI acquisition rates.

Classically, this influence of testosterone on behavior is seen in both sexes. Higher aggression is linked to a higher level of endogenous testosterone, which has been observed in both women and men (Dabbs Jr et al., 1988). This sex hormone-behavioral change does not seem to extend to female reproductive hormones, as increases of estrogen do not induce any apparent antagonistic behavioral changes (Goudriaan et al., 2010). However, research has shown that the use of hormonal contraceptives may influence the behavioral role of testosterone in women. Women

who use hormonal contraceptives appear to have a diminished rise in testosterone, as women who do not use HCs show noted increase in testosterone level as a response to sexual conditions (Goldey & van Anders, 2011).

The increased aggressive nature associated with higher testosterone level may also influence other aspects of STI transmission. For example, sexual violence is also associated with higher testosterone levels (Studer et al., 2005). Women have much higher rates of sexual violence perpetrated against them then do men- including forced sexual intercourse- from both general populations as well as intimate partners (Kann et al., 2018). Gender-based sexual violence can exacerbate STI risk for women. One predictor is that these types of assault are usually committed without condoms(Davis et al., 2012) (Peterson et al., 2010). It is common that there is a lack of the use of protective methods by women even in cases of intimate partner violence, because of fear of reactive physical or emotional abuse (Wingood & DiClemente, 1997). Overall, multiple studies have shown that women with a history of sexual abuse show a significantly higher risk of STI incidence than nonvictims (Allsworth et al., 2009) . The aftermath of sexual violence also has a long-term effect on the victims. In many cases, victims of rape will reduce risky behaviors, however, some women begin to exhibit a higher level of sexual risk post-incidence compared to pre-incidence, such as an increase in sexual activity overall or a decrease in condom use (Campbell et al., 2004).

2.5.2 Education

2.5.2a Related to Disease

A lack of sexual health education may also be a contributing factor in the incidence of STIs. People who display lower STI knowledge tend to have

increased rates of high-risk sexual behaviors, including lower STI testing rates. Misinformation is also commonly disseminated through word-of-mouth, such as the idea that “pulling out prevents STIs and pregnancy”, which can also lead to higher STI transmission rates (Champion et al., 2013). Even of those individuals with the understanding of the association between STI knowledge and risk perception, very few actually consider themselves to be “at risk” of contracting STIs, regardless of being sexually active (Oharume, 2020).This educational deficiency is also noted largely in adolescent and younger adults. Younger persons exhibit a lower level of understanding regarding pregnancy risk, contraceptive knowledge, and reproductive health. These age groups also have inexperience and lack of knowledge in health care access overall, as well as other barriers associated with younger adult populations (Fuentes et al., 2018), to be addressed in a later section. A lack of understanding of asymptomatic infections can also lead to an increase rate of STI transfer. Without the physical symptoms being present, an untreated person can act as a continuous reservoir for the STI (Marrazzo et al., 2001). Since many STIs present asymptomatically, detection is reliant on the patient to undergo screening independently, rather than encouraged by pain or discomfort (Farley et al., 2003). In many cases, even with the presence of mild itching/burning/pain, some people do not deem it adequate cause to justify medical intervention (Skaletz-Rorowski et al., 2021). Even with adequate knowledge regarding asymptomatic STIs, in some cases, like HSV, subclinical transmission is much more rare and therefore, not typically acknowledged by the general

population (Rooney et al., 1986). Lack of knowledge/awareness about available treatment methods also influence the likelihood of STI acquisition (Matacotta et al., 2020).

2.5.2b Related to Reproductive Health

Educational gaps in reproductive health also influence the type and even the overall use of hormonal contraceptives. Younger women are often misinformed about some of the longer acting contraceptive types, such as IUDs. There are many gaps in understanding the efficacy of these methods, leading to lower use (Stanwood & Bradley, 2006). Erroneous verbal testimony from peers creates can create widespread inaccuracies, for example, many of these younger women are unaware of the "reversible" aspect of these long-term contraceptives, likening them to overall sterility observed in hysterectomies (Okpo et al., 2014). This is likely based on the classical outlook that most women who are targeted to use long acting, reversible contraceptive (LARCs) are older women, who have decided they no longer wish to bear a child. This targeting of an older population is due to the historic inaccuracies that correlate LARCs to infertility (Teal & Romer, 2013). While there is a noted increase in younger LARC users in recent years, the established misinformation leaves younger and nulliparous women encouraged to use less effective birth control methods, such as OCs and condoms (Finer et al., 2012). Unfortunately, while it is correctly understood that these short-term methods prevent pregnancy, their efficacy is overestimated, which can lead to a higher rate of unintended pregnancy (Eisenberg et al., 2012). Even among women who do use LARCs,

many of them often rely on their healthcare provider to monitor and alert them of the timing, creating knowledge gaps in their understanding of their own sexual health (Fu et al., 2021). Fortunately, studies have shown that educational interventions do improve knowledge about pregnancy, STIs, and risk perception (Zizza et al., 2021), which may lead to a decrease in risky sexual behaviors and STI acquisition rates.

2.5.3 Cultural Viewpoints

Cultural and societal beliefs can impact healthcare outcomes and availability. As previously discussed, many societies assign traditional gender roles to women, which can influence sexual stigma, and indirectly have negative effects on sexual healthcare availability, use, and outcomes. Some countries, such as Sri Lanka and Nepal, view discussion or even acknowledgment of sexual behavior as taboo (Agampodi et al., 2008). This lack of communication and education on the subject leaves many young people in these regions with a lack of understanding regarding various aspects of sexual health, limited economic ability to pay for reproductive health services or contraceptive methods, and unwillingness to risk stigma in their community (Regmi et al., 2010).

2.5.4 Risky Behaviors

Historically, there are many behavioral influences associated with STI patterns. These perceived "risky" behaviors include certain sexual activities, such as age of virginity loss, number of sexual partners, engaging in various sexual practices, and substance abuse of drugs and or alcohol (Wasserheit, 1994). There are many factors that may affect these risky behaviors, with some behaviors acting as predictors for others. For example, persons who report the use of alcohol are more likely to be

sexually active (Imaledo et al., 2012). Several studies have outlined that parent-adolescent communication and peer and social group interaction can influence sexual behaviors in younger populations (Whitaker & Miller, 2000).

Social support has consistently been shown to be a influencing factor in health-risk behaviors such as alcohol use or smoking (Brechwald & Prinstein, 2011) , however, this interaction is not necessarily negative. Peer groups have been shown to both discourage and encourage unhealthy behaviors (Maxwell, 2002). The social status of peers tends to play a role in the degree of influence. The higher the perceived social status of an individual, the more likely a peer is to accept the influence, even aggressive and risky behaviors (Cohen & Prinstein, 2006).

Parental communication can also influence health outcomes in terms of behavior. For example, mother-daughter communication regarding condoms is associated with consistent condom use (Hutchinson & Montgomery, 2007). Parent-teen sexual risk communication is also seen to positively influence more conservative (i.e. less risky) sexual behavior and more open communication with sexual partners(Hutchinson & Montgomery, 2007).

2.5.5 Impact of Healthcare

Healthcare workers themselves can be a determinant of sexual health outcomes. Some providers express that the discussion of sexual health in certain populations- ethnic minorities, opposite sex, generationally older, and non-heterosexuals- can be uncomfortable to the point that there is a reduction in sexual health care quality (Gott et al., 2004).) and sometimes inadequate healthcare. For example, there are many gender disparities seen in provider compliance with STI documentation. The emergency room medical records of men are more likely to

have complete documentation per CDC guidelines than women (Kane et al., 2017). Lack of or inadequate treatment can result in an increased risk for significant consequences, such as infertility.

Even without the impact of medical personnel, there are other aspects of healthcare that can affect social risk factors of STI acquisition. Comorbidities can also influence STI acquisition. For example, young women who exhibit depression, high-stress levels, and limited social support are associated with high-risk sexual behaviors and/or a history of STI incidence (Mazzaferro et al., 2006).

2.6 Barriers to Healthcare Access

2.6.1 Demographic Barriers

Many factors, such as socioeconomic status, race, and geographic location, can create disparities in healthcare access, including sexual healthcare (Hoover et al., 2008). This imbalance is glaringly evident in any report assessing minority vs. majority population dynamics respect to with sexual health. For example, gonorrhea prevalence rates are about eighteen times higher in black populations than in white populations (Hamilton & Morris, 2015). STI acquisition risk also is significantly higher (sixfold increase) in black persons as compared to white (Harling et al., 2013) . Interestingly, this disparity is inconsistent with sexual behaviors, as black men tend to have higher rates of condom use than white men (Katz et al., 2023). Marginalized populations may face barriers in accessing STI screening and preventive services, leading to higher STI rates and late diagnoses (Hogben & Leichliter, 2008).

Younger persons, e.g., adolescents and young adults, are another important population to include when reviewing STI barriers in healthcare. In addition to concerns regarding the cost and availability of sexual health services, many younger

people tend to have a mistrust of healthcare specialists, especially in terms of privacy and confidentiality. Adolescents especially are concerned with the possibility that any sensitive information, such as sexual behaviors, will be disclosed to their parents, which leads them not to divulge anything related to sensitive issues or avoid healthcare specialists in general (Fuentes et al., 2018). In some cases, barriers to sexual healthcare for adolescents are severe enough that they forego treatment, even when they present with physical symptoms of STIs (Amsale & Yemane, 2012).

It is also fairly common for sexual and gender minority populations, particularly those In the LGBTQ+ community, to experience significant discrimination regarding healthcare services. Homophobia, transphobia, stigma, and lack of provider knowledge have severely limited the ability to access adequate healthcare among this population (Ayhan et al., 2020).

2.6.2 Self Barriers

Another important attribute to consider in the prevention and control of STIs is the infection timeline. Many people delay healthcare interventions for numerous reasons, including the perception that they will be judged, the cost of services, or the use of alternative medicine (Tsadik et al., 2019). In many cases, barriers to sexual healthcare come from the individual themself. Some of these "self barriers" include fear of being seen/discovered, stigma related to infection, damage to reputation, and overall embarrassment/shame (Lindberg et al., 2006). This embarrassment can result in no communication about sexual health to significant others, parents, friends, teachers, and even health care providers (van Teijlingen et al., 2007). These types of personal feelings can also prevent access to screening. The perception of negative consequences (like a positive STI test), emotional responses,

and even a skewed understanding of personal risk act as continued "self barriers" to sexual healthcare (Barth et al., 2002).

2.6.3 Compliance

Undergoing STI testing is a critical part of diagnosing and treating STIs before they spread throughout a population; however, many of the aforementioned factors may influence compliance. For example, when requested by a general practitioner, men residing in lower socioeconomic and disadvantaged areas or areas without access to an onsite pathology collection facility tend to forgo STI testing (Lau et al., 2016). Even with initial medical intervention, compliance with provider guidelines is necessary to manage and treat these diseases adequately. Some aspects of compliance include appropriate disease screening, medication regimen adherence, and potential lifestyle changes (Schneider et al., 2015).

One predictor of medical compliance is length of treatment regime. Longer treatment times can decrease overall adherence (Divakaruni et al., 2019; Matsitse et al., 2017). Another predictor of compliance is the method by which prescriptions are to be filled. Electronic prescriptions (e- prescriptions) are an increasingly common method of transmitting prescriptions directly to a pharmacy. They are also associated with higher rates of medication adherence, as compared to the traditional paper drop-off by the patient (Fischer et al., 2011).

Patient compliance can also get costly. Screening without compensation can cost medical clinics thousands of dollars. Moreover, not all insurance plans cover the complete range of STI screenings, even with the implementation of the ACA (Finer et al., 2014). This can lead to additional gaps in reimbursement for screening compliance (Eaton et al., 2017). These costs can be detrimental to the continuation

of local government funded STI clinics or other clinical health services. Due to funding issues between 2008-2012, approximately 10% of STI clinics in the United States were forced to close (Barrow et al., 2020). Other types of government intervention have also acted as a barrier for STI screening and treatment. For example, during the COVID-19 Pandemic and subsequent lockdown, most nonemergency services (including STI services) were suspended, even while there was continued sexual activity of the population (Balestri et al., 2020).

2.6.4 Patient- Healthcare Worker Relationship

Despite how common these STIs are, especially their asymptomatic forms, many providers do not consistently impart the importance of importance of testing and treatment of STIs to their patients. One study showed that fewer than 1/3 of physicians in the United States do routine screening for these diseases (St Lawrence et al., 2002). Even though adolescents and young adults credit their medical professionals as one of their top providers of sexual health knowledge, this interaction is often limited, and dependent on initiation by healthcare provider (Ackard & Neumark-Sztainer, 2001) .One study found that the average time for the discussion of sexuality within routine healthcare visits to be only around 36 seconds of a (average) 23 minute exam visit. These discussions also must be brought up by the physician, regardless of the patient's willingness to discuss the topic (Alexander et al., 2014). Many physicians are hesitant to bring up sexual health topics due to a number of concerns about their own, their patient's, or the patient's parent's comfort level on the subject. Other negative predictors include concern around patient stereotyping, the depth of sexual issues, and any legal/ethical issues involved (Boekeloo, 2014).

Patients may feel embarrassed or judged when discussing sexual health, leading to avoidance of seeking care (van Teijlingen et al., 2007).

In some cases, the medical administrative barrier occurs on the side of the medical professionals. One study likened the discussion of sexual health with patients as "opening a can of worms" due to the provider's beliefs of the sensitivity, complexity, and personal educational inadequacies on the topic (Gott et al., 2004). This mentality also impacts the willingness of certain underrepresented populations to seek medical care, especially for sexual health, which can be considered a sensitive topic. Provider sexual health assumptions and biases can influence their interactions with minority groups. Medical professionals often place the blame for negative interaction on the patients themselves, particularly with black, indigenous, and people of color (BIPOC), citing "ethnic" or "cultural" differences. Age and socioeconomic status are also factors that impact medical and sexual health assumptions, severely limiting provider interaction and approaches to topics such as contraception (Mann et al., 2022).

Many providers maintain a "heteronormative assumptive" approach to medical inquiry, which makes many LGBTQ+ persons unwilling to discuss their sexual health, gender identification, or sexual orientation (Rahman et al., 2023). This advice revolves around heterosexual cisgender norms, including pregnancy, STI preventative measures (e.g., condom use), and contraceptive use. Many providers also lack medical knowledge with respect to STI transmission in transgender individuals, which limits the medical advice that the transgender individual can utilize, ultimately impacting their willingness to seek help regarding issues of sexual health (Jahn et al., 2019). The effect of the intersection of these biases often leads

to medical distrust. In some cases, minority adolescents are hesitant to disclose information about their sexual orientation and sexual health concerns, as they do not trust the assumptions of medical providers or even the legitimacy of the provider maintaining the privacy of disclosed information (Fisher et al., 2018). Historically, sexual and gender minority individuals have experienced a litany of negative interactions and dangerous discriminative behaviors from healthcare providers, including refusal of healthcare and even physical abuse (Ayhan et al., 2020).

Patient mistreatment is not an uncommon phenomenon, especially in sexual and reproductive health. One survey of provider-patient interaction of new mothers (i.e., in maternity wards) showed that 1 in 6 women surveyed had experienced some form of mistreatment, including violation of privacy or personal information, disregard of patient's needs, threats to withhold treatment, and even physical abuse (Vedam et al., 2019).

Patient compliance with medical intervention is critical to maintain positive healthcare outcomes. A positive relationship with their prescriber has a positive relationship with patient adherence (Day et al., 2005; Kerse et al., 2004). Patient-clinician trust, compassion, and communication are an important aspects in the decision to get adequate disease screening (O'Malley et al., 2002). Adults who have positive interactions with their providers are more likely to undergo disease screening as well (Kindratt et al., 2020).

CHAPTER 3: METHODS

3.1 IRB info

Institutional Review Board approval for the research protocol was approved by the University of North Carolina at Charlotte Institutional Review Board. Subjects were given access to an online survey to fill out and return. Informed consent was obtained as part of the survey questionnaire. All survey participant information was kept anonymous, with no identifiable data included. Survey data was also kept confidential and locked on the primary researcher's work computer.

3.2 Survey creation and dissemination

One primary data source was the result of a cross-sectional survey. This survey contained both descriptive and experimental attributes. Data were gathered from a total of 522 women, all current students at the University of North Carolina at Charlotte.

The survey was administered through an online portal (SurveyMonkey) in May of 2018 and disseminated throughout the student body via email. Each student was emailed a link directing them to an online survey. Those who chose to participate answered a total of 32 questions, including an informed consent page and inclusion criteria demographics. The rest of the survey inquired about participant histories regarding past sexual and medical experiences, diagnostic history, and attributes relating to potential STI exposure and outcomes, as well as information involving birth control, personal perceptions, and other social demographic variables. The full survey is available in Appendix A.

At the end of the survey, the participants were invited to enter their email address into a pool (anonymously; this was not connected to the individual survey profile, therefore dismissing any potential identifying markers). The participants in the pool competed to win a 50$ Visa gift card as an incentive for participation.

The survey results were reviewed for any missing/invalid responses and to identify anyone outside our inclusion criteria. The primary variable of comparison was the lifelong incidence of STI. The

sample population within the inclusion criteria was considered an adequate representation of college women, thus, the data was unweighted.

3.2.1 Inclusion and Exclusions

Several requirements had to be met for data to be included in this study. All participants must have been born biologically female. All must be college students enrolled at the University of North Carolina at Charlotte. If on any form of birth control, it must have been consistently used for the last 6 months. Any information gathered by participants that did not meet this inclusion criteria was excluded from all data analyses.

3.3 External data source

This investigation used secondary analysis of cross-sectional data from the National Health and Nutritional Examination Survey (NHANES), through the Centers for Disease Control (accessed through the CDC, 2018). The NHANES program is designed to measure the overall health status of adults and children throughout the United States, and as such, is a nationally administered survey and physical examination assessment conducted by the National Center for Health Statistics (as subdivision of the CDC). The NHANES program began in the early 1960s and has been conducted as a series of surveys focusing on different population groups or health topics. In 1999, the survey became a continuous program that has a changing focus on a variety of health and nutrition measurements to meet emerging needs. The survey examines a nationally representative sample of about 5,000 persons each year. These persons are located in counties across the country, 15 of which are visited each year (Control, 2023).

The NHANES interview includes demographic, socioeconomic, dietary, and health-related questions. The examination component consists of medical, dental, and physiological measurements, as well as laboratory tests administered by highly trained medical personnel (Control, 2023)l.

For this investigation, data from the years 2011-2016 were used, as this was the most recent freely available information at the time. Data from beyond this time frame was unfortunately

inaccessible for this project due to complications of the COVID 19 pandemic with the data access and limiting report expansion. The utilized data reported questionnaire information relevant to sexual behaviors ("number of sexual encounters (times had vaginal or anal sex in the last year", "how often do you use condoms") histories ("at what age did you first have vaginal/anal sex"), demographic data (age, gender), and STI information ("in the last 12 months, have you been medically diagnosed with an STD", etc.), for 6065 men and women, 18-49 years old, and who are sexually active (have had sex at least once in the last 12 months). The STIs were limited to four groups for the investigation: Herpes Simplex Virus (HSV), Genital Warts, Chlamydia, and Gonorrhea.

3.4 Data Analysis

All statistical analytic tests were completed using SAS 9.4 (English) software.

3.4.1 Approach to Aim 1:

Statistical Methods:

NHANES data were compared between men and women to determine if gender continues to be a risk factor for STI status. The groups were all represented as categorical variables, analyzed with descriptive analysis, including Pearson's chi-square and Fisher's exact tests, to determine possible covariates. Continuous demographic variables, such as age, were analyzed for means and standard deviations, then converted to categorical values for logistic analysis as covariates. The categorical variables were analyzed using chi-square tests and logistic regressions.

3.4.2 Approach to Aim 2, 3, and 4:

Statistical Methods:

Bivariate analysis was performed first using a chi-square test, with significance interpreted at the $\alpha=0.05$ level. Secondary bivariate analysis was done using logistic regressions to assess individual variable odds ratios and confidence intervals. Multivariate logistic

regressions were then used to further evaluate associations of STI incidence risk and interactions with the variables of interest, while controlling for several covariates.

3.4.3 Approach to Aim 4:

Qualitative Methods:

Three of the questions in the survey asked for opinions regarding patient perceptions and were included with an open-answer input space. These questions included "how do you feel about discussing your sexual health/history with your medical professionals, and why do you feel this way", "how would/did you feel about a positive STI diagnosis", and "if you have been previously diagnosed, how did your medical professional make you feel about this diagnosis". As with the rest of the survey, the answers were typed anonymously, and kept confidential, thus maintaining the integrity of the responses.

CHAPTER 4: RESULTS

4.1 Aim 1:

4.1.1 External Data (NHANES) analysis:

The NHANES survey from 2011-1026 reports data from 6055 people and these were used for the prevalence analysis. Men made up 48.7% of individuals surveyed, and 51.3% were women. The mean age for both women and men was 33 years old, with 17 years being the average age for the first sexual encounter. There were 574 total cases of STIs reported, with men accounting for 30.8% and women 69.2%. The STIs were then divided into four groups and evaluated by gender. There were 239 HSV cases, 54.7% were male and 75.3% female; of the 215 cases of genital warts, 36.3% were male, and 63.7% were female; of the 96 cases of chlamydia, 29.2% were male and 70.8% female; and of 24 cases of gonorrhea, 62.5% male, and 37.5% female. In all cases except for gonorrhea, women showed a higher prevalence rate. In relation to the population's sexual history and behaviors, covariates were analyzed for possible interaction with the prevalence of STIs. Chi-square analysis showed that in addition to gender, age, age at first sexual encounter and condom use all displayed significant interaction with the outcome variable (STI status).

Bivariate logistic regression analysis was performed for each of the four disease groups individually, in addition to the combined total STI status. For HSV, genital warts, and chlamydia, odds ratios showed that men are significantly (p values range <0.0001- 0.0002) less likely to get a positive STI diagnosis (HSV= 0.334, 95% CI: 0.248-0.450; genital warts 0.428, 95% CI: 0.275-0.667; chlamydia 0.589, 95% CI: 0.444-0.781). The odds ratio for gonorrhea showed that men are 1.759 times more likely to get a positive medical diagnosis. However, this finding was not significant (p=0.181). The overall outcome variable, total STI status, showed that women were more likely to be diagnosed with an STI, as the odds ratio (of men compared to women) was 0.440, with a significance of P=<0.0001, and a 95% confidence interval of 0.361 to 0.535 (Table 1). The overall outcomes and significance did not change using

multivariate logistic regression to include the potential interaction of the covariates. The odds ratios and confidence intervals only differed slightly from the bivariate analysis.

Table 1. NHANES Data: STI Status, as Men compared to Women: Bivariate (logistic) Analysis				
Variable	Odds Ratio	Confidence Limits (95%)		P value
STD status (overall)				
Negative (reference)	1.00	----		----
Positive	0.440	0.361	0.535	<.0001
HSV Status				
Negative (reference)	1.00	-----		-----
Positive	0.334	0.248	0.450	<.0001
Chlamydia Status				
Negative (reference)	1.00	-----		-----
Positive	0.428	0.275	0.667	0.0002
Gonorrhea Status				
Negative (reference)	1.00	-----		-----
Positive	1.759	0.769	4.026	0.1811
Genital Warts Status				
Negative (reference)	1.00	-----		-----
Positive	0.589	0.444	0.781	0.0002

4.2 Aim 2, 3:

4.2.1 Survey Analysis- Statistical:

There were a total of 522 women who responded to our survey and met the inclusion criteria. Of these women, 95 (18.02%) had been diagnosed with an STI at some point in their lives. The mean age of the participants was 22.35 (SD 4.38; range 18-53). The mean age of participants with STI diagnoses was 23.99 (5.19) and 21.98 (SD 4.09) in those without any STI diagnoses. The number of lifetime sexual partners varied from 0 to 201, with a mean number of 8.47 in the total population (SD 13.74), 19.14 in STI-positive women (SD 24.57), and 8.17 in those who had not had any STI (SD 8.17) (Table 2). Data were analyzed to determine if any relationships were noted between STI incidence and participant variables.

Table 2. Continuous Descriptive Statistics of STI Incidence Population												
N with Positive STI= 95 N with Negative STI= 427 Total N=522												
Variable	Mean			Standard Deviation			Minimum			Maximum		
	N	STI+	STI-	N	STI+	STI-	N	STI+	STI-	N	STI+	STI-
Age	22.35	23.99	21.98	4.38	5.19	4.09	18	18	18	53	53	48
Number of Sexual Partners	8.47	19.14	6.09	13.74	24.57	8.17	0	1	0	201	201	80

Chi-square analysis showed no statistical associations ($p = <0.05$) between these groups with respect to relationship status, use of birth control, or condom use (Table 3). Significance was observed in the birth control type ($p = 0.0386$), the hormones used in the birth control methods (0.0200), and the amount of time since the participant's last visit to a physician for an STI screening ($p = <0.0001$).

Table 3. Characteristic of Participants* by STD Status (χ^2 frequency analysis)				
Variable	STD History		N=522	P value
	Positive	Negative		
Relationship Status				0.0890
Single	37 (22.42%)	128 (77.58%)	165	
In a Relationship	58 (16.24%)	299 (83.80%)	357	
Birth Control Use				0.0653
Yes	58 (16.11%)	302 (83.89%)	360	
No	37 (22.84%)	125 (77.16%)	162	
Birth Control Type				0.0386
None	37 (22.84%)	125 (77.16%)	162	
Short term (daily intake)	30 (13.33%)	195 (86.67%)	225	
Long term (insertion)	28 (20.74%)	107 (79.26%)	135	
Hormone Type (in birth control)				0. 0200
Mixed (Estradiol and Progesterone)	30 (12.93%)	202 (87.07%)	232	
Progesterone only	28 (22.95%)	94 (77.05%)	122	
None	37 (22.02%)	131 (77.98%)	168	
Last STI Screening				<0.0001
Two years or less	92 (22.38%)	319 (77.62%)	411	
More than two years	3 (2.70%)	108 (97.30%)	111	
Condom Use				0. 2157
Yes	23 (13.94%)	142 (86.06%)	165	
No	53 (20.62%)	204 (79.38%)	257	
Sometimes	19 (19.00%)	81 (81.00%)	100	

* N= 522, with STI Positive Case History= 95, including co-infections

All relevant variables were then analyzed using bivariate logistic regressions to identify potential risks for STI incidence (Table 4). This analysis also showed no significance (P= <0.05) for birth control use, relationship status, or condom use, corresponding with the results of the chi-square analysis. Significance was seen in birth control type and timing since the participant's last STI screening with a physician. The odds ratio of a positive STI history among women who take daily oral hormonal birth control compared to those who are on a single long-term treatment is 0.588 (p= 0.0142, 95% CI: 0.334-1.036). Women who not had been screened in the past 2 years (or more) showed a lower odds (0.096) of a positive STI diagnosis than those who had seen one (p= <.0001, 95% CI: 0.030- 0.310).

Table 4. Association between respondent predictors and STI Status (positive vs. negative): Bivariate (logistic) Analysis

Variable	Odds Ratio	Confidence Limits (95%)		P value
Birth Control Use				
Yes (reference)	1.00			----
No	1.541	0.971	2.447	0.0664
Birth Control Type				
Long Term- Implant (reference)	1.00	-----		-----
Short Term- Daily	0.588	0.334	1.036	0.0142
None	1.131	0.650	1.970	0.1001
Relationship Status				
Single (reference)	1.00			-----
In a relationship	0.671	0.423	1.064	0.0901
Last STI Screening				
Within the last 2 years (reference)	1.00	-----		-----
Longer than 2 years	0.096	0.030	0.310	<.0001
Condom Use				
Rarely/Never (reference)	1.00			
Always/Usually	0.624	0.366	1.064	0.1183
Sometimes	0.903	0.504	1.619	0.6432

Multivariate analysis was used to identify potential interactions between the variables (Table 5). After controlling for all potential covariates, statistical significance was only found in women who had not been screened for STIs in 2 or more years (OR= 0.194, p= 0.0090, 95% CI: 0.057-0.664), and the total number of sexual partners in the participants lifetime (OR= 1.098, P=<.0001, 95% CI: 1.065-1.131).

Table 5. Association between respondent predictors and STI Status (positive vs. negative): Multivariate (logistic) Analysis

Variable	Odds Ratio	Confidence Limits (95%)		P value
Birth Control Use				
Yes (reference)	1.00			----
No	586.782	<0.001	>999.999	0. 9653
Birth Control Type				
Long Term- Implant (reference)	1.00	-----		-----
Short Term- Daily	1.885	0.499	7.113	0. 9568
None	>999.999	<0.001	>999.999	0. 9516
Hormone Type				
Mixed- E2/P4 (reference)	1.00	-----		-----
P4 only	0.352	0.094	1.315	0.9118
None	<0.001	<0.001	>999.999	0. 9015
Relationship Status				
Single (reference)	1.00			-----
In a relationship	0. 934	0. 517	1. 688	0. 8216
Last STI Screening				
Within the last 2 years (reference)	1.00	-----		-----
Longer than 2 years	0. 194	0.057	0. 664	0. 0090
Condom Use				
Rarely/Never (reference)	1.00			
Always/Usually	0. 633	0. 328	1. 224	0. 4023
Sometimes	0. 686	0. 338	1. 392	0. 6614
Last STI Education				
Never (reference)	1.00			
Before high school	1.589	0.399	6.329	0.0867
High School	0.690	0.181	2.638	0.1426
College	0.870	0.224	3.383	0.6217
Age				
	1.027	0.970	1.088	0.3553

Table 5. Association between respondent predictors and STI Status (positive vs. negative): Multivariate (logistic) Analysis (continued)				
Sexual History (total number of partners during lifetime)	1.098	1.065	1.131	<.0001

4.3 Aim 4:

4.3.1 Survey Analysis- Statistical:

Survey variables were then re-analyzed using alternate statistics to identify potential influencing factors for the use of birth control among the participants. Chi-square analysis showed no statistical associations (p= <0.05) between these groups with respect to relationship status or timeline of STI educational intervention (Table 6). Significance was observed in the amount of time since the participant's last visit to a physician for an STI screening (p= 0.0003) and condom use (p= <0.0001).

Table 6. Characteristic of Participants that Use Hormonal Birth Control (χ^2 frequency analysis)

Variable	Birth Control Use		N=522	P value
	Yes	No		
Relationship Status				0.8718
Single	113 (68.48%)	52 (31.52%)	165	
In a Relationship	247 (69.19%)	110 (30.81%)	357	
Last STI Education				0.6775
Never	18 (64.29%)	10 (35.71%)	28	
Before High School	57 (65.52%)	30 (34.48%)	87	
High School	177 (71.37%)	71 (28.63%)	248	
College	108 (67.92%)	51 (32.08%)	159	
Last STI Screening				0.0003
Two years or less	299 (72.75%)	112 (27.25%)	411	
More than two years	61 (55.05%)	50 (45.05%)	111	
Condom Use				<0.0001
Yes	90 (54.55%)	75 (45.45%)	165	
No	202 (78.60%)	55 (21.40%)	257	
Sometimes	68 (68.00%)	32 (32.00%)	100	

Note N= 522, with Number of Women on Hormonal Birth Control= 360

Bivariate logistic analysis results were consistent with those of the Chi square frequency analysis (Table 7), showing no significance (P= <0.05) for relationship status, or timing of STI education. Significance was seen in timing since the participant's last STI screening to a physician and condom use. Women who had not seen a physician in the past 2 years (or more) showed a lower odds (0.457) of using hormonal birth control than those who had seen a physician (p= 0.0004, 95% CI: 0.297- 0.704).

Women who always use condoms also demonstrated lower odds (0.327) of taking hormonal birth control than those who never use condoms (p= <.0001, 95% CI: 0.213-0.501).

Table 7. Hormonal Birth Control Use (Yes vs. No): Bivariate (logistic) Analysis

Variable	Odds Ratio	Confidence Limits (95%)		P value
Relationship Status				
Single (reference)	1.00			-----
In a relationship	1.033	0.694	1.538	0.8715
Last STI Educational Intervention				
Never (reference)	1.00	-----		-----
Before High School	1.056	0.433	2.572	0.6887
In High School	1.385	0.610	3.146	0.2366
In College	1.176	0.507	2.730	0.8771
Last STI Screening				
Within the last 2 years (reference)	1.00	-----		-----
Longer than 2 years	0.457	0.297	0.704	0.0004
Condom Use				
Rarely/Never (reference)	1.00			
Always/Usually	0.327	0.213	0.501	<.0001
Sometimes	0.579	0.346	0.969	0.9597

Multivariate analysis was used to identify potential interactions between the variables (Table 8). After controlling for all potential covariates, statistical significance was only found in women who had not had an STI screening in 2 or more years (OR= 0.216, p= <.0001, 95% CI: 0.155-0.704), women who always/usually use condoms (OR= 0.253, p= <.0001, 95% CI: 0.155-0.413), and age (OR= 0.827, p= <.0001, 95%CI: 0.778- 0.878).

Table 8. Hormonal Birth Control Use (Yes vs. No): Multivariate (logistic) Analysis

Variable	Odds Ratio	Confidence Limits (95%)		P value
Relationship Status				
Single (reference)	1.00			-----
In a relationship	1.113	0.691	1.793	0.6601
Last STI Educational Intervention				
Never (reference)	1.00	-----		-----
Before High School	1.056	0.433	2.572	0.1793
In High School	1.385	0.610	3.146	0.8905
In College	1.176	0.507	2.730	0.2787
Last STI Screening				
Within the last 2 years (reference)	1.00	-----		-----
Longer than 2 years	0.261	0.155	0.704	<.0001
Condom Use				
Rarely/Never (reference)	1.00			-----
Always/Usually	0.253	0.155	0.413	<.0001
Sometimes	0.445	0.252	0.787	0.6372
Age				
	0.827	0.778	0.878	<.0001
Sexual History (lifetime number of partners)				
	0.988	0.972	1.005	0.827

4.3.2 Qualitative results:

The qualitative data gathered from the participants came from several free-report questions found in the survey. The three questions used were "how do you feel about discussing your sexual health/history with your medical professionals; why do you feel this way?", "How would/did you feel about a positive STI diagnosis?" and "If you HAVE been positively diagnosed previously, how did your medical professional make you feel about this diagnosis?". These questions were re-formatted into category codes (Table 9) for descriptive purposes for use in this section.

Table 9. Free-Response Categorization

Category Code	Description
Overall Comfort with Doctors	Participants were asked how they felt (e.g. comfort level) in discussing their own sexual health with their healthcare professionals and why.
Feelings on STIs	Participants were asked how they would feel (personally) if they were ever hypothetically diagnosed with an STI, or how they felt if they have had a positive diagnosis in the past.
Medical Response to STIs	Participants that have had a positive STI diagnosis in the past were asked how their doctor/medical professional made them feel about the diagnosis and their situation.

For each individual category code, all of the participant responses were analyzed (in full) and put into sub-categories. This was done based on the overall identity of the reply in reference to each code. Several of these sub-categories were further divided based on emotive themes or descriptions. This was done to clarify some potential differences in rationales that lead the response to fit into a certain sub-category, despite the participant's overall difference in reasoning (Table 10).

Table 10. Category Codes and Thematic Sub-divisions (with sample quotes for each grouping)

Category	Sub-category	Emotive theme/description	Quotes
Overall Comfort with Doctors	Positive	comfortable with sexual health discussion in general	*"Everyone has sex."*
		comfortable with sexual health discussion with medical professionals	*"I don't think it is anything to be ashamed of. If I want honest medical help, I have to be honest."*
	Mostly positive	has reservations but willing to engage in discussions with medical professionals	*"I am more comfortable than not because I trust them. However, it is an uncomfortable subject."*
		only comfortable with trusted physician	*"I found a doctor who is very real about it. She doesn't make me feel ashamed about mistakes, rather she helps me realize the consequences without shaming me."*
	Mixed	willing to discuss sexual health with medical professional, but uncomfortable in doing so	*"I take my sexual health seriously, however, I feel that medical professionals judge my decisions for stopping birth control and for not consistently using condoms."*
		unwilling for consistent and honest full disclosure; uncomfortable with discussion of most personal sexual information due to feelings of judgement	*"I feel like I might be judged with the amount of people that I have sex with so I usually say a smaller amount."*
	Negative	unwilling to discuss personal sexual health for fear of judgement or lack of anonymity	*"I feel like they are judging me and think that I am a slut."*
		unwilling to discuss sexual information outside of close personal relationships due to uncomfortable nature of topic	*"It feels private and I feel awkward talking about it to other people but not my boyfriend."*

Table 10. Category Codes and Thematic Sub-divisions (with sample quotes for each grouping)(continued)			
Feelings on STIs	Emotionally negative	Upset overall, sad, scared, or confused	*"I would feel shocked, grossed out and sad."*
		Self-blaming and disappointment	*"I would feel disgusted and mortified; like I failed as a sexual person."*
		Angry or betrayed	*"I would feel awful and betrayed by my partner."*
		Embarrassed or concerned on a social level	*"Embarrassed and scared. I would never want my parents to find out."*
	Concerned	Concerned with health issue	*"I would be worried for my health and afraid of the symptoms/treatment."*
		Upset, but optimistic about treatment and future	*"Scared, but I'd know that there is treatment for most STIs."*
	Neutral	Acknowledgement but unimpacted; matter of fact	*"Not terrible, it was easily treated with antibiotics. It was a very uncomfortable infection."*
Medical Response to STIs	Positive experience	Reassured	*"She tried to be comforting by letting me know how common and livable the condition is."*
		Professional	*"She made it very matter of fact."*
	Negative experience	Response implied shaming/expressed judgment	*"I feel like my doctor was judging me and looking down on me for having it."*
	Neutral experience	Impersonal response or no reassurance/counseling offered	*"They weren't negative, but they also did not ensure me that I would be ok, and that they would be able to help treat it."*

4.3.2a Free Response 1: Overall comfort with Doctors

Participants described their overall comfort level with discussing sexual health or their own history with their healthcare providers. The overall theme of the answers was divided into four sub-categories: those with overall positive connotations, mostly positive feelings, mixed

emotion, and those negative connotations. These sub-categories were further grouped into emotive themes, as many of the participants shared similar overall perception, but for different reasonings. Even with this division, some of the full responses to the answers blended between multiple categories, so numeric differentiation was not utilized for analysis between groups, therefore reducing the risk of any bias influencing quantitative statistics.

Positive response sub-categories:

The first sub-category was considered to be an overall positive response to the comfort level of the participant with their healthcare professional in regard to discussing sex. The responses included in this group were from those individuals whose responses implied an overall comfort with the topic (in general) and who had no issues with discussing the matter with anyone, including any healthcare persona. Some example responses were as follows:

"*I have no problem with my sexuality or my sexual history. I'm open about my methods of birth control and feel no shame on the subject."* (Participant #27)

"I'm comfortable with my sexuality." (Participant #88)

Some participants in this grouping described personal histories associated with their opinion on the topic:

"I had my daughter in October last year, so all modesty went out the window." (Participant #77)

"Growing up, my family was very open, so I am comfortable talking about things maybe a lot of people wouldn't." (Participant #101)

The other overall theme that denoted positive responses to the question also indicated that the participants were comfortable discussing sexual health and history. However, they limited their responses to references to medical situations and personnel. Some examples include:

"I am completely comfortable talking with medical professionals and I trust their expertise. As I have recently been diagnosed withHSV-2, I feel as though I have to be more aware of my sexual activity and how I am protecting myself and others. I trust that the medical professionals I go to are the best qualified people to advise me regarding this." (Participant #256)

"I think it's important to be able to discuss sexual health with a professional for your own well-being." (Participant #364)

The second sub-category responses were primarily positive regarding their views on medical professionals. However, the responses lacked the over-arching assured tone of the first two sub-categories. This grouping seemed to have a more reserved view towards open discussion about the topic, however, understood the medical necessity of being open with their medical professionals. This is seen in the following examples:

"They're there to help keep me safe and healthy, however it is personal and can be odd talking to someone who is a stranger in a way." (Participant #109)

"I am more comfortable than not because I trust them. However, it is an uncomfortable subject." (Participant #454)

Others in this sub-category mimicked the previous sub-category in its nuance of positivity with the pretense of public reservations on the subject, but not with medical employees. The difference from the previous groupings lies in the preference for particular providers over medical professionals in general. This group shared the previous reservation(s) on the topic, but understood the medical necessity of open and honest communication. However, they expressed that their comfort in discussing the topic was limited to those professionals with whom they shared a trusted relationship rather than anyone in the field. Some examples are as followed:

"In the past, some doctors have given a judgmental attitude when I am honest about my sexual history. Whereas, my last doctor was honest back, and was non-judgmental." (Participant #2)

"I found a doctor who is very real about it. She doesn't make me feel ashamed about mistakes, rather she helps me realize the consequences without shaming me." (Participant #355)

The third sub-category is the first that demonstrates real reservations about disclosing sexual information to healthcare providers. While the people in this group are still willing to speak about themselves and their history, they had such negative experiences in the past or are extremely concerned about judgment or perceptions that it seems to color their responses with feelings of discomfort regarding the topic.

"I'm currently in the latter stages of treating my vaginismus. In the past, general family doctors (especially the ones on campus in the health center) have dismissed my problems as not important or 'solvable if I relax and drink a glass of wine'. I had to fight in order to get a referral to an actual OB'GYN who basically validated my thoughts on vaginismus and recommended a treatment program that addressed both psychological and physical (I cannot stress how important physical treatment was) treatment. If more general practitioners would listen without jumping to conclusions, actually treating their patients as individuals than textbook examples, maybe they would alienate less people." (Participant #150).

"I take my sexual health seriously, however, I feel that medical professionals judge my decision for stopping birth control and for not consistently using condoms." (Participant #270)

For some of these participants, many of the judgmental views they worry about are also not strictly in regard to their sexual history, rather, their identity. For example,

"I'm a queer and transgender man who is currently sexually active with another queer transgender man. I try to be an open book, but you never know how a doctor is going to react, or whether they'll take your symptoms and issues seriously." (Participant #318)

The other grouping of this sub-category also shows how the participant's lack of comfort with their health professionals leads to a lack in overall trust and honesty toward their own health, regardless of the potential long-term detriment. The people in this group are still willing to speak with medical staff in terms of their sexual health and experiences. However, they are unlikely to be completely truthful in discussing their history. Some notable examples include:

"I feel my 'number' is too high to be completely honest about." (Participant #26)
"They always try to force abstinence and this is unrealistic for people who already engage in sexual activity." (Participant #249)

"I feel nervous to admit that I do not use condoms often. I get worried that they will judge me for being unsafe, when in actuality, I am being thoughtful and careful." (Participant #273)

The final sub-category demonstrates how the verbalized discomfort incorporates a damaging image of medical personnel to patients, leading to feelings of judgment or mistrust. For the most part, this emotion negatively impacts how open and sincere the person will be with their provider, despite any potential health repercussions of this type of dishonesty. Some of these feelings are based on the provider's care, for example:

"Medical professionals have judged me in the past." (Participant #135)

"My husband and I have had periods of agreed upon non-monogamy. During that time I contracted HSV1 and one of the less serious forms of HPV. The doctor assumed infidelity and get very awkward. Given the obviously conservative perspective she had I also did n't feel comfortable expressing it was agreed upon. Doctors don't know my sexuality. The know I'm married to a man and don't ask." (Participant #221)

"My doctor always made me feel as if I shouldn't be having sex and insulted my choice in men saying I shouldn't necessarily trust that my boyfriend was only sleeping with me." (Participant #491)

Other's feelings stem from personal perception or family background:

"I get embarrassed easily, fear of judgment." (Participant #349)

"Raised in Christian household where sex before marriage is a sin. If my parents (primarily mom) found out from a medical professional about my sexual history, it would be a very uncomfortable talk with her, so I tend to keep my sexual history private." (Participant #363)

Some participants further described that some of this fear doesn't only stem from personal experience or fear of judgement, but for worry about a lack of anonymity.

"My doctor is friends with my mom and even though the are not allowed to share my information, I feel judged." (Participant #74)

The rest of the participants who maintained this negative outlook also described their unwillingness to discuss sexual health and information with healthcare providers. Unlike the previous persons, this negative view stems less from fear of judgment or stigma and more from the patient's personal feelings about the uncomfortable nature of the topic. As such, these participants are only comfortable speaking about sex with their own personal confidents, such as a close friend or partner.

"It is a personal matter and it is uncomfortable and hard to discuss with people who are not extremely close to me." (Participant #7)

"Discussion of my sexual health/behavior is private and feels intrusive when asked, even if necessary." (Participant #440)

4.3.2b Free Response 2: Feelings on STIs

For the second free response, participants were asked to describe how they would feel if they were ever diagnosed with an STI. Any participant who has had a previously positive diagnosis was asked to elaborate on their genuine experience and emotion, rather than the hypothetical. The responses were grouped into three main sub-categories based on the overall tone of the reply: emotionally negative, concerned, or neutral. These were further defined into separate segments, displaying any acute differences between themes, or interpretations that would differentiate the individual responses, while keeping them within the sub-category overall.

The first sub-category for this response was that of some sort of negative emotion. Many of the participants associated the diagnosis of an STI as a stigma on themselves or others for a variety of reasons. This sub-category was further divided into four overall disapproving themes that summarized the overall premise of this undesirable response. These themes (and examples) include: upset overall (including sad, scared, or confused emotions),

"I would never have a sexual partner again." (Participant #190)

"Like my life would be over." (Participant #201)

"Terrified because if would change the way I view myself especially in terms of my sexual life." (Participant #421)

self-blame and disappointment,

"I have never personally been diagnosed with an STI but I feel if I would be disappointed in myself and nasty if I were to be." (Participant #46)

"I would feel upset, ashamed, and something like a walking disease. I would also feel less than everyone around me." (Participant #335)

angry/betrayed; primarily at their sexual partner(s),

"I would feel betrayed because my partner was tested before we got involved and we have been monogamous for a while. Since I have been faithful, I would assume he wasn't." (Participant #150)

"Angry and hopeless as it would mean my partner has been cheating." (Participant #440)

and embarrassed, particularly revolving around the negative social connotations they would feel.

"Depends on the diagnosis but many are extremely frowned upon or judged so I probably wouldn't feel comfortable talking about it." (Participant #69)

"*It made/makes me feel like I have something wrong with me."* (Participant #556)

The second sub-category were those responses that primarily expressed some form of concern, but not comparatively or overwhelmingly negative. Many of these responses implied more personal considerations, rather than outright emotion. These concerns were broken down into two thematic sets. The first of these groups were those who were/would be primarily concerned about the health issues and long-term implications about the diagnosis:

"*It would put my fertility at risk with my Mirena."* (Participant #130)

"I would want to know how I could become healthy again and what to do to prevent it from getting worse." (Participant #401)

The second grouping were those who would feel/felt regret and concern overall, but were not emotionally overwhelmed with the idea; instead, they were more optimistic and understanding about treatment and how this would affect their future health and behaviors:

"My feelings towards STIs have definitely changed over the years, I never understood how common STIs appear and how little it is talked about. Obviously I would be upset with the result in an STI diagnosis, but I would hope that it would be curable and if not use it as an opportunity to talk about how common they are and how taboo it is to have one." (Participant #359)

"Nervous and wanting to take steps to get healthier." (Participant #510)

"I was devastated. But happy to know it was curable. It allowed me to become more informed about safe sexual practices." (Participant #555)

The last sub-category included responses that were primarily neutral in tone. Those responses grouped in this theme expressed acknowledgement of the diagnosis, but overall, seemed unimpacted by the outcome. Some samples for this sort include:

"If I had one, I would feel confident it was something my doctor and I could take care of." (Participant #197).

"I wouldn't mind too much. They would painful and inconvenient, but they're just diseases like strep throat or an infected cut." (Participant #209)

4.3.2c Free Response 3: Medical Responses to STIs

The final free response was limited to those who have had a positive STI diagnosis by a medical professional at some point in their sexual history. These participants were asked to describe how they felt about their diagnosis, specifically how it relates to the interaction and experience that they underwent with their care provider. These answers were broken down into three sub-categories (positive experiences, neutral experiences, negative experiences) to express how their interaction with their healthcare providers influenced their feelings on the experience.

Those participants who expressed a positive past experience were broken into two reasoning themes, those who felt reassured on a personal level about their diagnosis and those who expressed their appreciation for the professional but respectful manner that their medical professional dealt them. Some samples for those who expressed gratitude for the provided comfort:

"My medical professional made it seem like a minor deal- she explained the treatment process and provided me with emotional support." (Participant #70)

"[for] herpes, like I wasn't alone; she told me some statistics and reassured me that it was stigmatized more because people think it's gross than it is harmful. [for] chlamydia- like everything would be okay because it could be cured, and I would still be able to have children if I wanted in the future." (Participant #355)

as compared to those who were appreciative of a professional but non-judgmental discussion:

"My doctor was very unbiased and VERY informative and helpful on how to prevent further UTIs." (Participant #97)

"She was nice. She definitely still relayed it as bad news, but she was very matter-of-face about it and immediately started working on a fix for it." (Participant #307)

The second sub-category were those who described having a very negative experience with their healthcare provider about their diagnosis. These person's responses implied that they were shamed or judged by their providers for having a positive test result, leading them to feel emotionally worse in addition to having an STI.

"They tried to make me feel ashamed." (Participant #416)

"I was discouraged to get tested for it in the first place. When I got the call I heard pity in the woman's voice." (Participant #599).

Fortunately, some of these encounters, however extremely negative, lead the participants to seek new healthcare providers, with much more positive outcomes.

"My first doctor was actually incredibly judgmental. She told me it was irresponsible even though my friend had given it to me, it wasn't some random stranger I had

recklessly slept with. My second doctor was really nice and reassured me that everything was going to be okay!" (Participant #438)

"Guy was a dick about kinda slut shamed me the entire time and did some Jesus bull shit on me. Then I changed OBGYN's and she was the greatest." (Participant #626)

The final sub-category was made up of those who expressed no overt feelings about their medical experience, and that for the most part, the encounter was neutral and did not affect them.

"*they didn't make me feel a certain way; neutral."* (Participant #302)

In most of these cases though, the participants did not even get a chance to discuss their diagnosis with medical personnel, which separated them from any emotive experience.

"It was told to me via voicemail, so it took my by surprise." (Participant #365)

"They didn't' tell me. I had to read it on my test results." (Participant #592)

CHAPTER 5: DISCUSSION

5.1 Revisiting Purpose and Objectives

There were several goals of the current study. Overall, we wanted to identify potential risk factors in the acquisition of sexually transmitted infections. This was done through a multi-faceted approach, which included reviewing national STI data and the creation, dissemination, and analysis of a local survey. The first of our aims was to identify consistent disparities in STI diagnostic history between men and women in the United States. Aims 2 and 3 involved investigating social factors, such as birth control use and type, condom use, and sexual history, and identifying any relationship to STI acquisition. Finally, our last aim explored variables that may influence birth control use, as well as any created self-barriers to other aspects of reproductive and sexual healthcare.

5.2 Summary of Findings

In analyzing the NHANES data, our outcome is consistent with previous literature. We found that overall, women show overall significantly higher odds of STI prevalence. This trend was reliable among most STIs analyzed (HSV, chlamydia, and genital warts), with the exception of gonorrhea. Our data did show that men tend to have a higher rate of gonorrhea, however, this dimorphism is not statistically significant. Gonorrhea does classically have a higher infection rate in men than women, so while not significant, this finding is in line with previous epidemiological data (National Center for HIV/AIDS, 2021).

Using our survey, the study showed that individually, birth control type and hormone level can affect the incidence of STIs, however, once confounding variables (such as age and education) and/or interacting variable are taken into consideration, that effect is nullified. This may be a result of the connection between types of birth control and hormones type, as the LARC methods all use P4-only hormones, and the short term (daily) forms can contain mixed blends of E_2 and P_4 (Mishell, 1996), likely linking these two variables together. We also found that the number of sexual partners tends to mirror

the probability of a positive STI diagnosis as well. This is consistent with literature likening number of sexual partners to a "risky behavior", and consequently a predictor of STIs (Wasserheit, 1994). We were also able to significantly identify condom use as a potential negative predictor of birth control use, which again is similar to results seen in previous studies (Gullette et al., 2009). Contradictory to previous literature, we were not able to identify relationships between STI histories with condom use, relationship status, overall birth control use (using dichotomous yes/no), or educational interventions(Civic, 2000; Fuentes et al., 2018; Milhausen et al., 2018). While identifying potential predictors for birth control use, we noted that women who use birth control were significantly less likely to use condoms, correlating with earlier studies' results (Gullette et al., 2009).

One interesting relationship noted was the interaction of the frequency of reproductive health visits with the STI rates and birth control use. Women who do not go to receive regular gynecological health checks (as measured if one has gone to the OBGYN in the past 2 years) have much lower rates of STIs and birth control use. This relationship makes sense, as both STI diagnosis and birth control prescription require medical intervention. However, one of the more discouraging details revealed in our survey is that 21% of the sexually active college women had not been to the OBGYN in the past 2 years. This lack of medical compliance is concerning considering that in the United States, it is recommended that sexually active women undergo regular STI screening (Workowski et al., 2015) and Pap smear screening at least every 3 years (Sirovich & Welch, 2004). Reviewing the qualitative discussion aspect of the study enlightened us as to some potential rationales behind this noncompliance. Many of our participants indicated a level of discomfort with sexual health, some women citing personal discomfort with the subject or with their medical personnel, others reporting significant negative interaction and experiences. As mentioned previously, the provider-patient healthcare relationship is an important variable as a social determinant of health. While an individual undesirable medical interaction may not seem substantial, sexual health is already a sensitive topic for

many, and having such an interaction creates more potential bias. An adverse provider relationship can create a long-term barrier to healthcare access, increasing the potential for negative health outcomes.

5.3 Study limitations:

There are several potential limitations to the methodology used in this study. These limitations may include nondifferential misclassification, selection bias, information bias, confounding, and generalizability. However, the goal of this study is to gain initial data on possible correlations between the factors, so bias in the pilot results are to be expected.

Nondifferential misclassification could occur in the survey portion of the study. This may occur with the incorrect assumption of a sexually transmitted disease symptom. For example, some ulcerative sores might be incorrectly identified to be a Herpes lesion, whereas actual HSV sores may also be erroneously identified, and assumed to be caused by another disease or trauma.

This study may also be prone to selection bias. The nature of this study is through a volunteer basis, which may introduce volunteer bias. The only participants who take part in this study are those willing to contribute.

Information bias may also occur in this study. The survey may be subject to observation bias, most notably, recall bias.

The largest potential limitation of this study is generalizability. This study uses only college age women recruited from the local university. This may not generalize to the total population.

5.4 Discussion and Future Directions:

By addressing the multifaceted nature of STIs as well as the social variables involved in their prevalence, we can work towards reducing infection rates, promoting health equity, and improving sexual health outcomes for all individuals and communities. With the influx of new ways of information dissemination, updated research, and other influencing factors, these goals may not be too far off. For example, there is a continued development of prophylactic treatments which may reduce the stigma of

STIs, including those that have lifelong impacts (Devarajan et al., 2020), There should also be continued sexual health campaigns that are clearer and more direct. Some campaigns allow STI stigma internalization to induce misinterpretation of the overall message, resulting in negative outcomes in belief and understanding regarding prophylactic treatment measures (Matacotta et al., 2020).

Since the 1980s, research has identified dozens of sexual health programs that have notably effective in the reduction of teen pregnancy and STI prevention (Goesling et al., 2014), demonstrating the efficacy of these types of educational intervention. In many countries, national and subnational data has shown rapid declines in STI rates in certain areas, when interventions that target the promotion of condom use and available sexual health services (Sharma et al., 2021). While shown to be effective, there are still necessary improvements to be made, such as a more inclusive target population, and an increase in comprehensive sexual and reproductive health programs education (Shangase et al., 2021; Tarasoff, 2021). However, even with these noted gaps, program improvements are consistently being updated, more incorporated, and researched. The original National Sex Education Standards (NSES) were established in 2012 (updated in 2020) in order to provide schools with a clear guideline on the basic inclusion necessities for comprehensive sex education. These standards consist of several topics, including those related to healthy relationships, consent, anatomy and physiology, sexual development, gender identity, sexual orientation, sexual health, and sexual abuse and violence (Initiative, 2020). One study analyzed literature from the last 30 years to establish if school-based comprehensive sexual health education is an effective tool to use for better understanding of sexual health outcomes, social/sexual relationships, and other factors of healthy sexual behaviors, particularly outside of STIs and pregnancy. This study showed that this type of thorough sex education helps younger generations in reducing homophobia, increase understanding of gender and gender norms, support healthy relationships, and reduce sexual abuse and violence (Goldfarb & Lieberman, 2021). Developing new protocols for the sexual healthcare of adolescents could also influence long-term health outcomes. This may require an

increase in the commitment and preparation of parents, patients, and physicians regarding these topics. Parents may need to impart the importance of sexual health, and work to decrease their own and their children's discomfort in the discussion. Adolescents should be more prepared to broach the topic. Healthcare providers may need additional education on adolescent sexual health, including the individual needs of various individuals from underrepresented groups, and skill building to better help disseminate appropriate information to meet the patient's needs (Boekeloo, 2014). Due to the lack of understanding and knowledge on the subject, young men and women also need to be more educated on the topic of contraceptive methods (Frost et al., 2012).

The patient-healthcare worker relationship is a critical factor in determining access to sexual healthcare. Barriers such as provider bias, lack of cultural competency, miscommunication, power dynamics, confidentiality concerns, and societal norms can impede patients' ability to seek and receive appropriate sexual health services. To overcome these barriers, healthcare providers should undergo training in cultural competency and LGBTQ+ health, cultivate non-judgmental and person-centered care approaches, and actively create a supportive and respectful environment for discussing sexual health concerns. By focusing on these issues, we can work towards improving sexual health care access and ensuring that all individuals receive comprehensive and inclusive sexual health services. As discussed above, STIs also continue to pose a significant public health challenge beyond the problems associated with adequate provider-patient barriers. However, the prevalence and transmission of STIs varies across populations, regions, and demographic groups.

Other attributes that may help with influencing better healthcare outcomes are related to the entry of new technology, such as social media. The increase in social media use has had a profound effect on typical patient interactions with medical understanding as people increasingly use social media as a platform for medical knowledge and advice. It is even more common now for medical professionals to communicate and market with social media sites such as LinkedIn and Twitter (Antheunis et al.,

2013). Social media can also be beneficial for public health interventions, including sexual health contributions, providing a large platform for dissemination (George et al., 2013). Unfortunately, the lack of veracity of available information has led to the mass dissemination of misleading or incorrect medical information (Suarez-Lledo & Alvarez-Galvez, 2021). There are now interventions being implemented to limit this misinformation, such as algorithm adjustments reducing the visibility of false information, with the expectation that they will mitigate the potential health toll that follows (Khullar, 2022).

The integration of technology into face-to-face medical practice is another beneficial step. Contraceptive decision aids are tools that allow the patient to access guided information on various birth control methods prior to a medical appointment. These decision aids have reduced the necessity for face-to-face sexual health discussions, and provide knowledgeable and safe advice regarding the different contraceptive methods for women who may otherwise be unwilling to discuss the matter during their appointment (Jones et al., 2022). The interface for these devices includes educational models that allow for a greater understanding of the types and efficacy of various contraceptive methods and helps someone decide which type is most appropriate for them. The ultimate decision gets transmitted to their medical professional for review beforehand, and together they can assess if that approach is best for the patient (Chen et al., 2019). One example is the tablet-based interactive counseling tool *My Birth Control*. Cluster studies have seen that *My Birth Control* has a positive outcome on patient interaction, with quality contraceptive healthcare and counseling on par with interventions received at area clinics (Dehlendorf et al., 2019). Patients also appreciate the directed, more personal approach that the tool initiates with their medical professional rather than an impersonal recommendation based solely on the provider's professional knowledge (Holt et al., 2020). At the same time, there are still significant conceptual difficulties with these tools, including many of the same problematic biases seen in face-to-face physician involvement (Gerchow & Squires, 2022). The

continued maintenance of these tools may begin to close that gap and reduce some of the barriers that patient-provider interactions create.

Governmental intervention can be a huge factor in increasing healthcare access. Continued policy change can reduce barriers to reproductive health. For example, in 2013, the Affordable Care Act (ACA) changed the requirements of many health insurance plans to include the coverage of contraceptive methods, reproductive health services, and counseling, without any out-of-pocket costs (Finer et al., 2014). While there are still many significant limitations to this policy, including constraints on individual STI screening type, this can still be considered a step in the right direction towards limiting financial barriers to healthcare and ultimately better sexual health outcomes (Finer et al., 2014).

5.5 Conclusion

This study, while comprehensive, is only one more step in recognizing some of variables that impact sexual health. Identifying relationships between social, behavioral, and biological factors is of utmost importance in determining how they influence the variability of STI rates. STIs continue to pose a significant public health challenge, affecting millions of people worldwide. These infections demonstrate significant variance in their prevalence, transmission rates, and clinical outcomes, which can likely be attributed to an intricate interplay of both biological and social factors. Determining the overall connection of each risk factor and the role that gender plays in them will help further expand our understanding of and provide for the identification of sexual health risks. Understanding these determinants is crucial for developing more specific prevention strategies, personalized treatments, and interventions to mitigate the impact of STIs on public health.

REFERENCES

Ackard, D. M., & Neumark-Sztainer, D. (2001). Health care information sources for adolescents: age and gender differences on use, concerns, and needs. *J Adolesc Health*, *29*(3), 170-176. https://doi.org/10.1016/s1054-139x(01)00253-1

Agampodi, S. B., Agampodi, T. C., & Ukd, P. (2008). Adolescents perception of reproductive health care services in Sri Lanka. *BMC Health Serv Res*, *8*, 98. https://doi.org/10.1186/1472-6963-8-98

Alexander, S. C., Fortenberry, J. D., Pollak, K. I., Bravender, T., Davis, J. K., Ostbye, T., Tulsky, J. A., Dolor, R. J., & Shields, C. G. (2014). Sexuality talk during adolescent health maintenance visits. *JAMA Pediatr*, *168*(2), 163-169. https://doi.org/10.1001/jamapediatrics.2013.4338

Allsworth, J. E., Anand, M., Redding, C. A., & Peipert, J. F. (2009). Physical and sexual violence and incident sexually transmitted infections. *J Womens Health (Larchmt)*, *18*(4), 529-534. https://doi.org/10.1089/jwh.2007.0757

Amsale, C., & Yemane, B. (2012). Knowledge of sexually transmitted infections and barriers to seeking health services among high school adolescents in Addis Ababa, Ethiopia. *Journal of AIDS and Clinical Research*, *3*(5).

Anderson, D., Politch, J. A., & Pudney, J. (2011). HIV infection and immune defense of the penis. *Am J Reprod Immunol*, *65*(3), 220-229. https://doi.org/10.1111/j.1600-0897.2010.00941.x

Angstwurm, M. W., Gartner, R., & Ziegler-Heitbrock, H. W. (1997). Cyclic plasma IL-6 levels during normal menstrual cycle. *Cytokine*, *9*(5), 370-374. https://doi.org/10.1006/cyto.1996.0178

Antheunis, M. L., Tates, K., & Nieboer, T. E. (2013). Patients' and health professionals' use of social media in health care: motives, barriers and expectations. *Patient Educ Couns*, *92*(3), 426-431. https://doi.org/10.1016/j.pec.2013.06.020

Archer, D. F. (2006). Menstrual-cycle-related symptoms: a review of the rationale for continuous use of oral contraceptives. *Contraception*, *74*(5), 359-366. https://doi.org/10.1016/j.contraception.2006.06.003

Ayhan, C. H. B., Bilgin, H., Uluman, O. T., Sukut, O., Yilmaz, S., & Buzlu, S. (2020). A Systematic Review of the Discrimination Against Sexual and Gender Minority in Health Care Settings. *Int J Health Serv*, *50*(1), 44-61. https://doi.org/10.1177/0020731419885093

Baeten, J. M., Nyange, P. M., Richardson, B. A., Lavreys, L., Chohan, B., Martin, H. L., Jr., Mandaliya, K., Ndinya-Achola, J. O., Bwayo, J. J., & Kreiss, J. K. (2001). Hormonal contraception and risk of sexually transmitted disease acquisition: results from a prospective study. *Am J Obstet Gynecol*, *185*(2), 380-385. https://doi.org/10.1067/mob.2001.115862

Bahamondes, L., Fernandes, A., Monteiro, I., & Bahamondes, M. V. (2020). Long-acting reversible contraceptive (LARCs) methods. *Best Pract Res Clin Obstet Gynaecol*, *66*, 28-40. https://doi.org/10.1016/j.bpobgyn.2019.12.002

Balestri, R., Magnano, M., Rizzoli, L., Infusino, S., Urbani, F., & Rech, G. (2020). STIs and the COVID-19 pandemic: the lockdown does not stop sexual infections. *Journal of the European Academy of Dermatology and Venereology: JEADV*, *34*(12), e766-e768.

Barrow, R. Y., Ahmed, F., Bolan, G. A., & Workowski, K. A. (2020). Recommendations for Providing Quality Sexually Transmitted Diseases Clinical Services, 2020. *MMWR Recomm Rep*, *68*(5), 1-20. https://doi.org/10.15585/mmwr.rr6805a1

Barth, K. R., Cook, R. L., Downs, J. S., Switzer, G. E., & Fischhoff, B. (2002). Social stigma and negative consequences: factors that influence college students' decisions to seek testing for sexually transmitted infections. *J Am Coll Health*, *50*(4), 153-159. https://doi.org/10.1080/07448480209596021

Baumeister, R. F., & Twenge, J. M. (2002). Cultural suppression of female sexuality. *Review of General Psychology*, *6*(2), 166-203.

Beagley, K. W., & Gockel, C. M. (2003). Regulation of innate and adaptive immunity by the female sex hormones oestradiol and progesterone. *FEMS Immunol Med Microbiol*, *38*(1), 13-22. https://doi.org/10.1016/S0928-8244(03)00202-5

Benagiano, G., Bastianelli, C., & Farris, M. (2008). Hormonal contraception: present and future. *Drugs Today (Barc)*, *44*(12), 905-923. https://doi.org/10.1358/dot.2008.44.12.1299292

Besse, J. P., & Garric, J. (2009). Progestagens for human use, exposure and hazard assessment for the aquatic environment. *Environ Pollut*, *157*(12), 3485-3494. https://doi.org/10.1016/j.envpol.2009.06.012

Blumenthal, P. D., & Edelman, A. (2008). Hormonal contraception. *Obstet Gynecol*, *112*(3), 670-684. https://doi.org/10.1097/AOG.0b013e31818425b7

Boekeloo, B. O. (2014). Will you ask? Will they tell you? Are you ready to hear and respond?: barriers to physician-adolescent discussion about sexuality. *JAMA Pediatr*, *168*(2), 111-113. https://doi.org/10.1001/jamapediatrics.2013.4605

Bordini, B., & Rosenfield, R. L. (2011). Normal pubertal development: Part I: The endocrine basis of puberty. *Pediatr Rev*, *32*(6), 223-229. https://doi.org/10.1542/pir.32-6-223

Boslego, J. W., Tramont, E. C., Chung, R. C., McChesney, D. G., Ciak, J., Sadoff, J. C., Piziak, M. V., Brown, J. D., Brinton, C. C., Jr., Wood, S. W., & et al. (1991). Efficacy trial of a parenteral gonococcal pilus vaccine in men. *Vaccine*, *9*(3), 154-162. https://doi.org/10.1016/0264-410x(91)90147-x

Bouman, A., Heineman, M. J., & Faas, M. M. (2005). Sex hormones and the immune response in humans. *Hum Reprod Update*, *11*(4), 411-423. https://doi.org/10.1093/humupd/dmi008

Brechwald, W. A., & Prinstein, M. J. (2011). Beyond Homophily: A Decade of Advances in Understanding Peer Influence Processes. *J Res Adolesc*, *21*(1), 166-179. https://doi.org/10.1111/j.1532-7795.2010.00721.x

Brotman, R. M., Ravel, J., Bavoil, P. M., Gravitt, P. E., & Ghanem, K. G. (2014). Microbiome, sex hormones, and immune responses in the reproductive tract: challenges for vaccine development against sexually transmitted infections. *Vaccine*, *32*(14), 1543-1552. https://doi.org/10.1016/j.vaccine.2013.10.010

Buder, S., Schofer, H., Meyer, T., Bremer, V., Kohl, P. K., Skaletz-Rorowski, A., & Brockmeyer, N. (2019). Bacterial sexually transmitted infections. *J Dtsch Dermatol Ges*, *17*(3), 287-315. https://doi.org/10.1111/ddg.13804

Campbell, R., Sefl, T., & Ahrens, C. E. (2004). The impact of rape on women's sexual health risk behaviors. *Health Psychol*, *23*(1), 67-74. https://doi.org/10.1037/0278-6133.23.1.67

Cates, W., Jr., & Steiner, M. J. (2002). Dual protection against unintended pregnancy and sexually transmitted infections: what is the best contraceptive approach? *Sex Transm Dis*, *29*(3), 168-174. https://doi.org/10.1097/00007435-200203000-00007

Champion, J. D., Harlin, B., & Collins, J. L. (2013). Sexual risk behavior and STI health literacy among ethnic minority adolescent women. *Applied nursing research*, *26*(4), 204-209.

Chen, M., Lindley, A., Kimport, K., & Dehlendorf, C. (2019). An in-depth analysis of the use of shared decision making in contraceptive counseling. *Contraception*, *99*(3), 187-191. https://doi.org/10.1016/j.contraception.2018.11.009

Cherpes, T. L., Melan, M. A., Kant, J. A., Cosentino, L. A., Meyn, L. A., & Hillier, S. L. (2005). Genital tract shedding of herpes simplex virus type 2 in women: effects of hormonal contraception, bacterial vaginosis, and vaginal group B Streptococcus colonization. *Clin Infect Dis*, *40*(10), 1422-1428. https://doi.org/10.1086/429622

Cibula, D., Gompel, A., Mueck, A. O., La Vecchia, C., Hannaford, P. C., Skouby, S. O., Zikan, M., & Dusek, L. (2010). Hormonal contraception and risk of cancer. *Hum Reprod Update*, *16*(6), 631-650. https://doi.org/10.1093/humupd/dmq022

Civic, D. (2000). College Students' Reasons for Nonuse of Condoms Within Dating Relationships. *Journal of Sex & Marital Therapy*, *26*(1), 95-105. https://doi.org/10.1080/009262300278678

Cohen, G. L., & Prinstein, M. J. (2006). Peer contagion of aggression and health risk behavior among adolescent males: an experimental investigation of effects on public conduct and private attitudes. *Child Dev*, *77*(4), 967-983. https://doi.org/10.1111/j.1467-8624.2006.00913.x

Cohen, M. S., Hoffman, I. F., Royce, R. A., Kazembe, P., Dyer, J. R., Daly, C. C., Zimba, D., Vernazza, P. L., Maida, M., Fiscus, S. A., & Eron, J. J., Jr. (1997). Reduction of concentration of HIV-1 in semen after treatment of urethritis: implications for prevention of sexual transmission of HIV-1. AIDSCAP Malawi Research Group. *Lancet*, *349*(9069), 1868-1873. https://doi.org/10.1016/s0140-6736(97)02190-9

Control, C. f. D. (2023). *About the National Health and Nutrition Examination Survey*. Retrieved October 20 from https://www.cdc.gov/nchs/nhanes/about_nhanes.htm

Corey, L., Adams, H. G., Brown, Z. A., & Holmes, K. K. (1983). Genital herpes simplex virus infections: clinical manifestations, course, and complications. *Ann Intern Med*, *98*(6), 958-972. https://doi.org/10.7326/0003-4819-98-6-958

Dabbs Jr, J. M., Ruback, R. B., Frady, R. L., Hopper, C. H., & Sgoutas, D. S. (1988). Saliva testosterone and criminal violence among women. *Personality and Individual Differences*, *9*(2), 269-275.

Daniels, K., Dougherty, J., & Jones, J. (2014). *Current contraceptive status among women aged 15-44: United States, 2011-2013*. US Department of Health and Human Services, Centers for Disease Control and ….

Davis, K. C., Kiekel, P. A., Schraufnagel, T. J., Norris, J., George, W. H., & Kajumulo, K. F. (2012). Men's alcohol intoxication and condom use during sexual assault perpetration. *J Interpers Violence*, *27*(14), 2790-2806. https://doi.org/10.1177/0886260512438277

Day, J. C., Bentall, R. P., Roberts, C., Randall, F., Rogers, A., Cattell, D., Healy, D., Rae, P., & Power, C. (2005). Attitudes toward antipsychotic medication: the impact of clinical variables and relationships with health professionals. *Arch Gen Psychiatry*, *62*(7), 717-724. https://doi.org/10.1001/archpsyc.62.7.717

de Bastos, M., Stegeman, B. H., Rosendaal, F. R., Van Hylckama Vlieg, A., Helmerhorst, F. M., Stijnen, T., & Dekkers, O. M. (2014). Combined oral contraceptives: venous thrombosis. *Cochrane Database Syst Rev*(3), CD010813. https://doi.org/10.1002/14651858.CD010813.pub2

De, M., Sanford, T. R., & Wood, G. W. (1992). Interleukin-1, interleukin-6, and tumor necrosis factor alpha are produced in the mouse uterus during the estrous cycle and are induced by estrogen and progesterone. *Dev Biol*, *151*(1), 297-305. https://doi.org/10.1016/0012-1606(92)90234-8

De Schryver, A., & Meheus, A. (1990). Epidemiology of sexually transmitted diseases: the global picture. *Bulletin of the World Health Organization*, *68*(5), 639.

de Villiers, E. M., Fauquet, C., Broker, T. R., Bernard, H. U., & zur Hausen, H. (2004). Classification of papillomaviruses. *Virology*, *324*(1), 17-27. https://doi.org/10.1016/j.virol.2004.03.033

Dehlendorf, C., Fitzpatrick, J., Fox, E., Holt, K., Vittinghoff, E., Reed, R., Campora, M. P., Sokoloff, A., & Kuppermann, M. (2019). Cluster randomized trial of a patient-centered contraceptive decision support tool, My Birth Control. *Am J Obstet Gynecol*, *220*(6), 565 e561-565 e512. https://doi.org/10.1016/j.ajog.2019.02.015

Devarajan, S., Sales, J. M., Hunt, M., & Comeau, D. L. (2020). PrEP and sexual well-being: a qualitative study on PrEP, sexuality of MSM, and patient-provider relationships. *AIDS Care*, *32*(3), 386-393. https://doi.org/10.1080/09540121.2019.1695734

Dhont, M. (2010). History of oral contraception. *Eur J Contracept Reprod Health Care*, *15 Suppl 2*, S12-18. https://doi.org/10.3109/13625187.2010.513071

Di Renzo, G. C., Giardina, I., Clerici, G., Brillo, E., & Gerli, S. (2016). Progesterone in normal and pathological pregnancy. *Horm Mol Biol Clin Investig*, *27*(1), 35-48. https://doi.org/10.1515/hmbci-2016-0038

Divakaruni, A. K., Mahabir, B., Orrett, F. A., Adidam, S. R., Venkata, S. A., Adidam, V. C. R., & Divakaruni, S. (2019). Compliance and Treatment Outcomes of Various Regimens for Trichomoniasis in Trinidad and Tobago. *Med Sci (Basel)*, *7*(10). https://doi.org/10.3390/medsci7100097

Eaton, E. F., Hudak, K., & Muzny, C. A. (2017). Budgetary Impact of Compliance With STI Screening Guidelines in Persons Living With HIV. *J Acquir Immune Defic Syndr*, *74*(3), 303-308. https://doi.org/10.1097/QAI.0000000000001212

Edwards, J. L., & Butler, E. K. (2011). The Pathobiology of Neisseria gonorrhoeae Lower Female Genital Tract Infection. *Front Microbiol*, *2*, 102. https://doi.org/10.3389/fmicb.2011.00102

Eisenberg, D. L., Secura, G. M., Madden, T. E., Allsworth, J. E., Zhao, Q., & Peipert, J. F. (2012). Knowledge of contraceptive effectiveness. *Am J Obstet Gynecol*, *206*(6), 479 e471-479. https://doi.org/10.1016/j.ajog.2012.04.012

Farley, T. A., Cohen, D. A., & Elkins, W. (2003). Asymptomatic sexually transmitted diseases: the case for screening. *Prev Med*, *36*(4), 502-509. https://doi.org/10.1016/s0091-7435(02)00058-0

Fatahzadeh, M., & Schwartz, R. A. (2007). Human herpes simplex virus infections: epidemiology, pathogenesis, symptomatology, diagnosis, and management. *J Am Acad Dermatol*, *57*(5), 737-763; quiz 764-736. https://doi.org/10.1016/j.jaad.2007.06.027

Ferguson, N. M., & Garnett, G. P. (2000). More realistic models of sexually transmitted disease transmission dynamics: sexual partnership networks, pair models, and moment closure. *Sex Transm Dis*, *27*(10), 600-609. https://doi.org/10.1097/00007435-200011000-00008

Festin, M. P. R. (2020). Overview of modern contraception. *Best Pract Res Clin Obstet Gynaecol*, *66*, 4-14. https://doi.org/10.1016/j.bpobgyn.2020.03.004

Fidel, P. L., Jr., Cutright, J., & Steele, C. (2000). Effects of reproductive hormones on experimental vaginal candidiasis. *Infect Immun*, *68*(2), 651-657. https://doi.org/10.1128/IAI.68.2.651-657.2000

Finer, L. B., Jerman, J., & Kavanaugh, M. L. (2012). Changes in use of long-acting contraceptive methods in the United States, 2007-2009. *Fertil Steril*, *98*(4), 893-897. https://doi.org/10.1016/j.fertnstert.2012.06.027

Finer, L. B., Sonfield, A., & Jones, R. K. (2014). Changes in out-of-pocket payments for contraception by privately insured women during implementation of the federal contraceptive coverage requirement. *Contraception*, *89*(2), 97-102. https://doi.org/10.1016/j.contraception.2013.11.015

Fischer, M. A., Choudhry, N. K., Brill, G., Avorn, J., Schneeweiss, S., Hutchins, D., Liberman, J. N., Brennan, T. A., & Shrank, W. H. (2011). Trouble getting started: predictors of primary medication nonadherence. *Am J Med*, *124*(11), 1081 e1089-1022. https://doi.org/10.1016/j.amjmed.2011.05.028

Fisher, C. B., Fried, A. L., Macapagal, K., & Mustanski, B. (2018). Patient-Provider Communication Barriers and Facilitators to HIV and STI Preventive Services for Adolescent MSM. *AIDS Behav*, *22*(10), 3417-3428. https://doi.org/10.1007/s10461-018-2081-x

Foo, Y. Z., Nakagawa, S., Rhodes, G., & Simmons, L. W. (2017). The effects of sex hormones on immune function: a meta-analysis. *Biol Rev Camb Philos Soc*, *92*(1), 551-571. https://doi.org/10.1111/brv.12243

Forman, D., de Martel, C., Lacey, C. J., Soerjomataram, I., Lortet-Tieulent, J., Bruni, L., Vignat, J., Ferlay, J., Bray, F., Plummer, M., & Franceschi, S. (2012). Global burden of human papillomavirus and related diseases. *Vaccine*, *30 Suppl 5*, F12-23. https://doi.org/10.1016/j.vaccine.2012.07.055

Forslund, M., Melin, J., Alesi, S., Piltonen, T., Romualdi, D., Tay, C. T., Witchel, S., Pena, A., Mousa, A., & Teede, H. (2023). Different kinds of oral contraceptive pills in polycystic ovary syndrome: a systematic review and meta-analysis. *Eur J Endocrinol*, *189*(1), S1-S16. https://doi.org/10.1093/ejendo/lvad082

Frank, S. A. (2002). *Immunology and evolution of infectious disease*. Princeton University Press. Table of contents http://www.loc.gov/catdir/toc/prin031/2002018384.html Publisher description http://www.loc.gov/catdir/description/prin022/2002018384.html

Frost, J. J., Lindberg, L. D., & Finer, L. B. (2012). Young adults' contraceptive knowledge, norms and attitudes: associations with risk of unintended pregnancy. *Perspect Sex Reprod Health*, *44*(2), 107-116. https://doi.org/10.1363/4410712

Fu, T.-c., Herbenick, D., Dodge, B. M., Beckmeyer, J. J., & Hensel, D. J. (2021). Long-Acting Reversible Contraceptive Users' Knowledge, Conversations with Healthcare Providers, and Condom Use: Findings from a U.S. Nationally Representative Probability Survey. *International Journal of Sexual Health*, *33*(2), 163-174. https://doi.org/10.1080/19317611.2020.1870024

Fuentes, L., Ingerick, M., Jones, R., & Lindberg, L. (2018). Adolescents' and Young Adults' Reports of Barriers to Confidential Health Care and Receipt of Contraceptive Services. *J Adolesc Health*, *62*(1), 36-43. https://doi.org/10.1016/j.jadohealth.2017.10.011

Gajer, P., Brotman, R. M., Bai, G., Sakamoto, J., Schutte, U. M., Zhong, X., Koenig, S. S., Fu, L., Ma, Z. S., Zhou, X., Abdo, Z., Forney, L. J., & Ravel, J. (2012). Temporal dynamics of the human vaginal microbiota. *Sci Transl Med*, *4*(132), 132ra152. https://doi.org/10.1126/scitranslmed.3003605

Garcia-Gomez, E., Gonzalez-Pedrajo, B., & Camacho-Arroyo, I. (2013). Role of sex steroid hormones in bacterial-host interactions. *Biomed Res Int*, *2013*, 928290. https://doi.org/10.1155/2013/928290

Garcia, P. J., Miranda, A. E., Gupta, S., Garland, S. M., Escobar, M. E., Fortenberry, J. D., & International Union Against Sexually Transmitted, I. (2021). The role of sexually transmitted infections (STI)

prevention and control programs in reducing gender, sexual and STI-related stigma. *EClinicalMedicine*, *33*, 100764. https://doi.org/10.1016/j.eclinm.2021.100764

Geniole, S. N., & Carre, J. M. (2018). Human social neuroendocrinology: Review of the rapid effects of testosterone. *Horm Behav*, *104*, 192-205. https://doi.org/10.1016/j.yhbeh.2018.06.001

George, D. R., Rovniak, L. S., & Kraschnewski, J. L. (2013). Dangers and opportunities for social media in medicine. *Clin Obstet Gynecol*, *56*(3), 453-462. https://doi.org/10.1097/GRF.0b013e318297dc38

Gerchow, L., & Squires, A. (2022). Dimensional Analysis of Shared Decision Making in Contraceptive Counseling. *J Obstet Gynecol Neonatal Nurs*, *51*(4), 388-401. https://doi.org/10.1016/j.jogn.2022.04.005

Ghebremichael, M. S., & Finkelman, M. D. (2013). The Effect of Premarital Sex on Sexually Transmitted Infections (STIs) and High Risk Behaviors in Women. *J AIDS HIV Res*, *5*(2), 59-64. https://www.ncbi.nlm.nih.gov/pubmed/23626920

Gibson, E. J., Bell, D. L., & Powerful, S. A. (2014). Common sexually transmitted infections in adolescents. *Prim Care*, *41*(3), 631-650. https://doi.org/10.1016/j.pop.2014.05.011

Gillgrass, A. E., Fernandez, S. A., Rosenthal, K. L., & Kaushic, C. (2005). Estradiol regulates susceptibility following primary exposure to genital herpes simplex virus type 2, while progesterone induces inflammation. *J Virol*, *79*(5), 3107-3116. https://doi.org/10.1128/JVI.79.5.3107-3116.2005

Glaser, R., & Kiecolt-Glaser, J. (2005). How stress damages immune system and health. *Discov Med*, *5*(26), 165-169. https://www.ncbi.nlm.nih.gov/pubmed/20704904

Go, V. F., Quan, V. M., Chung, A., Zenilman, J., Hanh, V. T., & Celentano, D. (2002). Gender gaps, gender traps: sexual identity and vulnerability to sexually transmitted diseases among women in Vietnam. *Soc Sci Med*, *55*(3), 467-481. https://doi.org/10.1016/s0277-9536(01)00181-2

Goesling, B., Colman, S., Trenholm, C., Terzian, M., & Moore, K. (2014). Programs to reduce teen pregnancy, sexually transmitted infections, and associated sexual risk behaviors: a systematic review. *J Adolesc Health*, *54*(5), 499-507. https://doi.org/10.1016/j.jadohealth.2013.12.004

Goldey, K. L., & van Anders, S. M. (2011). Sexy thoughts: effects of sexual cognitions on testosterone, cortisol, and arousal in women. *Horm Behav*, *59*(5), 754-764. https://doi.org/10.1016/j.yhbeh.2010.12.005

Goldfarb, E. S., & Lieberman, L. D. (2021). Three Decades of Research: The Case for Comprehensive Sex Education. *J Adolesc Health*, *68*(1), 13-27. https://doi.org/10.1016/j.jadohealth.2020.07.036

Goodman, L. S. (1996). *Goodman and Gilman's the pharmacological basis of therapeutics* (Vol. 1549). McGraw-Hill New York.

Gott, M., Galena, E., Hinchliff, S., & Elford, H. (2004). "Opening a can of worms": GP and practice nurse barriers to talking about sexual health in primary care. *Fam Pract*, *21*(5), 528-536. https://doi.org/10.1093/fampra/cmh509

Goudriaan, A. E., Lapauw, B., Ruige, J., Feyen, E., Kaufman, J. M., Brand, M., & Vingerhoets, G. (2010). The influence of high-normal testosterone levels on risk-taking in healthy males in a 1-week letrozole administration study. *Psychoneuroendocrinology*, *35*(9), 1416-1421. https://doi.org/10.1016/j.psyneuen.2010.04.005

Group, E. C. W. (2013). Venous thromboembolism in women: a specific reproductive health risk. *Hum Reprod Update*, *19*(5), 471-482. https://doi.org/10.1093/humupd/dmt028

Gullette, D. L., Rooker, J. L., & Kennedy, R. L. (2009). Factors associated with sexually transmitted infections in men and women. *J Community Health Nurs*, *26*(3), 121-130. https://doi.org/10.1080/07370010903034425

Hall, K. S., Moreau, C., & Trussell, J. (2012). Continuing social disparities despite upward trends in sexual and reproductive health service use among young women in the United States. *Contraception*, *86*(6), 681-686. https://doi.org/10.1016/j.contraception.2012.05.013

Hamilton, D. T., & Morris, M. (2015). The racial disparities in STI in the U.S.: Concurrency, STI prevalence, and heterogeneity in partner selection. *Epidemics*, *11*, 56-61. https://doi.org/10.1016/j.epidem.2015.02.003

Harling, G., Subramanian, S., Barnighausen, T., & Kawachi, I. (2013). Socioeconomic disparities in sexually transmitted infections among young adults in the United States: examining the interaction between income and race/ethnicity. *Sex Transm Dis*, *40*(7), 575-581. https://doi.org/10.1097/OLQ.0b013e31829529cf

Hill, S. A., Masters, T. L., & Wachter, J. (2016). Gonorrhea - an evolving disease of the new millennium. *Microb Cell*, *3*(9), 371-389. https://doi.org/10.15698/mic2016.09.524

Hogben, M., & Leichliter, J. S. (2008). Social determinants and sexually transmitted disease disparities. *Sex Transm Dis*, *35*(12 Suppl), S13-18. https://doi.org/10.1097/OLQ.0b013e31818d3cad

Holmes, K. K., Levine, R., & Weaver, M. (2004). Effectiveness of condoms in preventing sexually transmitted infections. *Bull World Health Organ*, *82*(6), 454-461. https://www.ncbi.nlm.nih.gov/pubmed/15356939

Holt, K., Kimport, K., Kuppermann, M., Fitzpatrick, J., Steinauer, J., & Dehlendorf, C. (2020). Patient-provider communication before and after implementation of the contraceptive decision support tool My Birth Control. *Patient Educ Couns*, *103*(2), 315-320. https://doi.org/10.1016/j.pec.2019.09.003

Homminga, I., Ter Meer, A. F., Groen, H., Cantineau, A. E. P., & Hoek, A. (2023). Thin endometrial lining: is it more prevalent in patients utilizing preimplantation genetic testing for monogenic disease

(PGT-M) and related to prior hormonal contraceptive use? *Hum Reprod*, *38*(2), 237-246. https://doi.org/10.1093/humrep/deac258

Hoover, K., Bohm, M., & Keppel, K. (2008). Measuring disparities in the incidence of sexually transmitted diseases. *Sex Transm Dis*, *35*(12 Suppl), S40-44. https://doi.org/10.1097/OLQ.0b013e3181886750

Hosenfeld, C. B., Workowski, K. A., Berman, S., Zaidi, A., Dyson, J., Mosure, D., Bolan, G., & Bauer, H. M. (2009). Repeat infection with Chlamydia and gonorrhea among females: a systematic review of the literature. *Sex Transm Dis*, *36*(8), 478-489. https://doi.org/10.1097/OLQ.0b013e3181a2a933

Hunter, P., Dalby, J., Marks, J., Swain, G. R., & Schrager, S. (2014). Screening and prevention of sexually transmitted infections. *Prim Care*, *41*(2), 215-237. https://doi.org/10.1016/j.pop.2014.02.003

Hutchinson, M. K., & Montgomery, A. J. (2007). Parent communication and sexual risk among African Americans. *West J Nurs Res*, *29*(6), 691-707. https://doi.org/10.1177/0193945906297374

Imaledo, J. A., Peter-Kio, O. B., & Asuquo, E. O. (2012). Pattern of risky sexual behavior and associated factors among undergraduate students of the University of Port Harcourt, Rivers State, Nigeria. *Pan Afr Med J*, *12*, 97. https://www.ncbi.nlm.nih.gov/pubmed/23133697

Initiative, F. o. S. E. (2020). National sex education standards: Core content and skills, K-12. *Future of Sex Education Initiative*.

Jahn, J. L., Bishop, R. A., Tan, A. S. L., & Agenor, M. (2019). Patient-Provider Sexually Transmitted Infection Prevention Communication among Young Adult Sexual Minority Cisgender Women and Nonbinary Assigned Female at Birth Individuals. *Womens Health Issues*, *29*(4), 308-314. https://doi.org/10.1016/j.whi.2019.01.002

Jones, A., Allison, B. A., & Perry, M. (2022). Effectiveness of Contraceptive Decision Aids in Adolescents and Young Adults: A Systematic Review. *J Pediatr Adolesc Gynecol*, *35*(1), 7-17. https://doi.org/10.1016/j.jpag.2021.08.005

Jones, J., Mosher, W., & Daniels, K. (2012). Current contraceptive use in the United States, 2006-2010, and changes in patterns of use since 1995. *Natl Health Stat Report*(60), 1-25. https://www.ncbi.nlm.nih.gov/pubmed/24988814

Kane, B. G., Guillaume, A. W. D., Evans, E. M., Goyke, T. E., Eygnor, J. K., Semler, L., Dusza, S. W., & Greenberg, M. R. (2017). Gender Differences in CDC Guideline Compliance for STIs in Emergency Departments. *West J Emerg Med*, *18*(3), 390-397. https://doi.org/10.5811/westjem.2016.12.32440

Kann, L., McManus, T., Harris, W. A., Shanklin, S. L., Flint, K. H., Queen, B., Lowry, R., Chyen, D., Whittle, L., Thornton, J., Lim, C., Bradford, D., Yamakawa, Y., Leon, M., Brener, N., & Ethier, K. A. (2018). Youth Risk Behavior Surveillance - United States, 2017. *MMWR Surveill Summ*, *67*(8), 1-114. https://doi.org/10.15585/mmwr.ss6708a1

Katz, D. A., Copen, C. E., Haderxhanaj, L. T., Hogben, M., Goodreau, S. M., Spicknall, I. H., & Hamilton, D. T. (2023). Changes in Sexual Behaviors with Opposite-Sex Partners and Sexually Transmitted Infection Outcomes Among Females and Males Ages 15-44 Years in the USA: National Survey of Family Growth, 2008-2019. *Arch Sex Behav*, *52*(2), 809-821. https://doi.org/10.1007/s10508-022-02485-3

Kaushic, C., Zhou, F., Murdin, A. D., & Wira, C. R. (2000). Effects of estradiol and progesterone on susceptibility and early immune responses to Chlamydia trachomatis infection in the female reproductive tract. *Infect Immun*, *68*(7), 4207-4216. https://doi.org/10.1128/IAI.68.7.4207-4216.2000

Kavanaugh, M. L., & Jerman, J. (2018). Contraceptive method use in the United States: trends and characteristics between 2008, 2012 and 2014. *Contraception*, *97*(1), 14-21. https://doi.org/10.1016/j.contraception.2017.10.003

Kerrigan, D., Andrinopoulos, K., Johnson, R., Parham, P., Thomas, T., & Ellen, J. M. (2007). Staying strong: gender ideologies among African-American adolescents and the implications for HIV/STI prevention. *J Sex Res*, *44*(2), 172-180. https://doi.org/10.1080/00224490701263785

Kerse, N., Buetow, S., Mainous, A. G., 3rd, Young, G., Coster, G., & Arroll, B. (2004). Physician-patient relationship and medication compliance: a primary care investigation. *Ann Fam Med*, *2*(5), 455-461. https://doi.org/10.1370/afm.139

Khullar, D. (2022). Social Media and Medical Misinformation: Confronting New Variants of an Old Problem. *JAMA*, *328*(14), 1393-1394. https://doi.org/10.1001/jama.2022.17191

Kindratt, T. B., Atem, F., Dallo, F. J., Allicock, M., & Balasubramanian, B. A. (2020). The Influence of Patient-Provider Communication on Cancer Screening. *J Patient Exp*, *7*(6), 1648-1657. https://doi.org/10.1177/2374373520924993

Kita, E., Takahashi, S., Yasui, K., & Kashiba, S. (1985). Effect of estrogen (17 beta-estradiol) on the susceptibility of mice to disseminated gonococcal infection. *Infect Immun*, *49*(1), 238-243. https://doi.org/10.1128/iai.49.1.238-243.1985

Klein, S. L. (2000). The effects of hormones on sex differences in infection: from genes to behavior. *Neurosci Biobehav Rev*, *24*(6), 627-638. https://doi.org/10.1016/s0149-7634(00)00027-0

Kleppa, E., Holmen, S. D., Lillebo, K., Kjetland, E. F., Gundersen, S. G., Taylor, M., Moodley, P., & Onsrud, M. (2015). Cervical ectopy: associations with sexually transmitted infections and HIV. A cross-sectional study of high school students in rural South Africa. *Sex Transm Infect*, *91*(2), 124-129. https://doi.org/10.1136/sextrans-2014-051674

Lau, A., Spark, S., Tomnay, J., Smith, M. T., Fairley, C. K., Guy, R. J., Donovan, B., & Hocking, J. S. (2016). Socio-demographic and structural barriers to being tested for chlamydia in general practice. *Med J Aust*, *204*(3), 112 e111-115. https://doi.org/10.5694/mja15.00933

Lena, S., Pourbohloul, B., & Brunham, R. C. (2005). Effect of immune response on transmission dynamics for sexually transmitted infections. *J Infect Dis*, *191 Suppl 1*, S78-84. https://doi.org/10.1086/425289

Leone, J. E., Fetro, J. V., Kittleson, M., Welshimer, K. J., Partridge, J. A., & Robertson, S. L. (2011). Predictors of adolescent male body image dissatisfaction: Implications for negative health practices and consequences for school health from a regionally representative sample. *Journal of School Health*, *81*(4), 174-184.

Li, G., Xie, R., Zhu, X., Mao, Y., Liu, S., Jiao, H., Yan, H., Xiong, K., & Ji, M. (2014). Antibodies with higher bactericidal activity induced by a Neisseria gonorrhoeae Rmp deletion mutant strain. *PLoS One*, *9*(3), e90525. https://doi.org/10.1371/journal.pone.0090525

Lindberg, C., Lewis-Spruill, C., & Crownover, R. (2006). Barriers to sexual and reproductive health care: urban male adolescents speak out. *Issues Compr Pediatr Nurs*, *29*(2), 73-88. https://doi.org/10.1080/01460860600677577

Liu, Z. H., Ogejo, J. A., Pruden, A., & Knowlton, K. F. (2011). Occurrence, fate and removal of synthetic oral contraceptives (SOCs) in the natural environment: a review. *Sci Total Environ*, *409*(24), 5149-5161. https://doi.org/10.1016/j.scitotenv.2011.08.047

Livadas, S., & Chrousos, G. P. (2019). Molecular and Environmental Mechanisms Regulating Puberty Initiation: An Integrated Approach. *Front Endocrinol (Lausanne)*, *10*, 828. https://doi.org/10.3389/fendo.2019.00828

Looker, K. J., Johnston, C., Welton, N. J., James, C., Vickerman, P., Turner, K. M., Boily, M. -C., & Gottlieb, S. L. (2020). The global and regional burden of genital ulcer disease due to herpes simplex virus: a natural history modelling study. *BMJ global health*, *5*(3), e001875.

Louv, W. C., Austin, H., Perlman, J., & Alexander, W. J. (1989). Oral contraceptive use and the risk of chlamydial and gonococcal infections. *Am J Obstet Gynecol*, *160*(2), 396-402. https://doi.org/10.1016/0002-9378(89)90456-0

Mabire, X., Puppo, C., Morel, S., Mora, M., Rojas Castro, D., Chas, J., Cua, E., Pintado, C., Suzan-Monti, M., Spire, B., Molina, J. M., & Preau, M. (2019). Pleasure and PrEP: Pleasure-Seeking Plays a Role in Prevention Choices and Could Lead to PrEP Initiation. *Am J Mens Health*, *13*(1), 1557988319827396. https://doi.org/10.1177/1557988319827396

Mann, E. S., Chen, A. M., & Johnson, C. L. (2022). Doctor knows best? Provider bias in the context of contraceptive counseling in the United States. *Contraception*, *110*, 66-70. https://doi.org/10.1016/j.contraception.2021.11.009

Mansour, D., Inki, P., & Gemzell-Danielsson, K. (2010). Efficacy of contraceptive methods: A review of the literature. *Eur J Contracept Reprod Health Care*, *15*(1), 4-16. https://doi.org/10.3109/13625180903427675

Marrazzo, J., & Suchland, R. (2014). Recent advances in understanding and managing Chlamydia trachomatis infections. *F1000Prime Rep*, *6*, 120. https://doi.org/10.12703/P6-120

Marrazzo, J. M., Whittington, W. L., Celum, C. L., Handsfield, H. H., Clark, A., Cles, L., Krekeler, B., & Stamm, W. E. (2001). Urine-based screening for Chlamydia trachomatis in men attending sexually transmitted disease clinics. *Sex Transm Dis*, *28*(4), 219-225. https://doi.org/10.1097/00007435-200104000-00006

Matacotta, J. J., Rosales-Perez, F. J., & Carrillo, C. M. (2020). HIV Preexposure Prophylaxis and Treatment as Prevention - Beliefs and Access Barriers in Men Who Have Sex With Men (MSM) and Transgender Women: A Systematic Review. *J Patient Cent Res Rev*, *7*(3), 265-274. https://doi.org/10.17294/2330-0698.1737

Matsitse, T. B., Helberg, E., Meyer, J. C., Godman, B., Massele, A., & Schellack, N. (2017). Compliance with the primary health care treatment guidelines and the essential medicines list in the management of sexually transmitted infections in correctional centres in South Africa: findings and implications. *Expert Rev Anti Infect Ther*, *15*(10), 963-972. https://doi.org/10.1080/14787210.2017.1382354

Maxwell, K. A. (2002). Friends: The role of peer influence across adolescent risk behaviors. *Journal of Youth and adolescence*, *31*(4), 267-277.

Mazzaferro, K. E., Murray, P. J., Ness, R. B., Bass, D. C., Tyus, N., & Cook, R. L. (2006). Depression, stress, and social support as predictors of high-risk sexual behaviors and STIs in young women. *J Adolesc Health*, *39*(4), 601-603. https://doi.org/10.1016/j.jadohealth.2006.02.004

McLachlan, R. I., Wreford, N. G., O'Donnell, L., de Kretser, D. M., & Robertson, D. M. (1996). The endocrine regulation of spermatogenesis: independent roles for testosterone and FSH. *J Endocrinol*, *148*(1), 1-9. https://doi.org/10.1677/joe.0.1480001

Mertz, G. J., Benedetti, J., Ashley, R., Selke, S. A., & Corey, L. (1992). Risk factors for the sexual transmission of genital herpes. *Ann Intern Med*, *116*(3), 197-202. https://doi.org/10.7326/0003-4819-116-3-197

Milhausen, R. R., McKay, A., Graham, C. A., Sanders, S. A., Crosby, R. A., Yarber, W. L., & Wood, J. (2018). Do Associations Between Pleasure Ratings and Condom Use During Penile-Vaginal Intercourse Vary by Relationship Type?: A Study of Canadian University Students. *J Sex Res*, *55*(1), 21-30. https://doi.org/10.1080/00224499.2017.1298713

Mishell, D. R., Jr. (1996). Pharmacokinetics of depot medroxyprogesterone acetate contraception. *J Reprod Med*, *41*(5 Suppl), 381-390. https://www.ncbi.nlm.nih.gov/pubmed/8725700

Mohseni, M., Sung, S., & Takov, V. (2023). Chlamydia. In *StatPearls*. StatPearls Publishing

Morrison, C. S., Bright, P., Wong, E. L., Kwok, C., Yacobson, I., Gaydos, C. A., Tucker, H. T., & Blumenthal, P. D. (2004). Hormonal contraceptive use, cervical ectopy, and the acquisition of cervical infections. *Sex Transm Dis*, *31*(9), 561-567. https://doi.org/10.1097/01.olq.0000137904.56037.70

Moses, S., Bailey, R. C., & Ronald, A. R. (1998). Male circumcision: assessment of health benefits and risks. *Sex Transm Infect*, *74*(5), 368-373. https://doi.org/10.1136/sti.74.5.368

Narouz, N., Allan, P. S., Wade, A. H., & Wagstaffe, S. (2003). Genital herpes serotesting: a study of the epidemiology and patients' knowledge and attitude among STD clinic attenders in Coventry, UK. *Sex Transm Infect*, *79*(1), 35-41. https://doi.org/10.1136/sti.79.1.35

National Center for HIV/AIDS, V. H., STD, and TB Prevention (U.S.)Division of STD Prevention. (2021). *"Sexually transmitted disease surveillance 2019 : Case definitions"* https://stacks.cdc.gov/view/cdc/105132

O'Malley, A. S., Forrest, C. B., & Mandelblatt, J. (2002). Adherence of low-income women to cancer screening recommendations. *J Gen Intern Med*, *17*(2), 144-154. https://doi.org/10.1046/j.1525-1497.2002.10431.x

Oharume, I. M. (2020). Knowledge, sexual behaviours and risk perception of sexually transmitted infections among students of the polytechnic, Ibadan, Oyo state. *Afr Health Sci*, *20*(1), 39-44. https://doi.org/10.4314/ahs.v20i1.7

Okpo, E., Allerton, L., & Brechin, S. (2014). 'But you can't reverse a hysterectomy!' Perceptions of long acting reversible contraception (LARC) among young women aged 16-24 years: a qualitative study. *Public Health*, *128*(10), 934-939. https://doi.org/10.1016/j.puhe.2014.08.012

Organization, W. H. (2012). *Global incidence and prevalence of selected curable sexually transmitted infections-2008*. World Health Organization.

Organization, W. H. (2016). *Global health sector strategy on sexually transmitted infections 2016-2021: toward ending STIs*.

Peterson, Z. D., Janssen, E., & Heiman, J. R. (2010). The association between sexual aggression and HIV risk behavior in heterosexual men. *J Interpers Violence*, *25*(3), 538-556. https://doi.org/10.1177/0886260509334414

Piccinni, M. P., Giudizi, M. G., Biagiotti, R., Beloni, L., Giannarini, L., Sampognaro, S., Parronchi, P., Manetti, R., Annunziato, F., Livi, C., & et al. (1995). Progesterone favors the development of human T helper cells producing Th2-type cytokines and promotes both IL-4 production and membrane CD30 expression in established Th1 cell clones. *J Immunol*, *155*(1), 128-133. https://www.ncbi.nlm.nih.gov/pubmed/7541410

Pleck, J. H., Sonenstein, F. L., & Ku, L. (1993). Changes in adolescent males' use of and attitudes toward condoms, 1988-1991. *Family Planning Perspectives*, 106-117.

Plichta, S. B., & Abraham, C. (1996). Violence and gynecologic health in women <50 years old. *Am J Obstet Gynecol*, *174*(3), 903-907. https://doi.org/10.1016/s0002-9378(96)70323-x

Prevention), C. C. f. D. C. a. (2010). Seroprevalence of herpes simplex virus type 2 among persons aged 14-49 years--United States, 2005-2008. *MMWR Morb Mortal Wkly Rep*, *59*(15), 456-459.

Rahman, M., Fikslin, R. A., Matthews, E., Vazquez Sanchez, M. A., Ahn, G. O., Kobrak, P. H., Lovinger, E. S., & Golub, S. A. (2023). Exploring Factors Affecting Patient-Provider Interactions and Healthcare Engagement Among a Diverse Sample of Women Who Have Sex with Women in New York City. *Arch Sex Behav*, *52*(2), 833-849. https://doi.org/10.1007/s10508-022-02478-2

Reed, B. G., & Carr, B. R. (2000). The Normal Menstrual Cycle and the Control of Ovulation. In K. R. Feingold, B. Anawalt, M. R. Blackman, A. Boyce, G. Chrousos, E. Corpas, W. W. de Herder, K. Dhatariya, K. Dungan, J. Hofland, S. Kalra, G. Kaltsas, N. Kapoor, C. Koch, P. Kopp, M. Korbonits, C. S. Kovacs, W. Kuohung, B. Laferrere, M. Levy, E. A. McGee, R. McLachlan, M. New, J. Purnell,

R. Sahay, A. S. Shah, F. Singer, M. A. Sperling, C. A. Stratakis, D. L. Trence, & D. P. Wilson (Eds.), *Endotext*. https://www.ncbi.nlm.nih.gov/pubmed/25905282

Regmi, P. R., van Teijlingen, E., Simkhada, P., & Acharya, D. R. (2010). Barriers to sexual health services for young people in Nepal. *J Health Popul Nutr*, *28*(6), 619-627. https://doi.org/10.3329/jhpn.v28i6.6611

Rehnstrom Loi, U., Otieno, B., Oguttu, M., Gemzell-Danielsson, K., Klingberg-Allvin, M., Faxelid, E., & Makenzius, M. (2019). Abortion and contraceptive use stigma: a cross-sectional study of attitudes and beliefs in secondary school students in western Kenya. *Sex Reprod Health Matters*, *27*(3), 1652028. https://doi.org/10.1080/26410397.2019.1652028

Rettew, J. A., Huet-Hudson, Y. M., & Marriott, I. (2008). Testosterone reduces macrophage expression in the mouse of toll-like receptor 4, a trigger for inflammation and innate immunity. *Biol Reprod*, *78*(3), 432-437. https://doi.org/10.1095/biolreprod.107.063545

Richmond, E. J., & Rogol, A. D. (2007). Male pubertal development and the role of androgen therapy. *Nat Clin Pract Endocrinol Metab*, *3*(4), 338-344. https://doi.org/10.1038/ncpendmet0450

Rivera, R., Yacobson, I., & Grimes, D. (1999). The mechanism of action of hormonal contraceptives and intrauterine contraceptive devices. *Am J Obstet Gynecol*, *181*(5 Pt 1), 1263-1269. https://doi.org/10.1016/s0002-9378(99)70120-1

Rocha-Zavaleta, L., Yescas, G., Cruz, R. M., & Cruz-Talonia, F. (2004). Human papillomavirus infection and cervical ectopy. *Int J Gynaecol Obstet*, *85*(3), 259-266. https://doi.org/10.1016/j.ijgo.2003.10.002

Rodrigues, D. L., Carvalho, A. C., Prada, M., Garrido, M. V., Balzarini, R. N., de Visser, R. O., & Lopes, D. (2023). Condom Use Beliefs Differ According to Regulatory Focus: A Mixed-Methods Study in Portugal and Spain. *J Sex Res*, 1-18. https://doi.org/10.1080/00224499.2023.2181305

Rooney, J. F., Felser, J. M., Ostrove, J. M., & Straus, S. E. (1986). Acquisition of genital herpes from an asymptomatic sexual partner. *N Engl J Med*, *314*(24), 1561-1564. https://doi.org/10.1056/NEJM198606123142407

Rowley, J., Vander Hoorn, S., Korenromp, E., Low, N., Unemo, M., Abu-Raddad, L. J., Chico, R. M., Smolak, A., Newman, L., Gottlieb, S., Thwin, S. S., Broutet, N., & Taylor, M. M. (2019). Chlamydia, gonorrhoea, trichomoniasis and syphilis: global prevalence and incidence estimates, 2016. *Bull World Health Organ*, *97*(8), 548-562P. https://doi.org/10.2471/BLT.18.228486

Sanjeev Khanth, P. E., & Maheswari, K. (2023). Hormonal Contraceptives. In T. K. Shackelford (Ed.), *Encyclopedia of Sexual Psychology and Behavior* (pp. 1-3). Springer International Publishing. https://doi.org/10.1007/978-3-031-08956-5_313-1

Santelli, J. S., Kouzis, A. C., Hoover, D. R., Polacsek, M., Burwell, L. G., & Celentano, D. D. (1996). Stage of behavior change for condom use: the influence of partner type, relationship and pregnancy factors. *Fam Plann Perspect*, *28*(3), 101-107. https://www.ncbi.nlm.nih.gov/pubmed/8827145

Satish, S., Moore, J. F., Littlefield, J. M., Bishop, I. J., & Rojas, K. E. (2023). Re-Evaluating the Association Between Hormonal Contraception and Breast Cancer Risk. *Breast Cancer (Dove Med Press)*, *15*, 227-235. https://doi.org/10.2147/BCTT.S390664

Satterwhite, C. L., Torrone, E., Meites, E., Dunne, E. F., Mahajan, R., Ocfemia, M. C., Su, J., Xu, F., & Weinstock, H. (2013). Sexually transmitted infections among US women and men: prevalence and incidence estimates, 2008. *Sex Transm Dis*, *40*(3), 187-193. https://doi.org/10.1097/OLQ.0b013e318286bb53

Schneider, K., Byczkowski, T., & Reed, J. (2015). Treatment Compliance Among Asymptomatic Adolescents With Sexually Transmitted Infections. *JAMA Pediatr*, *169*(11), 1065-1066. https://doi.org/10.1001/jamapediatrics.2015.1627

Schroeder, H. A., Nunn, K. L., Schaefer, A., Henry, C. E., Lam, F., Pauly, M. H., Whaley, K. J., Zeitlin, L., Humphrys, M. S., Ravel, J., & Lai, S. K. (2018). Herpes simplex virus-binding IgG traps HSV in human cervicovaginal mucus across the menstrual cycle and diverse vaginal microbial composition. *Mucosal Immunol*, *11*(5), 1477-1486. https://doi.org/10.1038/s41385-018-0054-z

Shangase, N., Kharsany, A. B. M., Ntombela, N. P., Pettifor, A., & McKinnon, L. R. (2021). A Systematic Review of Randomized Controlled Trials of School Based Interventions on Sexual Risk Behaviors and Sexually Transmitted Infections Among Young Adolescents in Sub-Saharan Africa. *AIDS Behav*, *25*(11), 3669-3686. https://doi.org/10.1007/s10461-021-03242-8

Sharma, M., Rewari, B. B., Aditama, T. Y., Turlapati, P., Dallabetta, G., & Steen, R. (2021). Control of sexually transmitted infections and global elimination targets, South-East Asia Region. *Bull World Health Organ*, *99*(4), 304-311. https://doi.org/10.2471/BLT.20.254003

Sirovich, B. E., & Welch, H. G. (2004). The frequency of Pap smear screening in the United States. *J Gen Intern Med*, *19*(3), 243-250. https://doi.org/10.1111/j.1525-1497.2004.21107.x

Skaletz-Rorowski, A., Potthoff, A., Nambiar, S., Wach, J., Kayser, A., Kasper, A., & Brockmeyer, N. H. (2021). Sexual behaviour, STI knowledge and Chlamydia trachomatis (CT) and Neisseria gonorrhoeae (NG) prevalence in an asymptomatic cohort in Ruhr-area, Germany: PreYoungGo study. *J Eur Acad Dermatol Venereol*, *35*(1), 241-246. https://doi.org/10.1111/jdv.16913

Smith, G., Mysak, K., & Michael, S. (2008). Sexual Double Standards and Sexually Transmitted Illnesses: Social Rejection and Stigmatization of Women. *Sex Roles*, *58*(5), 391-401. https://doi.org/10.1007/s11199-007-9339-5

Sonnex, C. (1998). Influence of ovarian hormones on urogenital infection. *Sex Transm Infect*, *74*(1), 11-19. https://doi.org/10.1136/sti.74.1.11

St Lawrence, J. S., Montano, D. E., Kasprzyk, D., Phillips, W. R., Armstrong, K., & Leichliter, J. S. (2002). STD screening, testing, case reporting, and clinical and partner notification practices: a national

survey of US physicians. *Am J Public Health*, *92*(11), 1784-1788. https://doi.org/10.2105/ajph.92.11.1784

Staley, K., & Scharfman, H. (2005). A woman's prerogative. *Nat Neurosci*, *8*(6), 697-699. https://doi.org/10.1038/nn0605-697

Stamm, W. E. (1999). Chlamydia trachomatis infections: progress and problems. *J Infect Dis*, *179 Suppl 2*, S380-383. https://doi.org/10.1086/513844

Stanwood, N. L., & Bradley, K. A. (2006). Young pregnant women's knowledge of modern intrauterine devices. *Obstet Gynecol*, *108*(6), 1417-1422. https://doi.org/10.1097/01.AOG.0000245447.56585.a0

Stephens, R. S. (2020). Antigenic variation of Chlamydia trachomatis. In *Intracellular Parasitism* (pp. 51-62). CRC Press.

Stigum, H., Magnus, P., Veierod, M., & Bakketeig, L. S. (1995). Impact on sexually transmitted disease spread of increased condom use by young females, 1987-1992. *Int J Epidemiol*, *24*(4), 813-820. https://doi.org/10.1093/ije/24.4.813

Stone, K. M., Grimes, D. A., & Magder, L. S. (1986). Personal protection against sexually transmitted diseases. *Am J Obstet Gynecol*, *155*(1), 180-188. https://doi.org/10.1016/0002-9378(86)90108-0

Stuckey, B. G. (2008). Female sexual function and dysfunction in the reproductive years: the influence of endogenous and exogenous sex hormones. *J Sex Med*, *5*(10), 2282-2290. https://doi.org/10.1111/j.1743-6109.2008.00992.x

Studer, L. H., Aylwin, A. S., & Reddon, J. R. (2005). Testosterone, sexual offense recidivism, and treatment effect among adult male sex offenders. *Sex Abuse*, *17*(2), 171-181. https://doi.org/10.1177/107906320501700207

Su, L., Sun, Y., Ma, F., Lu, P., Huang, H., & Zhou, J. (2009). Progesterone inhibits Toll-like receptor 4-mediated innate immune response in macrophages by suppressing NF-kappaB activation and

enhancing SOCS1 expression. *Immunol Lett*, *125*(2), 151-155. https://doi.org/10.1016/j.imlet.2009.07.003

Suarez-Lledo, V., & Alvarez-Galvez, J. (2021). Prevalence of Health Misinformation on Social Media: Systematic Review. *J Med Internet Res*, *23*(1), e17187. https://doi.org/10.2196/17187

Sychareun, V., Thomsen, S., Chaleunvong, K., & Faxelid, E. (2013). Risk perceptions of STIs/HIV and sexual risk behaviours among sexually experienced adolescents in the northern part of Lao PDR. *BMC Public Health*, *13*, 1126. https://doi.org/10.1186/1471-2458-13-1126

Szekeres-Bartho, J., Barakonyi, A., Par, G., Polgar, B., Palkovics, T., & Szereday, L. (2001). Progesterone as an immunomodulatory molecule. *Int Immunopharmacol*, *1*(6), 1037-1048. https://doi.org/10.1016/s1567-5769(01)00035-2

Taneja, V. (2018). Sex Hormones Determine Immune Response. *Front Immunol*, *9*, 1931. https://doi.org/10.3389/fimmu.2018.01931

Tarasoff, L. A. (2021). A Call for Comprehensive, Disability- and LGBTQ-Inclusive Sexual and Reproductive Health Education. *J Adolesc Health*, *69*(2), 185-186. https://doi.org/10.1016/j.jadohealth.2021.05.013

Teal, S., & Edelman, A. (2021). Contraception Selection, Effectiveness, and Adverse Effects: A Review. *JAMA*, *326*(24), 2507-2518. https://doi.org/10.1001/jama.2021.21392

Teal, S. B., & Romer, S. E. (2013). Awareness of long-acting reversible contraception among teens and young adults. *J Adolesc Health*, *52*(4 Suppl), S35-39. https://doi.org/10.1016/j.jadohealth.2013.01.013

Teede, H., Tassone, E. C., Piltonen, T., Malhotra, J., Mol, B. W., Pena, A., Witchel, S. F., Joham, A., McAllister, V., Romualdi, D., Thondan, M., Costello, M., & Misso, M. L. (2019). Effect of the combined oral contraceptive pill and/or metformin in the management of polycystic ovary

syndrome: A systematic review with meta-analyses. *Clin Endocrinol (Oxf)*, *91*(4), 479-489. https://doi.org/10.1111/cen.14013

Teede, H. J., Tay, C. T., Laven, J., Dokras, A., Moran, L. J., Piltonen, T. T., Costello, M. F., Boivin, J., L, M. R., J, A. B., Norman, R. J., Mousa, A., Joham, A. E., & International, P. N. (2023). Recommendations from the 2023 International Evidence-based Guideline for the Assessment and Management of Polycystic Ovary Syndrome. *Fertil Steril*. https://doi.org/10.1016/j.fertnstert.2023.07.025

Teng, C. T., Liu, Y., Yang, N., Walmer, D., & Panella, T. (1992). Differential molecular mechanism of the estrogen action that regulates lactoferrin gene in human and mouse. *Mol Endocrinol*, *6*(11), 1969-1981. https://doi.org/10.1210/mend.6.11.1480183

Tjaden, P. G., & Thoennes, N. (2006). Extent, nature, and consequences of rape victimization: Findings from the National Violence Against Women Survey.

Trussell, J. (2011). Contraceptive failure in the United States. *Contraception*, *83*(5), 397-404. https://doi.org/10.1016/j.contraception.2011.01.021

Tsadik, M., Lam, L., & Hadush, Z. (2019). Delayed health care seeking is high among patients presenting with sexually transmitted infections in HIV hotspot areas, Gambella town, Ethiopia. *HIV AIDS (Auckl)*, *11*, 201-209. https://doi.org/10.2147/HIV.S210977

Tuddenham, S., Ravel, J., & Marrazzo, J. M. (2021). Protection and Risk: Male and Female Genital Microbiota and Sexually Transmitted Infections. *J Infect Dis*, *223*(12 Suppl 2), S222-S235. https://doi.org/10.1093/infdis/jiaa762

Van de Laar, M. J., & Morré, S. A. (2007). Chlamydia: a major challenge for public health. *Eurosurveillance*, *12*(10), 1-2.

Van Gerwen, O. T., Muzny, C. A., & Marrazzo, J. M. (2022). Sexually transmitted infections and female reproductive health. *Nat Microbiol*, *7*(8), 1116-1126. https://doi.org/10.1038/s41564-022-01177-x

van Teijlingen, E., Reid, J., Shucksmith, J., Harris, F., Philip, K., Imamura, M., Tucker, J., & Penney, G. (2007). Embarrassment as a key emotion in young people talking about sexual health. *Sociological research online*, *12*(2), 1-16.

Vedam, S., Stoll, K., Taiwo, T. K., Rubashkin, N., Cheyney, M., Strauss, N., McLemore, M., Cadena, M., Nethery, E., Rushton, E., Schummers, L., Declercq, E., & Council, G. V.-U. S. (2019). The Giving Voice to Mothers study: inequity and mistreatment during pregnancy and childbirth in the United States. *Reprod Health*, *16*(1), 77. https://doi.org/10.1186/s12978-019-0729-2

Ventola, C. L. (2015). The antibiotic resistance crisis: part 1: causes and threats. *P T*, *40*(4), 277-283. https://www.ncbi.nlm.nih.gov/pubmed/25859123

Verthelyi, D. (2001). Sex hormones as immunomodulators in health and disease. *Int Immunopharmacol*, *1*(6), 983-993. https://doi.org/10.1016/s1567-5769(01)00044-3

Walker, W. H. (2009). Molecular mechanisms of testosterone action in spermatogenesis. *Steroids*, *74*(7), 602-607. https://doi.org/10.1016/j.steroids.2008.11.017

Waller, J., McCaffery, K., Forrest, S., Szarewski, A., Cadman, L., & Wardle, J. (2003). Awareness of human papillomavirus among women attending a well woman clinic. *Sexually Transmitted Infections*, *79*(4), 320-322.

Wasserheit, J. N. (1994). Effect of changes in human ecology and behavior on patterns of sexually transmitted diseases, including human immunodeficiency virus infection. *Proc Natl Acad Sci U S A*, *91*(7), 2430-2435. https://doi.org/10.1073/pnas.91.7.2430

Weill, A., Dalichampt, M., Raguideau, F., Ricordeau, P., Blotiere, P. O., Rudant, J., Alla, F., & Zureik, M. (2016). Low dose oestrogen combined oral contraception and risk of pulmonary embolism, stroke, and myocardial infarction in five million French women: cohort study. *BMJ*, *353*, i2002. https://doi.org/10.1136/bmj.i2002

Westhoff, C. (2003). Depot-medroxyprogesterone acetate injection (Depo-Provera): a highly effective contraceptive option with proven long-term safety. *Contraception*, *68*(2), 75-87. https://doi.org/10.1016/s0010-7824(03)00136-7

Whitaker, D. J., & Miller, K. S. (2000). Parent-Adolescent Discussions about Sex and Condoms: Impact on Peer Influences of Sexual Risk Behavior. *Journal of Adolescent Research*, *15*(2), 251-273. https://doi.org/10.1177/0743558400152004

Whitley, R. J., & Roizman, B. (2001). Herpes simplex virus infections. *The lancet*, *357*(9267), 1513-1518.

WHO. (2018). Report on global sexually transmitted infection surveillance. *Southern Medical Journal*, *70*, 74.

Wingood, G. M., & DiClemente, R. J. (1997). The effects of an abusive primary partner on the condom use and sexual negotiation practices of African-American women. *Am J Public Health*, *87*(6), 1016-1018. https://doi.org/10.2105/ajph.87.6.1016

Wira, C. R., Rodriguez-Garcia, M., & Patel, M. V. (2015). The role of sex hormones in immune protection of the female reproductive tract. *Nat Rev Immunol*, *15*(4), 217-230. https://doi.org/10.1038/nri3819

Wong, T., Singh, A., Mann, J., Hansen, L., & McMahon, S. (2004). Gender Differences in Bacterial STIs in Canada. *BMC Womens Health*, *4 Suppl 1*(Suppl 1), S26. https://doi.org/10.1186/1472-6874-4-S1-S26

Workowski, K. A., & Berman, S. M. (2010). Sexually transmitted diseases treatment guidelines, 2010.

Workowski, K. A., Bolan, G. A., Centers for Disease, C., & Prevention. (2015). Sexually transmitted diseases treatment guidelines, 2015. *MMWR Recomm Rep*, *64*(RR-03), 1-137. https://www.ncbi.nlm.nih.gov/pubmed/26042815

Wu, Z., Xu, L., Tu, Y., Chen, R., Yu, Y., Li, J., Tan, M., & Chen, H. (2011). The relationship between the symptoms of female gonococcal infections and serum progesterone level and the genotypes of

Neisseria gonorrhoeae multi-antigen sequence type (NG-MAST) in Wuhan, China. *European journal of clinical microbiology & infectious diseases*, *30*, 113-116.

Yi, T. J., Shannon, B., Prodger, J., McKinnon, L., & Kaul, R. (2013). Genital immunology and HIV susceptibility in young women. *Am J Reprod Immunol*, *69 Suppl 1*, 74-79. https://doi.org/10.1111/aji.12035

Yu, J., & Hu, X. H. (2013). Inappropriate use of combined hormonal contraceptives for birth control among women of reproductive age in the United States. *J Womens Health (Larchmt)*, *22*(7), 595-603. https://doi.org/10.1089/jwh.2012.3955

Zheng, Y., Yu, Q., Lin, Y., Zhou, Y., Lan, L., Yang, S., & Wu, J. (2022). Global burden and trends of sexually transmitted infections from 1990 to 2019: an observational trend study. *Lancet Infect Dis*, *22*(4), 541-551. https://doi.org/10.1016/S1473-3099(21)00448-5

Zitzmann, M. (2020). Testosterone, mood, behaviour and quality of life. *Andrology*, *8*(6), 1598-1605. https://doi.org/10.1111/andr.12867

Zizza, A., Guido, M., Recchia, V., Grima, P., Banchelli, F., & Tinelli, A. (2021). Knowledge, Information Needs and Risk Perception about HIV and Sexually Transmitted Diseases after an Education Intervention on Italian High School and University Students. *Int J Environ Res Public Health*, *18*(4). https://doi.org/10.3390/ijerph18042069

APPENDIX

Sample Survey

Please answer the questions honestly and to the best of your ability.

1. Are you sexually active (within the last 6 months)?
    a. Yes
    b. No
2. What do you best sexually identify as?
    a. Heterosexual
    b. Homosexual
    c. Bisexual
    d. Transsexual
    e. Asexual
    f. Pansexual
3. How many sexual partners have you had in your lifetime?
    a. 0
    b. 1-5
    c. 5-15
    d. 15-30
    e. 30+
4. How many sexual partners have you had in the last 6 months?
    a. 0
    b. 1-5
    c. 5-15
    d. 15-30
    e. 30+
5. Do you use condoms during sexual intercourse?
    a. Always
    b. Sometimes
    c. Never
6. Are you currently on any other (non condom) form of birth control?
    a. Pills
    b. Patch
    c. IUD
    d. Injection
    e. Arm Implant
    f. Vaginal Ring
7. How long have you used your current method of birth control?
    a. Less than 6 months
    b. 6 months- 2 years
    c. more than 2 years
    d. I am not on any form of birth control
    e. I only use condoms as my method of birth control
8. Have you ever been on any other form of birth control?
    a. Please describe:
        i. What type/types (name/physical description):
            a. _____
        ii. When (start date):

a. _____

iii. How long were you on this method:

a. _____

9. When was your last visit to the OBGYN/ STI screening?
    a. Less than 6 months
    b. 6 months- 2 years
    c. more than 2 years
    d. never
10. At your last visit, what did you get screened for (please circle all that apply, if you are unsure, do not mark)
    a. PAP/HPV
    b. General vaginal STI check (Gonorrhea, Chlamydia, Trichomonas)
    c. HIV (blood test)
    d. Syphilis (blood test)
    e. HSV (blood test)
    f. HSV (lesion test)
    g. Other
        i. *Please describe* _____
11. On a scale from 1-10, how do you feel about discussing your sexual health/history with your medical professionals? (1 being extremely uncomfortable, 10 being completely comfortable)

    _____

    a. Why do you feel this way? _____
12. Have you ever been diagnosed with a sexually transmitted infection?
    a. Yes, I have been diagnosed with an STI by a medical professional
        i. If yes, please specify what type and any associated symptoms (place a check mark next to the appropriate infection)
            1. _____ Chlamydia
                a. _____
                b. Date of diagnosis: _____
            2. _____ Gonorrhea
                a. _____
                b. Date of diagnosis: _____
            3. _____ Syphilis
                a. _____
            4. _____ Herpes Simplex Virus
                a. _____
                b. Date of diagnosis: _____
            5. _____ Human Papilloma Virus
                a. _____
                b. Date of diagnosis: _____
            6. _____ Trichomoniasis
                a. _____
                b. Date of diagnosis: _____
            7. _____ Other (_____)
                a. _____
                b. Date of diagnosis: _____
    b. No, I have never been diagnosed with an STI by a medical professional
13. How would/did you feel about a positive STI diagnosis?

_____

a. If you HAVE been positively diagnosed previously, how did your medical professional make you feel about this diagnosis?

_____

14. Have you ever had any blisters, open sores, ulcers or cold sores on your mouth, genital, or anal regions?
    a. Yes
        i. If yes, please specify where _____
    b. No
15. Have you ever had any unusual vaginal secretion, burning urination, genital irritation, bloody urination, or pelvic pain?
    a. Yes
        i. If yes, please describe _____
    b. No
16. Do you experience any pain or discomfort during sexual intercourse?
    a. Yes
        i. If yes, please describe _____
    b. No
17. How would you classify your current STI knowledge and understanding?
    a. (1-10, 1 being little to no knowledge, 10 being the highest level)

    _____
18. What is your age group?
    a. 18-23
    b. 23-30
    c. 30-35
    d. 40+
19. When was your last STI educational intervention?
    a. Middle school or earlier
    b. High school
    c. College
    d. Never
20. How would you classify your current stress level?
    a. (1-10, 1 being none, 10 being the highest amount possible)

    _____
21. What is your current education level (baccalaureate 2nd year, PhD 3rd year, etc..) as well as your primary area of study/major?

    _____
    _____

22. Please list (by name or physical description) all current medications (including contraceptives) or supplements?

    _____
    _____
    _____
    _____
    _____