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Chlamydia Trachomatis and Neisseria Gonorrhoeae: Impact of Health Literacy on Prevalence

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This is to certify that the doctoral dissertation by

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has been found to be complete and satisfactory in all respects,
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Abstract

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by

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MSPH, Walden University, 2008

MSW, University of Missouri, 2004

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Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

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Public Health - Epidemiology

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Abstract

Millions of dollars are spent each year on preventing sexually transmitted diseases (STDs), yet the rates of chlamydia trachomatis (chlamydia) and neisseria gonorrhoeae (gonorrhea) infection continue to be high. Health literacy and its impact have been recognized in diabetes maintenance, control of hypertension, medical adherence, and reproductive health outcomes, yet no research has been conducted regarding the relationship between health literacy and chlamydia and gonorrhea prevalence. This study examined the relationship between health literacy scores and chlamydia and gonorrhea prevalence health literacy scores and reproductive health/STD knowledge, and reproductive health/STD knowledge and chlamydia and gonorrhea prevalence. Participants included 114 women over 18 years of age, who attended community health clinics in the northeastern United States. Health literacy was measured using the Rapid Estimate of Adult Literacy in Medicine instrument, and reproductive health/STD knowledge was assessed using a self-administered questionnaire. Data analysis revealed an inverse correlation between lower health literacy scores and an increase in gonorrhea and combined chlamydia/gonorrhea prevalence. Findings also revealed a positive correlation between health literacy scores and reproductive health/STD knowledge scores. The results of this study suggest that service providers should consider the use of health literacy level with targeted reproductive health and STD messages as a tool to empower clients, decrease the prevalence of chlamydia and gonorrhea, and increase positive reproductive health outcomes.

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Chapter 1: Introduction

Background

Health literacy, the "degree to which individuals have the capacity to obtain, process and understand basic health information and services needed to make appropriate health decisions" (U.S. Department of Health and Human Services [DHHS], 2003, p. 11-20), has been shown to have a significant impact on health outcomes of individuals in the United States. Lower health literacy levels have been linked to negative health outcomes from disease management and medical adherence to disease screening (Kutner, Greenberg, Jin, & Paulsen, 2006). Health literacy has been a notable concern in public health since the early 1980's (Kutner et al., 2006). This problem continues to be of national importance (Kutner et al., 2006). Based on the 2003 National Assessment of Adult Literacy, a study of 19,000 individuals in the United States, it was estimated that only 12% of the population have a proficient level of health literacy (Kutner et al., 2006). Lower levels of health literacy have been tied to chronic disease medical adherence issues (Hussey, 1994), decreased screening for illness and disease (Fortenberry et al., 2001), increased hypertension (Williams, Baker, Parker, & Nurss, 1998), and negative health outcomes regarding asthma (Mancuso & Rincon, 2006). In addition, low health literacy has been linked to less knowledge and understanding regarding sexually transmitted diseases (STDs) and women's reproductive health issues and their prevention (Rutherford et al., 2006). Using the framework of the health belief model (HBM), knowledge is one of the modifying factors influencing behavior change and is the foundation for understanding the consequences of behavior and personalizing the threats

of disease as well as the benefits of avoiding disease (Becker et al.1977). In a study of 48 women between the ages of 25 and 66, regarding the heart health of women, researchers found that increasing knowledge may be linked to increased perception of susceptibility with the greatest correlation shown in women with limited health knowledge at baseline assessment (Jones, Weaver, & Friedmann, 2007). It can, therefore, be deduced that without a base knowledge of possible negative health outcomes there can be neither perception of threat nor perception of benefit of avoiding the disease. Furthermore, health literacy has been correlated to decreased comprehension of health related materials. In a study of 127 women between the ages of 16 – 21, which looked at the relationship between health literacy, comprehension, and STD risk, researchers found that lower health literacy was correlated to less comprehension of written materials; however, they did not find a correlation between comprehension of materials and high-risk sexual activity (Needham, Wiemann, Tortolero, & Chacko, 2010). The above studies show health literacy as a factor in many areas of health and women's health, yet a review of the literature has revealed that limited research exists regarding women who attend community clinics that provide family planning services, chlamydia and gonorrhea prevalence, and health literacy.

According to the Centers for Disease Control and Prevention (CDC), in the United States, chlamydia is the number one reported bacterial STD, followed by gonorrhea (CDC, 2014a). In 2013, there were over 1,300,000 million cases of chlamydia and more than 309,000 cases of gonorrhea reported to the (CDC, 2014a). Further, the case rate for chlamydia. Further, the case rate for chlamydia in 2013 was 610.6 per

100,000 women and gonorrhea had a case rate of 94.1 per 100,000 women. In addition, the CDC (2014a), reported that the case rate for chlamydia is approximately two and one half times higher in women than in men. The case rate for gonorrhea was slightly higher in women at 106.5 per 100,000 women than in men at 94.1 per 100,000 men (CDC 2014a).

If compared to that of the human immunodeficiency virus (HIV), which is commonly viewed as a devastating illness of national significance, one finds the case rate of HIV infection in the United States to be 17.4 per 100,000 of the overall population (CDC, 2014b). Men being infected more often than women; however, the case rate of chlamydia is approximately 35 times higher than that of HIV, while gonorrhea is approximately 5.4 times higher than that of HIV. Though the disease burden is higher and the long term health effect can be severe, less attention is given to chlamydia and gonorrhea, which are both significant problems within the United States. It is estimated that as a result of these infections, approximately 100,000 cases of pelvic inflammatory disease (PID) occur each year (Sutton, Sternberg, Saidi, St. Louis, & Markowitz, 2005). PID can result in infertility, ectopic pregnancy, chronic pain, and other illnesses (Farquhar, 2005; Winter, Goldy, & Baer, 1998). According to Velebil et al. (1995), PID is the leading cause of gynecological hospital admissions. Chlamydial PID is associated with more severe tissue damage and long-term negative effects than that of gonococcal PID, which is often times more acutely severe (Miettinen, Saikku, Jansson, & Paavonen, 1986).

Problem Statement

Since health literacy can be correlated to many different health outcomes, it stands to reason that lower levels of health literacy can be correlated to specific disease incidence and prevalence. Studies have examined health literacy and STD screening (Fortenberry et al., 2001), as well as STD knowledge and understanding (Rutherford et al., 2006). Other studies have examined health literacy and other diseases such as asthma (Rosenfield et al., 2011; Thai & George, 2010), diabetes (Mancuso, 2009; Powell, Hill & Clancy, 2007; Sakraida & Robinson, 2009), and other diseases, such as brucellosis (Pappas et al., 2007), but again, no research that specifically examines health literacy and the rates of chlamydia and gonorrhea infection. None of the studies reviewed revealed an interplay between health literacy levels, knowledge of health or disease, and prevalence of STDs, namely chlamydia and gonorrhea. This lack of research does not negate the possibility for a correlation between the variables and that health literacy may play a role in the rates of transmission of chlamydia and gonorrhea, it simply means research is needed. This gap in the body of knowledge needs to be pursued in an effort to reduce the devastating effects of chlamydia complications in the United States. This study examined the correlation between health literacy scores and the self-reported case prevalence of chlamydia and gonorrhea and the correlation between health literacy scores and reproductive health and STD knowledge.

Nature of Study

This non-experimental cross-sectional study examined the relationship between health literacy scores (as determined using the Rapid Estimate of Adult Literacy in

Medicine [REALM]), reproductive health knowledge (determined through a self-administered survey), and self-reported history of chlamydia and gonorrhea in women who attended community clinics that provided some type of reproductive health services located in New York City and the five boroughs. It was hypothesized that lower health literacy scores would be inversely correlated to higher prevalence of chlamydia and gonorrhea. The hypothesis of this study was based on the literature and centered on the notion that preventive science-based messages can be adjusted to match appropriate health literacy abilities and thus be used more effectively. There was a correlation, between health literacy and gonorrhea and chlamydia and/or gonorrhea and chlamydia combined, which may lead to adaptations of preventive messages, and these modified messages may help decrease infection by chlamydia and gonorrhea in women attending community clinics that provide reproductive health services clinics across the country. This research was founded on the following research questions and hypotheses:

Research Question 1: Are health literacy scores associated with self-reported chlamydia and gonorrhea case prevalence among women attending community clinics that provide some form of reproductive health services?

Hypothesis 1: Health literacy as measured by the REALM is inversely correlated to the prevalence of chlamydia and gonorrhea in women receiving services at community clinics that provide some form of reproductive health services

Null Hypothesis 1: Health literacy as measured by the REALM is not correlated to the prevalence of chlamydia and gonorrhea in women receiving services at community clinics that provide some form of reproductive health services

Research Question 2: Are lower health literacy scores related to lower reproductive health and STDs knowledge?

Hypothesis 2: Lower health literacy scores are positively correlated with a lower knowledge scores regarding reproductive health and STDs.

Null Hypothesis 2: Lower health literacy scores are not correlated with a lower knowledge scores regarding reproductive health and STDs.

Research Question 3: Are lower reproductive health and STD knowledge scores related to an increased case prevalence of chlamydia and/or gonorrhea in women receiving services at community clinics that provide some form of reproductive health services?

Hypothesis 3: Lower knowledge scores regarding reproductive health and STDs is inversely correlated with chlamydia and/or gonorrhea case prevalence of women receiving services at community clinics that provide some form of reproductive health services.

Null Hypothesis 3: Lack of knowledge regarding reproductive health and STDs is not correlated with increased chlamydia and/or gonorrhea case prevalence of women receiving services at community clinics that provide some form of reproductive health services.

Research Question 4: Is there a point or health literacy score threshold, in which self-reported chlamydia and/or gonorrhea prevalence significantly increases?

Hypothesis 4: Using the REALM, a specific score threshold exists in which chlamydia and/or gonorrhea prevalence significantly increases.

Null Hypothesis 4: Using the REALM, no specific score threshold exists in which chlamydia and/or gonorrhea prevalence significantly increases.

Purpose

The purpose of this research project was to expand the body of knowledge on health literacy as it relates to STD prevention. This study investigated the possible correlation between health literacy and chlamydia and gonorrhea prevalence in women's health with a specific focus on women attending community clinics that provided some form of reproductive health services clinics. The intended outcome of this study was to assist medical providers in creating targeted messages for low health literacy patients, resulting in decreased incidence and/or prevalence of chlamydia and gonorrhea and their related negative consequences, such as infertility in women of child bearing age. Based on the HBM, it can be assumed that individuals who do not understand their own bodies, the diseases, and how disease impacts their bodies will not be able to change behavior, as they see no need to change.

Conceptual Ideas

The HBM is a cognitive psychological model and theory that is used to explain and predict health behaviors a person does or does not follow based on his or her attitudes and beliefs (Rosenstock, 1966, 1974a, 1974b). This model has been applied to diabetes (Charron-Prochownik et al., 2001), weight management (Daddario, 2007), exercise (Wilson et al., 2008), smoking (Mantler, 2013), vaccinations (Chen et al., 2011), STDSTD prevention (Adefuye, Kennedy, Nolen, & Sayad, 2011), and contraceptive programs (DiMatteo, Haskard, & Williams, 2007). It has also been used as the foundation

for interventions regarding health literacy (Conner & Norman, 1996). This model was first developed by Public Health Services psychologists in the 1950s and has been widely used since that time (Janz & Becker, 1984). The final version of the model now includes six key behavior change factors with the last being added in the 1980s (Downing-Matibag & Geisinger, 2009; Family Health International, 2004). The key factors involved in behavior change, according to the HBM, are perceived threats, perceived benefits, perceived barriers to change, cues to action, other factors/variables (knowledge, demographic, psychosocial, and cultural), and self-efficacy (Glanz & Bishop, 2010; Lajunen & Rasanen, 2004; Rosenstock, 1966, 1974a, 1974b; Rosenstock, Strecher, & Marshal, 1988; Rutter & Quine, 2002).

Each of the above mentioned factors impacts and affects the possibility of behavior change. None of the factors works independently of the others. According to the HBM, in order for behavioral change to occur the individual must first perceive that he or she is susceptible to the condition or disease (Rosenstock, 1966, 1974a, 1974b). In addition, the individual must believe that the disease or condition will negatively impact his or her life in a significant manner if left to run its natural course; this includes medical, social, and economic consequences (Rosenstock, 1966, 1974a, 1974b). The person must also carry out a decisional balance or cost benefit assessment and determine if the benefits of changing behavior outweigh the barriers to changing the behavior (Rosenstock, 1966, 1974a, 1974b). The individual must also have the self-efficacy to accomplish the behavior change sought (Rosenstock, Strecher, & Marshal, 1988). Self-

efficacy is not just wanting to change a behavior, but also believing that it can be completed or accomplished (Rosenstock, Strecher, & Marshal, 1988).

Simultaneously, as with the first components of HBM, there need to be cues or strategies which trigger the person to take action and may include the person suffering symptoms of a disease or condition, awareness of social media information, or receiving medical information provided by a medical expert (Rutter & Quine, 2002). Finally, impacting each of the above stated factors are the "other" factors including age, race, gender, ethnicity, culture, education, socio-demographics, and knowledge (Glanz & Bishop, 2010; Lajunen & Rasanen, 2004; Rosenstock, Strecher, & Marshal, 1988; Rutter & Quine, 2002).

It is within this "other" factors component, of the HBM, where health literacy may impact behavior change, within the knowledge, educational, and cultural variables specifically. Health literacy may impact how a person learns about the disease or condition, its severity and its threat to the person him/herself. As stated in the introduction, studies by Becker et al. (1977) and Jones et al. (2007), reveal that decreased knowledge of a disease or condition may be associated with a decreased perception of susceptibility. Again, without basic knowledge and an understanding of the information being presented, a person may not believe he/she is vulnerable or susceptible to a condition. It is this lack of knowledge, which may result in an individual not feeling that preventing a disease or condition is relevant to him/her, which results in a lack of behavior change. It is widely accepted that behavior change is a key component in the prevention of chlamydia, gonorrhea, and other STDs including HIV (Shafer, & Boyer,

1991). Disciplines, such as health education, are founded on the belief that health related behavior change results in healthier individuals (Glanz, Rimer, & Viswanath, 2008).

Operational Definitions

The following is an explanation of terms that are used throughout this study and are provided for clarification:

Health literacy: Health literacy is the ability of an individual to find, understand, and apply basic health information and services to make appropriate health decisions used by the (DHHS, 2009). This definition includes prose, documents, and quantitative literacy, or the ability to verbally and audibly process both health facts and information whether in text or numerical form, as in food labels (Kutner et al., 2006). In previous studies, a person with a score of between 0 and 44 has been designated as having a below-sixth grade educational equivalent (Davis, Croch, Long, & Green, 1993). For the purpose of this study, and in accordance with previous research, low health literacy is defined as an individual's lack of capacity to make adequately informed health decisions represented by a score of 0 to 44 out of 66 on the REALM instrument for assessing health literacy. In addition, individual REALM scores were also used to determine if a specific threshold exists regarding health literacy and an increased prevalence of chlamydia and gonorrhea. This study examined chlamydia and gonorrhea in relationship to health literacy. Chlamydia is described as an obligate, gram-negative interacellular organism that works parasitically to reproduce (Adderly-Kelly & Stephens, 2005). Chlamydia only reproduces within host cells and, in women, usually infects the cervix then spreads to the fallopian tubes and ovaries (Adderly-Kelly & Stephens, 2005). Chlamydia is a specific parasite of

squamocolumnar and columnar cells and is therefore found within the transitional zone and edocirvix (Sweet & Gibbs, 2009). Participants indicated via a written questionnaire if they have ever had chlamydia and if so how many times?

Gonorrhea: This study examined chlamydia and gonorrhea in relationship to health literacy. Gonorrhea is a fastidious, gram-negative diplocuccus (Nelson & Williams, 2007). Gonorrhea adheres to the mucosal cell lining of the genitourinary tract (Sweet & Gibbs, 2009). Once attached, it is transported to the epithelial cells and submucosal tissue (Sweet & Gibbs, 2009). Once established in the tissue, it releases endotoxin gonococcal lipolysaccharide, which results in damaged cells (Sweet & Gibbs, 2009).

Prevalence: This study examined the correlation between self-reported prevalence of chlamydia and gonorrhea and health literacy. Prevalence is defined as the total number of people who are infected with a disease divided by the total number of individuals in the specified population at a particular point in time (Nelson & Williams, 2007).

Health clinics: For this study, women were attending community clinic is a site that offers reproductive health services to the general public and uses funds to provide free or reduced-fee services to at least some clients.

Health literacy threshold: This study examined whether or not a point exists wherein health literacy levels, as measured by the REALM, reveal a significant increase in chlamydia and gonorrhea prevalence as reported by participants. It also examined whether a health literacy threshold exists at which scores on the reproductive health/STD knowledge significantly decrease.

Sexually Transmitted Disease knowledge: The knowledge of how chlamydia and gonorrhea are transmitted or prevented related to health literacy as measured by the reproductive health and STD knowledge survey.

Reproductive health knowledge: The knowledge of menstruation, fertility and pregnancy prevention related to health literacy as measured by the reproductive health and STD knowledge survey.

Assumptions, Limitations, Scope and Delimitations

This study focused on determining if a correlation existed between health literacy scores and chlamydia and gonorrhea prevalence. Further, it examined the possibility of a correlation between health literacy scores and knowledge as they are related to reproductive health and STDs. Other STDs were examined through this project, but were not used to answer the research questions or hypotheses. In addition, this study looked at a single component of the HBM, which is knowledge. This study only examined the prevalence of disease as compared to the health literacy scores of women over the age of 18 who attended community clinics that provided reproductive health services including referrals for pregnancy testing and specialized, reproductive health services.

A major assumption of this study was that health messages targeted at the health literacy level of individuals impact the effectiveness of STD prevention messages by health and health related service practitioners. It is also assumed that once a correlation between health literacy and STD prevalence were determined, those findings could ultimately impact how preventive messages are presented in women's reproductive health settings. In addition, it was assumed that health literacy impacts health far beyond those

studies that have previously been discussed and that have shown how health literacy impacts disease screening, medical adherence, and disease processes such as hypertension. A final assumption was that the data collected regarding chlamydia and gonorrhea were accurate and were representative of the United States female urban populations.

The delimitations of the study focused primarily on the population selected for this study and the diseases examined. Clinic patients under the age of 18 were not be used for this study in an effort to protect the rights and safety of those individuals. Due to the low number of male clients being served in community clinics providing some form of reproductive health service, they were excluded from this study. Although HIV, syphilis, and other STDs can be found in the population being studied, the incidence and prevalence of these diseases are limited and therefore were not the focus of this study.

The limitations of this study included the focus on English speaking individuals, not including STDs other than chlamydia and gonorrhea, and the generalizability of the findings to the United States female population. This study focused on women over 18 years of age and examined the possible correlation between health literacy and chlamydia and gonorrhea disease burden within a localized population. This study specifically focused on women over 18 years of age who were attending community clinics that provide some type of reproductive health services in a New York City borough. It examined women receiving services in community clinics that provide reproductive health services of some type and no other types of health care related clinics. Furthermore, this study did not examine the relationship of health literacy and chlamydia

and gonorrhea prevalence in non-English speaking individuals or those whom English is not their first language. This study also did not examine health literacy and disease burden in the general population or those attending STD clinics. Although not generalizable to women across the United States, the study findings may be used within community clinics that provide some type of reproductive health services to better serve those women who attend those clinics. In addition, participants in the study were not assessed for visual acuity or mental status. It is possible that both of these factors may have impacted a participant's ability to read and pronounce words on the REALM. Finally, this study did not examine the amount or degree of prevention education each participant received during their visit.

Significance of the Study

This study regarding health literacy will help to increase the body of knowledge concerning women over the age of 18 who receive services at community based clinics, chlamydia and gonorrhea transmission within a population, and the relationship between the two. This health literacy research can be used to change the way prevention messages are presented, and therefore, impact the effectiveness of STD prevention messages to women and specifically those attending community clinics that provide reproductive health services clinics. A decrease in chlamydia and gonorrhea rates would impact both individuals and society through long term health effects and costs related to the long term outcomes of both diseases. Decreased costs in this area could be redirected to other services such as pregnancy prevention and chronic disease prevention leading to additional progress made in those areas as they relate to women's health and wellness.

This study was designed, through its methodologies, to provide further insights into the chlamydia and gonorrhea epidemics occurring within the United States. In addition, it focused specifically on the diseases as they are found in New York City. Chlamydia and gonorrhea both have lasting health, economic, and social consequences, which could be impacted positively if a correlation was found and as a result of the findings led to the creation of both oral and written prevention messages that were used to target individual health literacy levels. Through the use of these study results, the rates and effect of STDs may be decreased and the wellness of the community with regards to STDs could be promoted. Further explanation of the health care impacts of health literacy and both chlamydia and gonorrhea will be explored in the next chapter.

Summary

This study examined the relationships between health literacy and chlamydia and gonorrhea prevalence; health literacy and reproductive health and STD knowledge; and reproductive health and STD knowledge and chlamydia and gonorrhea prevalence. This study also explored whether or not a health literacy threshold existed that was predictive of chlamydia and gonorrhea prevalence. The focus of the study was English speaking women over the age of 18 who attended one of three clinics, providing some form of reproductive health services, in the borough of Queens. One goal of the study was to inform the literature in a manner that would assist in empowering clients through their understanding messages. In addition, this study was conducted to explore the need for further research focusing on health literacy and STD prevalence.

Chapter 2: Literature Review

Introduction

A search of the literature revealed that health literacy has been correlated with health knowledge and understanding (Powell, Hill, & Clancy, 2007); disease outcomes (Berkman, Sheridfan, Donahue, Halpern, & Crotty, 2011; Nokes et al.2007; Peterson et al., 2011; Shaw, Huebner, Armin, Orzech, & Vavian, 2009); and adherence and disease screening (Kalichman et al., 2008; Kripalani, Gatti, & Jacobson, 2010; Morrow, Weiner, Steinley, Yourn, & Murray, 2007). Additionally, the literature revealed that research exists regarding community based family planning participants and chlamydia and gonorrhea (Han, Coles, & Hipp, 1997; Park, Arney, Creegan, Barandas, & Bauer, 2010); community family planning patients and health literacy regarding tool readability (Wells, Ruscavage, Parker & McArther, 1994); and community family planning patient's health literacy correlated to reproductive health knowledge (Hall, Castano, Stone, & Westhoff, 2010). The search of the literature revealed that only one study existed, the basis for this study, which examined community family planning patients providing reproductive health services, health literacy and reproductive health knowledge, with some suggestion of a relationship to chlamydia and gonorrhea prevalence (Rutherford et al., 2006). This Rutherford study (2006) was conducted in the United Kingdom with 505 women between the ages of 16 – 35 years. Though the research examined age of sexual debut, number of sex partners, use of contraception, and knowledge regarding STDs, it did not examine the relationship between health literacy, STD and reproductive health knowledge, and chlamydia and gonorrhea prevalence (Rutherford et al., 2006).

The literature search was conducted using the Walden Library databases including behavioral studies, education, health sciences and nursing, human services and social sciences, multidisciplinary, and dissertations databases. Specific search engines contained in the databases were Psych Info, Socio Index, Psych Articles, Sage Premier 2010, ERIC, ProQuest, CINAHL, Medline, Health and Medical Complete, Ovid, Annual Reviews, and Academic Search Complete. Searches of Google Scholar and general internet searches were also conducted using Google search engines. Terms researched included: *health literacy, literacy, adolescent development and sexuality, health literacy and family planning, family planning, reproductive health, survey instruments in health literacy*, and *survey instruments in reproductive health*. Other terms searched included *sexually transmitted infection and health literacy, gonorrhea and health literacy, chlamydia and health literacy, gonorrhea in New York, chlamydia in New York, gonorrhea in the United States, chlamydia in the United States, complications of sexually transmitted diseases*, and *cost of sexually transmitted disease*. These terms yielded the following review of literature.

Epidemiology

Chlamydia and gonorrhea continue to be national concerns. In the United States, over 1,401,906 cases of Chlamydia were reported last year (CDC, 2014a). Approximately 71% of those cases were in women (CDC, 2014a). In addition, 69% cases were in individuals below the age of 24 (CDC, 2014a). In the United States, over 333, 004 cases of gonorrhea were reported in 2013 (CDC, 2014a). Approximately 93.6% of all gonorrhea cases were in persons aged 15 - 44. Risk factors listed for these STDs include

age, race, and other demographic factors (CDC, 2014a). Health literacy, however, has not been discussed as being directly related to chlamydia or gonorrhea as a risk factor. Health literacy has been discussed as impacting other areas of health and screening (Kutner, Greenberg, Jin, & Paulsen, 2006). In the following section, information will be presented on STDs; at risk populations, primarily young adults; and health literacy.

Chlamydia and Gonorrhea: United States and New York

Chlamydia is the most commonly reported STD in the United States, followed only by gonorrhea (CDC, 2014a). In the United States, gonorrhea and chlamydia, are STDs reportable to the CDC, allowing researchers to track and monitor epidemiological trends and help prevent each of these diseases (CDC, 2014a). In 2013, there were a total of 1,401,906 reported cases of chlamydia and 333,004 reported cases of gonorrhea in the United States (CDC, 2014a). The rates for chlamydia represent an upward trend since the early 1990s (see Figure 1).

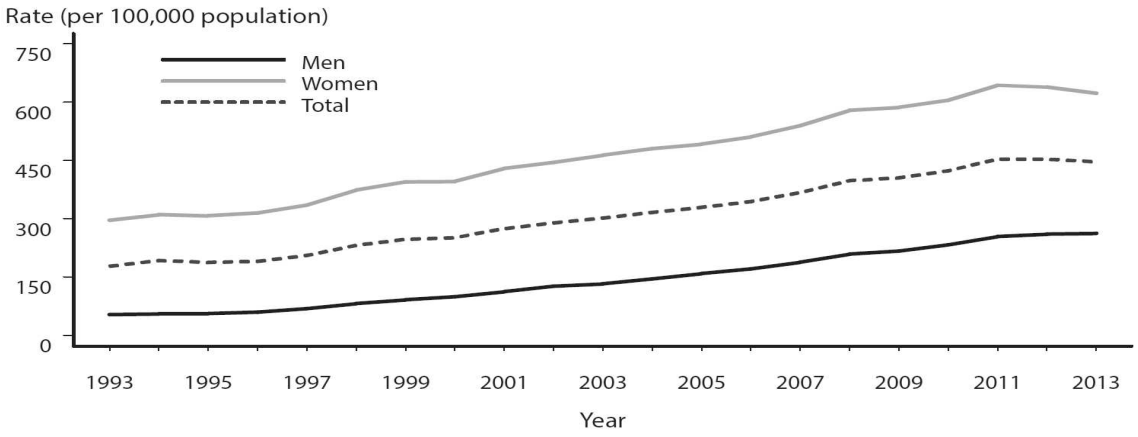

Figure 1. Chlamydia—Rates: Total and by sex: United States, 1993–2013. From *"*Sexually Transmitted Disease Surveillance 2013," By CDC, 2014. Atlanta, GA: U.S. Department of Health and Human Services. Reprinted with permission.

As stated previously, the CDC (2014a) reported that the majority of chlamydia and gonorrhea cases reported were in women. The case rate of chlamydia for women in 2014 was 623.1 per 100,000 of the population and gonorrhea had a case rate of 105.1 per 100,000 of the population (CDC, 2014a). For males, the case rates were 262.6 per 100,000 of the population and 130.8 per 100,000 of the population respectively (see Figure 2; CDC, 2014a). All the studies examined mentioned gender, age, and race, and revealed that women have the highest case rates for chlamydia and gonorrhea (CDC, 2014a).

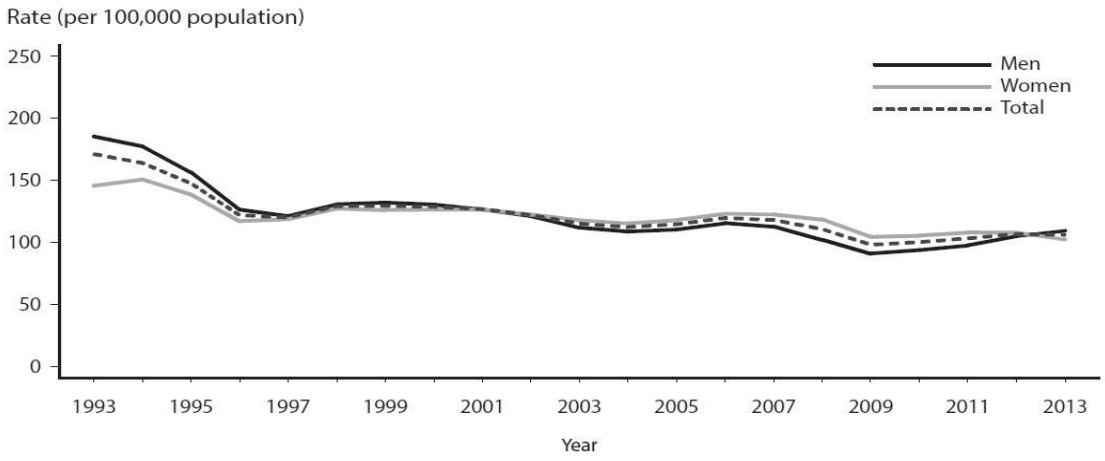

Figure 2. Gonorrhea - Rates: Total and by sex: United States, 1993–2013. From "*Sexually Transmitted Disease Surveillance 2013". By CDC, 2014.* Atlanta, GA: U.S. Department of Health and Human Services. Reprinted with permission.

Not only did women represent the highest prevalence of chlamydia and gonorrhea; non-White/Caucasian populations also represented the highest prevalence of the diseases. In all cases, the highest incidence occurs in African Americans with 6.4 times the rate of White/Caucasians for chlamydia (see Figure 3) and 12.1 times greater for gonorrhea (CDC, 2014a; see Figure 4). Other minority populations are also

disproportionately affected by both chlamydia and gonorrhea, including American Indians. A study of American Indian women showed that the prevalence was 13.35, representing prevalence five times higher than that of White/Caucasians (Dicker, Mosure, Kay, Shelby, & Cheek, 2008).

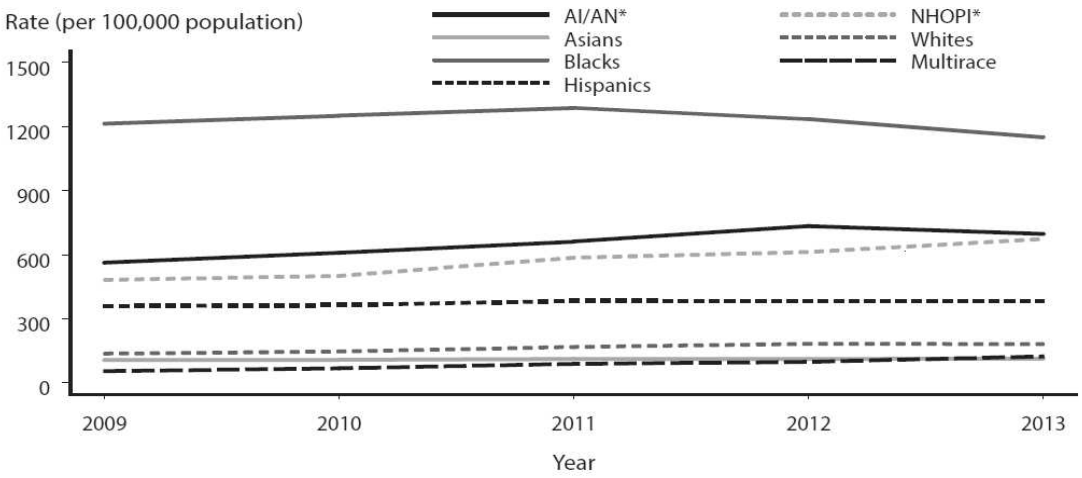

Figure 3. Chlamydia - Rates of Reported Cases by Race/Ethnicity, United States, 2009 – 2013. "*Sexually Transmitted Disease Surveillance 2013"*. Atlanta, GA: U.S. Department of Health and Human Services; 2014. Reprinted with permission.

In 2013, the majority of all new reports of STDs occurred in individuals between the ages of 15and 24(CDC, 2014a. Chlamydia was the most prevalent in females aged 20 to 24with a rate of 3,621.1 cases per 100,000 of the population followed by females ages 15 to 19with a case rate of 3,043.3 cases per 100,000 of the population (CDC, 2014a; see Figure 5). With regards to gonorrhea, the case rate for those aged 15 to 19, in 2013 was at 4,592.9 per 100,000 of the population and for those 20 to 24 years of age, the case rate was 541.6 per 100,000 population (CDC, 2014a; see Figure 6). Over the past decade,

numerous studies have been conducted regarding the prevalence and incidence of chlamydia and gonorrhea in adolescents (CDC, 2014a).

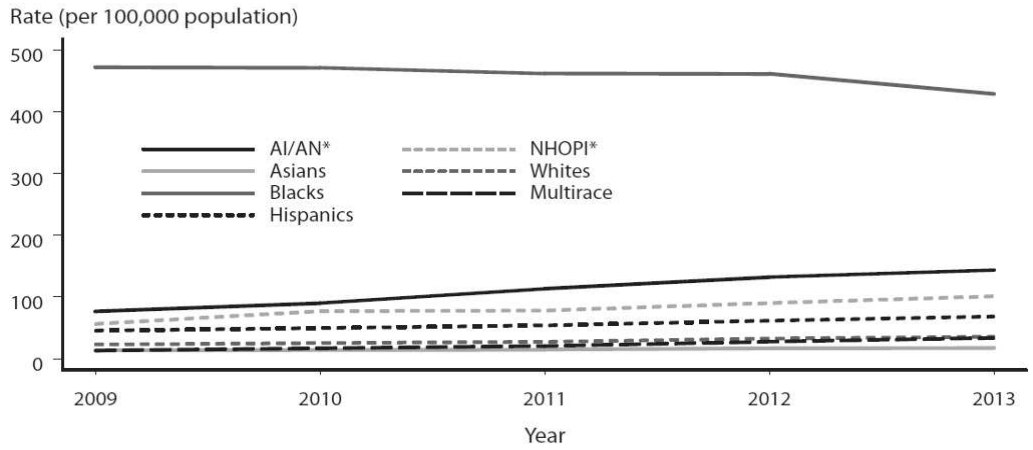

Figure 4. Gonorrhea - Rates of Reported Cases by Race/Ethnicity, United States, 2009 – 2013. "*Sexually Transmitted Disease Surveillance 2013"*. Atlanta, GA: U.S. Department of Health and Human Services; 2014. Reprinted with permission.

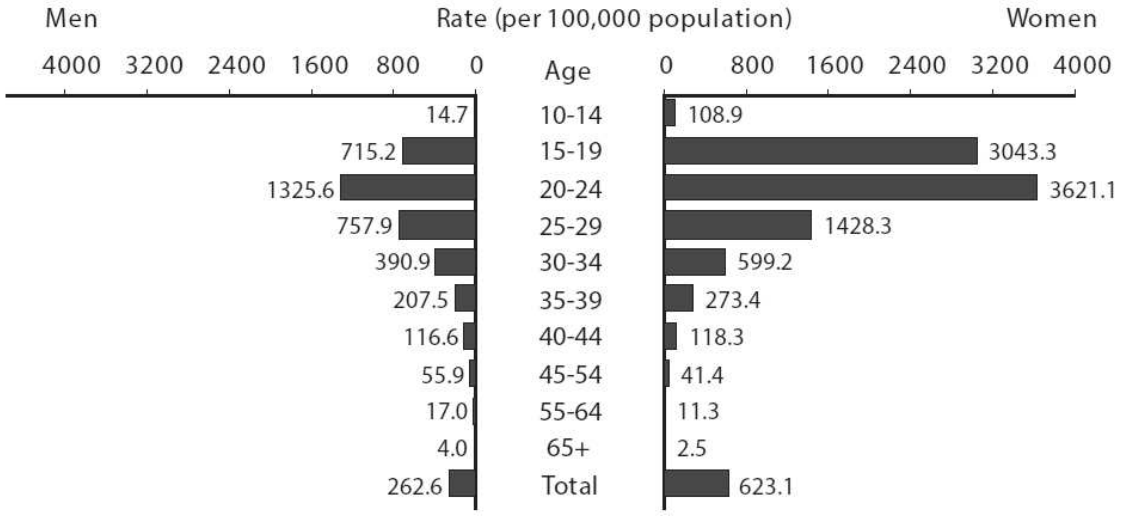

Figure 5. Chlamydia - Rates by Age and Sex, United States, 2013. "*Sexually Transmitted Disease Surveillance 2013"*. Atlanta, GA: U.S. Department of Health and Human Services; 2014. Reprinted with permission.

Homeless adolescents aged 13 to 20 revealed that chlamydia was present in 6.3% of the population examined (Noell et al.2000). Adolescents living in a large urban area were screened for chlamydia through family planning, STDSTD, and school-based clinics and were found to have an incidence of 29.1%. Overall, the incidence rate was 28.0 cases per 1,000 persons. (Burstein et al.1998).

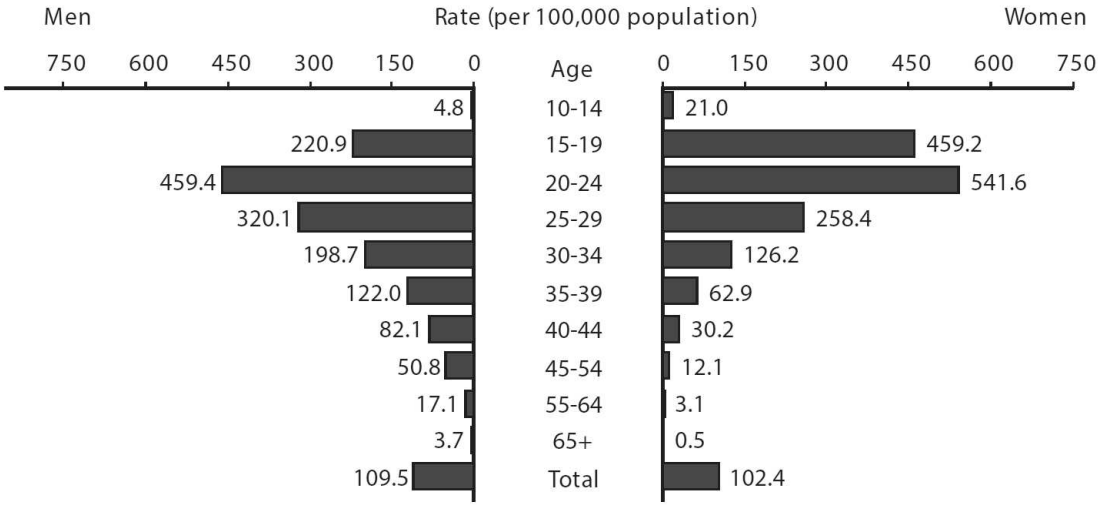

Figure 6. Gonorrhea - Rates by Age and Sex, United States, 2013. "*Sexually Transmitted Disease Surveillance 2013"*. Atlanta, GA: U.S. Department of Health and Human Services; 2014. Reprinted with permission.

A study of urban and rural clinics found that there was no difference in the prevalence of chlamydia in either setting and determined that only age was independently associated with chlamydia infection, with younger ages being directly correlated with the prevalence of chlamydia (CDC, 2014a). Adolescents and young adults under the age of 24 are clearly most at risk for chlamydia infection (CDC, 2014a). This is reinforced when looking at college students. College students under the age of 20 were found to have a

66% greater chance of being infected with chlamydia than students over 25 years of age (James, Simpson, & Chamberlain, 2008).

In addition, using age as a factor for women with chlamydia was echoed again in a study of inner city females which revealed an incidence of 31.2% in those below the age of 25 and 9.6% of females over the age of 25 (Burstein et al., 1998). This study of over 3,860 sexually active women also revealed that many women had a subsequent chlamydia infection between seven and 13.8 months based on the age grouping of below 25 years of age or above respectively. In addition, there were concerns regarding the coinfection of chlamydia and gonorrhea. A study of 303 adolescents conducted in an urban teen clinic revealed that almost four percent of the teens studied had cooccurring infections (Boyer, Sebro, Wibbelsman, & Shafer, 2006). Adding to the concerns of possible coinfection in adolescents and young adults is the possibility that coinfection with chlamydia may increase the colonization of gonorrhea (Vonck, Darvill, O'Connell, & Jerse, 2011) and may enhance the infection. In their research, Volck et al. (2011), discovered that in coinfected mice there was more colonization of gonorrhea than in those with either chlamydia or gonorrhea.

Considerable attention has been given to STD infections in adolescents and young adults as they appear to be more at risk from the infections than other age groups. From the above presented information, it is clear that chlamydia and gonorrhea affect women between the ages of 15 to 24 more than any other group. Adolescent and young adult knowledge regarding STDs and their own bodies may be linked in some way to these outcomes. When examining the statistics from the state of New York for 2010, it is

apparent that with a rate of infection over 511 per 100,000 of the population New York states ranks high with regards to chlamydial infections within the United States and for gonorrhea at a rate of 102.2 per 100,000 of the population (CDC, 2014a). The CDC (2014), ranked New York as having the 13th highest rate of infection for chlamydia and as having the 20th highest rate of infection for gonorrhea. As with other areas of the United States, the highest rates of infection for both chlamydia and gonorrhea, in the State of New York, can be seen in women between the ages of 15–24 (New York City Department of Health and Mental Hygiene [NYCDOHMH], 2014).

In New York City, in 2013, there were 58,098 cases of chlamydia reported with annual case rate of 888.1 per 100,000 population in women and 512.6 in men. The rate of infection in women was almost twice that for the entire state. In addition, there were 13,500 gonorrhea cases reported resulting in a rate of 110.42 per 100,000 population for women and 224.13 per 100,000 population for men regarding gonorrhea. Again the rate almost doubled that for the entire state (NYCDOHMH, 2014). Chlamydia is most prevalent in New York City among women and men ages 15 – 24 years of age. The highest number of new cases, in 2013, for women was reported in women ages 20 - 24 years of age while in men the highest number of cases was reported in those between the ages of 15 - 19 years of age. Women between the ages of 20 - 24 years of age, in New York City, had a chlamydia case rate of 3991.6, while men between the ages of 20 - 24 years of age had a case rate of 1931.8. These rates of infection reveal a substantial problem for both young men and women in the State of New York and specifically within New York City. Within New York City, the highest rates of infection for

chlamydia in women, for 2013, was reported most often in the borough of the Bronx with a case rate of approximately 1494 per 100,000 population. Queens's borough had a case rate of 649 per 100,000. Gonorrhea, in women, was most often reported in the borough of Brooklyn with a case rate of 913 per 100,000. Queens's borough had a case rate of 649 per 100,000. Gonorrhea in males was most often reported in the borough of the Bronx with a case rate of approximately 1569 per 100,000 population and Brooklyn borough with a case rate of approximately 1493 per 100,000 population (NYCDOHMH, 2014).

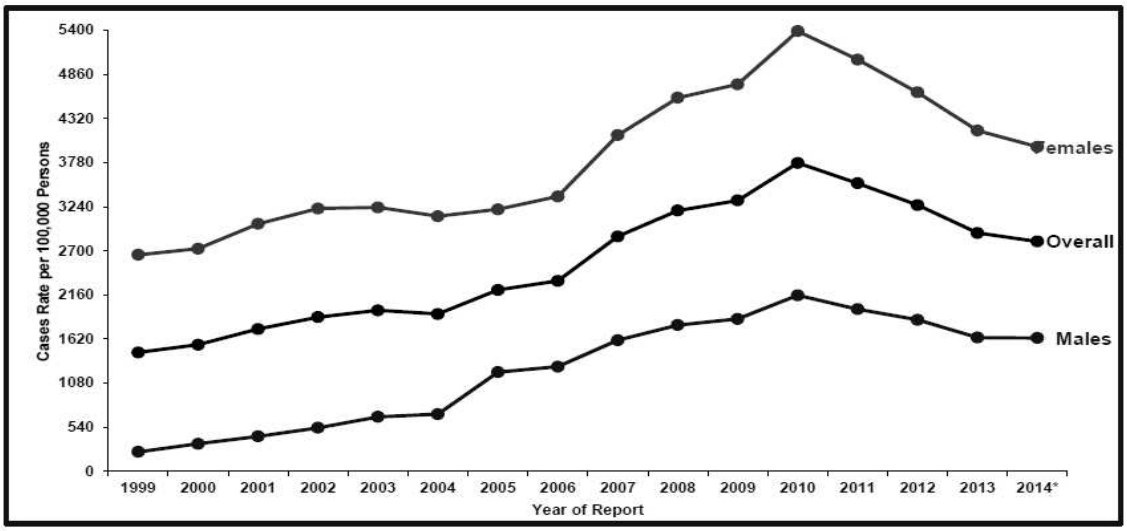

Figure 7. Chlamydia – Ages 15 to 24, New York City Area, 2013." *New York City Department of Health and Mental Hygiene. Bureau of Sexually Transmitted Diseases 4th Quarter Report, 2014.* New York, NY: New York Department of Health and Mental Hygiene; 2014. Reprinted with permission.

Gonorrhea is the second most reported STD in the New York City area. As with chlamydia the highest rates of infection can be seen in persons between the ages of 15 to 24 years. Women between the ages of 15 and 19 had a prevalence rate of 578.0 per

100,000 persons while males had a rate of 321.5 per 100,000 population. In women between the ages of 20 and 24 had a prevalence rate of 452.3 while men had a prevalence rate of 277.1 per 100,000 population (NYCDOHMH, 2014) (see Figure 7).

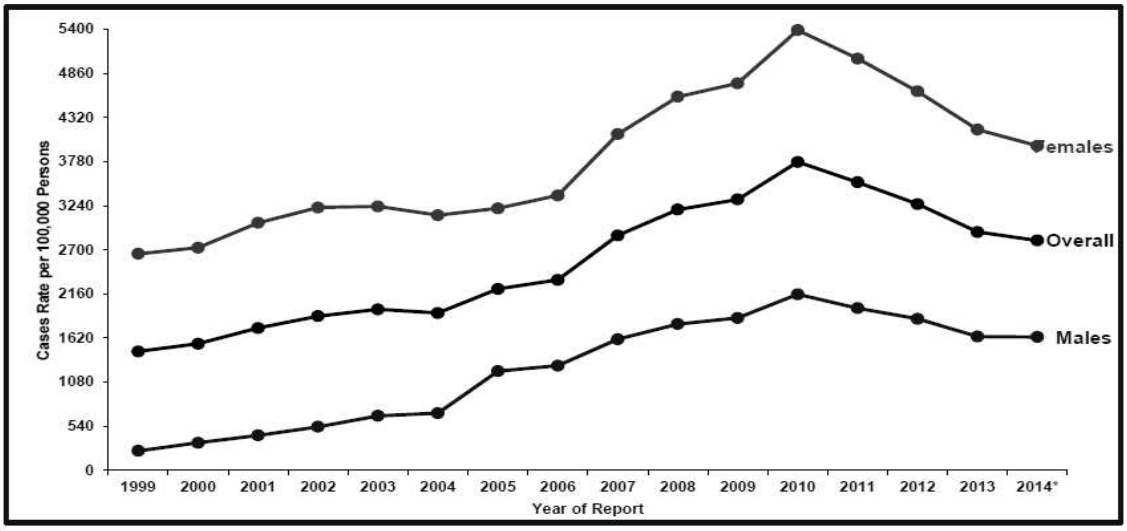

Figure 8. N. gonorrhoeae – Ages 15 to 24, New York City Area, 2013. "*New York City Department of Health and Mental Hygiene. Bureau of Sexually Transmitted Diseases 4th Quarter Report", 2014*. New York, NY: New York Department of Health and Mental Hygiene; 2014. Reprinted with permission.

Gonorrhea shows a shift in highest rate of infection by gender based on age group. The disease is more prevalent in women between the ages of 15 to 19 years while it is highest in men who are between the ages of 20 to 24 years of age (see Figure 8). This is unlike chlamydia, in which women have the highest rate of infection overall. The case rates reported in New York City represent the crisis surrounding new cases of both chlamydia and gonorrhea. The number of new cases combined with the potential for

clinical complications of both clearly expresses the need for adequate health literate prevention messages.

Complications of chlamydia and gonorrhea.

The main complication of both chlamydia and gonorrhea is pelvic inflammatory disease (PID) which can further result in ectopic pregnancy, infertility, and chronic abdominal/pelvic pain (Farquhar, 2005; Winter, Goldy & Baer, 1998). PID is an infection that results in inflammation of the upper genital tract concerning the fallopian tubes, ovaries and nearby structures (Ross, 2001). PID includes a large number of gynecological disorders including endometritis, oophoritis, pelvic peritonitis (Nelson & Williams, 2007), salpingitis, and parametritis (Hemhill & Kovach, 2009). Approximately 1,000,000 women annually are diagnosed with PID (Sutton, Sternberg, Saidi, St. Louis, & Markowitz, 2005). PID, as previously stated is the leading cause of gynecological hospital admissions according to a study conducted by Velebil et al., (1995). In addition, chlamydial PID results in more severe tissue harm and long-term negative health effects than that of gonococcal PID. Gonococcal PID is often more acutely severe than that of chlamydial PID (Miettinen, Saikku, Jansson, & Paavonen, 1986).

Ectopic pregnancy is one long term effect of chlamydia infection and PID. In a Norwegian study of over 20,000 women, a significant increase in ectopic pregnancy was observed in women who had at least one positive chlamydia test as compared to women with no history of chlamydia (Bakken, Skjeldestad, Lydersen, & Nordbo, 2007). In addition, the study found that the risk of ectopic pregnancy increased with the number of prior infections. Ectopic pregnancy in the United States occurs 19.7 times per every 1000

pregnancies. Ectopic pregnancy is the number one cause of maternal mortality for women in the first trimester of their pregnancy (Tenore, 2000). The complications of both chlamydia and gonorrhea infection are both serious and potentially life threatening.

Chlamydia and gonorrhea: Economical costs.

Not only do the complications of chlamydia and gonorrhea impact individual's health, but their financial status. It is estimated that medical costs from sexually transmitted diseases (STD) total over $13 billion dollars annually (Chesson, Blanford, Gift, Tao, & Erwin, 2004). In a study of 100,000 women ages 20 to 24 who had acquired PID, their average lifetime medical costs ranged from $1,060 to $3,180 (Yeh, Hook, & Goldie, 2003). In addition, the average lifetime costs for chronic pelvic pain was estimated at $6,350. The average lifetime costs for women who had an ectopic pregnancy was $6,840. It was also estimated that the lifetime costs for women with infertility problems was $1,270. Not only do the complications of chlamydia and gonorrhea impact a woman financially through medical costs but also productivity costs. Blanford and Thomas (2006) estimated, using the Monte Carlo method that productivity costs ranged from $130 to $649 dollars based on both untreated chlamydial infection and subsequent PID. Chlamydia and gonorrhea are both diseases that are focused on young adults as shown through the epidemiological profile. Costs and long term health effects of these diseases can impact individuals well beyond their young adulthood and throughout their lives. Sexual risk taking by young adults can only be impacted through understandable prevention messages.

Adolescent and Young Adult Sexuality and Sexual Risks

Adolescent and young adult development and sexuality are complex concepts. The adolescent development process is generally seen as the process between childhood and adult hood; however, there is a growing body of literature that suggests that sexual identity formation is not reached by the end of high school (Montemayor, Brown & Adams, 1985) but continues into the twenties (Valde, 1996). No single theory explains the sexual development or sexual identity formation process. Common theorists in adolescent development include Erik Erickson, Bernice Neugarten, and Gail Sheehy (Sharpe, 2003). Each of these theorists hypothesized that the developmental process is accomplished via a series of stages. Erickson (1968) put forth the concept of mastery through crisis as a person navigates eight distinct phases. Neugarten (1976) expressed her theory in terms of a social clock, while Sheehy (1974) expressed her theory in temporal constructs.

Erik Erickson's developmental theory is widely used and is therefore, the core of this section. His 8 stages of development and crisis negotiation include: infancy – trust verses mistrust; toddler – autonomy verses shame and doubt; preschool - initiative verses guilt; adolescence – identity verses role confusion; young adulthood – intimacy verses isolation; middle adulthood - generativity verses stagnation; and Senior– integrity verses despair (Erickson, 1968). According to Erickson, infancy lasts from, approximately, age 0 to one year; toddler lasts from two years to three years; preschool lasts from age four to six years; childhood from age seven to 12 years; adolescence from age 13 to 19 years; young adulthood from ages 20 to 24 years; middle adulthood from age 25 to 65 years;

and senior from age 65 year and beyond. Sexual development, according to Erickson focuses on the adolescent and young adulthood stages. In adolescents and young adults, the ego crises focus is on questions relating to who am I and am I loved. Montgomery (2005) using Erikson's theory examined the beliefs, behaviors and experiences of 473 adolescents. She discovered that older adolescents and those going through young adulthood had more dating experiences, believed they had been in love more often, and reported commitment-related beliefs than younger adolescents. In addition, her findings related females less often than males reported "love at first sight", and reported less times of being in love than males. Finally, greater intimacy was associated with stronger self-image, commitment-related beliefs, and a more developed sense of psychosocial identity. These beliefs, however, do not always translate into sexual behavior based on love.

Manning et al. (2006) discovered that more than one half of the sexually active adolescents studied reported having sexual partners they were not "dating" although over 33% of these hoped for more in the relationship in the future. In their study they discovered that over 25% had sex after just meeting the sex partner, 53.5% had known the person between one day and one month. Additionally, over 74% did not want this person to be a girlfriend or boyfriend. Participants reported that 36.9% of the time they were seeing someone else or 21.3% their partner was seeing someone else. In terms of sexuality, Erickson's stage of young adulthood and the conflict between intimacy verses isolation goes beyond the belief in love towards physical manifestations of sexuality in general. From the research, the stages of development seem to apply to intimacy and

love-based sexual contact, but does not completely explain the sexual practices of adolescents and young adults.

In a qualitative study of 79 "young adults", ages 18 to 23 years, females reported more often than males that their male partners placed emphasis on sex and pressured them into having sex (Morgan & Zurbriggen, 2007, p. 523). A female participant of the study stated, "He always talked about like, you know, you can show your love through sex and all that kinda stuff you now, and that it's just an important part of our relationship to him." Another related, "He loved sex….He made it very clear that that's what he liked." Finally, one female stated "Well, we were both really young so we wanted to wait, and since he's a guy, he wanted to [have sex] earlier than I did….I probably had sex earlier than I would have wanted to…" (Morgan & Zurbriggen, 2007, p. 523). Each of these statements expressed the desire for relationship by a woman and the discordant desires, at times, between females and males as they navigate the young adult stage of Erikson's theory. This push towards having sex may increase the risks of STD transmission in women between the ages of 15 and 24. Young adult females may, as a result of their desire for intimacy, utilize protective barriers less than those who do not desire intimacy. Specifically, desire for intimacy is correlated with inconsistent condom use and increased risk of STDs (Foulkes, Pettigrew, Livingston & Niccolai, 2009; Sadovszky, Vahey, McKinney & Keller, 2006). Other risk factors for STDs have included low socioeconomic status, history of abuse, exposure to violence, and depression (Buffardi, Thomas, Holmes, & Manhart, 2008).

Research on STDs and HIV has yielded other aspects of human sexuality and specifically healthy human sexuality opening up other variables and avenues that may impact why STDs are spread most often in adolescents and early adulthood. The sexual health model postulates that there are 10 key aspects of human sexuality and development (Robinson, Bockting, Rosser, Miner & Coleman, 2002). Those aspects are the ability to talk about sex, cultural and sexual identity, understanding of sexual anatomy, sexual health care, overcoming barriers to sexual health (abuse, substance use, etc.), body image, normalization of masturbation and fantasy, positive sexuality, intimacy and relationships and finally spirituality. Many of the studies previously cited, represented various aspects of this model; there are four aspects of this model that relate directly to health literacy and its potential impact on STD transmission. They are the knowledge of sexual anatomy and sexual health care, ability to talk about sex, and the adolescent or young adult's culture and sexual identification.

The ability to talk about sex and sexuality includes such areas as being able to talk to partners, the ability to talk about sexual health in schools, and ability to talk to parents about sex (Robinson et al., 2001). Culture and sexual identification continues from the ability to talk about sex and sexuality. Culture can impact an adolescent's concept of sexuality, for example, the desires for African American women to remain chaste as based on historical messages from slavery (Wyatt, 1997). Knowledge of sexual anatomy and functioning deals with not only the text book explanation biological functioning, but deals with an individual's understanding of what healthy sexual functioning is with regard to his/her body. This concept of knowing sexual anatomy and functioning directly

relates back to an adolescent or young adult's ability to communicate to both their partners (Ehrhardt, Yingling, Zawadzki, & Martinez, 1992) and health providers (Bockting & Forberg, 1992). This then leads to the final factor that can be linked directly to health literacy and STDs, sexual health care. An adolescent's or young adult's ability to practice safer sex, seek out health care for routine and acute care is based on his/her knowledge and understanding of the components of a medical visit, what is being discussed, and how it directly impacts the individual. Although, the sexual health model and studies presented examine various factors that impact HIV and STD transmission, each of the studies mentioned failed to expressly address a possible correlation between young women, health literacy, and the understanding of health outcomes.

Women's Health and Family Planning/Reproductive Health

Family Planning Clinics, as defined by the Department of Health and Human Services (DHHS), Title X program, are those clinics that "provide individual's with comprehensive family planning and related preventive health services" which includes "access to contraceptive services, supplies and information" (DHHS, 2008). For this study clinics that provide any form of reproductive health were considered viable data collection sites. In addition, sites that provide referrals to direct reproductive health services providers were also included.

Legislation.

Title X legislation was first enacted on December 24, 1970 under Public Law 91 – 572 and referred to commonly at that time as the "Family Planning Services and Population Research Act of 1970" (DHHS, 2008). The legislation had eight declared

purposes, established the Office of Population Affairs, and established the funding for the activities of the Office of Population Affairs. The legislation continues to guide the practices conducted within reproductive health clinics.

Epidemiological profile.

According to the Office of Population Affairs (Fowler, Lloyd, Gable, Wang, & Krieger, 2015), over 4.1 million patients were served in 2014 by Title X funded family planning clinics, of those 91% were women. Of those served, 21% were African-American, 54% White/Caucasian, five percent reported more than one race and % were from other races. Thirty percent self-identified as Hispanic. Individuals who did not report their race or their race was not reported by the funded agencies accounted for 16%. In addition, a majority of those served, 28% percent were between the ages of 20 and 24 years of age. Over 18% were between the ages of 15 and 19 years of age while an additional 22% were between the ages of 25 years to 29 years. From this population, in 2010, Title X clinics conducted over 4.8 million chlamydia/ gonorrhea tests. In 2013, 13% of Title X family planning users were reported as having Limited English Proficiency (Fowler et al., 2015).

According to the Guttmacher Institute (2008), approximately 4,352,810 women in New York who are in need of supplemented family planning and reproductive health services as their incomes fall within 250% of poverty. The poverty threshold for a single individual, according to the United States Census Bureau is $10,000. For a household of 2 the threshold is $14,051. Of those women served by Title X funded family planning clinics, 1,392,400 were Non-Hispanic White/Caucasian, 440,410 were African-American

and 453,530 were Hispanic. Family planning serves a large number of women who are at risk of contracting chlamydia and / or gonorrhea.

Health Literacy

As stated previously, health literacy is the "Degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions" (DHHS, 2003, p. 11-20). This definition has been utilized in other studies such as that by White et al. (2008), and thus has become the standard definition for use. This definition includes prose, document, and quantitative literacy (Kutner et al., 2006) or the ability to verbally and audibly process both health facts and information whether in text or numerical form (i.e. food labels). According to Baker (2006), the increased ability to understand health related information should result in better health outcomes. . It stands to reason that a person's ability to read and understand prescriptions, disease conditions, and modes of transmission should relate to his/her ability to protect him/herself from STDs and HIV. Taking this concept one step further, it can be hypothesized that lower health literacy scores, as measured by the REALM-R, may be correlated with lower reproductive health knowledge (Rutherford, et al., 2006), increased Emergency Contraception use, and increased rates of STDs (Fortenberry et al., 2001).

United States – Overall situation

Health literacy as a whole in the United States is a significant issue. Kutner et al. (2006), used a 500 point scale in their national survey to determine the prevalence of health literacy. For them a score using prose, document, and quantitative measurements

between 310 – 500 represented a proficient level; 226 - 309 an intermediate level; 185 – 225 a basic level; and 0 – 184 a below basic level of health literacy. For Kutner et al. (2006), a proficient level of scoring indicated that an individual could read lengthy, complex texts as well as synthesize information, locate information in dense, complex documents, and locate quantitative information while using it to solve multi-step problems.

A score at an intermediate level indicated that the individual could read and understand moderately dense less commonplace texts as well as being able to summarize the purpose, locate information and make simple inferences, and locate less familiar quantitative information to solve problems when the answer is not inferred. A basic level score indicated that the individual could read and understand commonplace text, understand simple documents, and locate easily identifiable quantitative information and complete one step mathematical calculations when it was inferred. The below basic score indicated that an individual could locate easily identifiable information in short commonplace text, follow instructions in a simple document, and could locate numbers using them to complete simple mathematical equations. This study was representative of the over 19,000 individuals, over the age of 16, in both households and prisons across the United States. The findings revealed, over 53% of U.S adults have an intermediate level of health literacy and only 12% are proficient. In contrast, 22% are believed to have a basic health literacy ability and 14% have what is classified as a below basic level of health literacy (Kutner et al, 2006).

Tests used to measure health literacy.

In addition to the scale used in this national survey, there are other tests that determine health literacy. These tests include the Test of Functional Health Literacy in Adults [TOFHLA] (Parker, Baker, Williams, & Nurss, 1995), Newest Vital Sign [NVS] (Weiss et al., 2005), Wide Range Achievement Test – Revised [WRAT-R] (Bass, Wilson, Charles, & Griffith, 2003), and the Rapid Estimate of adult Literacy in Medicine [REALM] (Davis, Long, Jackson, Meyeaux, George, Murphy, & Crouch, 1991). The test vary in length and in the time it takes to administer each one.

The TOFHLA is a 36 question multiple choice survey. This test specifically looks at an individual's reading comprehension. It was tested on 256 English speaking and 249 Spanish speaking patients (Parker et al., 1995). Within this study the TOFHLA was compared to the REALM and WRAT-R and found to be a valid and reliable indicator of health literacy and showed good correlation with both tests (correlation coefficient .74 WRAT-R and .84 REALM. In addition to the TOFHLA, another commonly used test of health literacy is the Newest Vital Sign.

The Newest Vital Sign was validated in a study of 250 English speaking and 250 Spanish speaking participants. Individuals were administered the nutrition label based six question test as well as the TOFHLA. The Newest Vital Sign was estimated to take three minutes to administer. The tool was found to be reliable and valid as compared to the TOFHLA with a coefficient of .76 for the English version and .69 for the Spanish version (Weiss, et al., 2003). Researchers deemed it a useful quick screening tool for health literacy. Using the TOFHLA, Baker et al. (1997), determined that health literacy is

associated with self-reported levels of health and is more accurate a measure than years completed in school. Their findings were later supported by a qualitative study by McKague and Verhoef (2003). Additionally, other studies have consistently shown the correlation between health literacy levels as they relates to disease screening, medication adherence and patient understanding of health related knowledge. The Newest Vital Sign did not, however, correlate as high as the TOFHLA, WRAT-R and REALM when each was tested for validity.

The WRAT-R and REALM are the most similar tests as they each focus on pronunciation of words or letters. The WRAT-R is a 57-question test which focuses on both word and letter pronunciation. It takes approximately eight minutes to administer and has a higher response burden (Bass et al., 2003). The REALM is estimated as taking five to six minutes to administer. The REALM is a 66-question test and is further discussed in Chapter 3. Both the REALM and WRAT and widely used within the health care community (Bass et al., 2005).

The REALM-R is a shortened version of the REALM taking two minutes to administer. This test consists of an eight word pronunciations. The REALM-R correlated well with the WRAT-R (correlation coefficient of .91) when administered to 157 patients (Bass et al., 2003). The REALM-R, however, has not been tested against the REALM or TOEFHLA. The researchers and creators of the tool classified it as promising, but stated that more research was needed.

Each of these tools discussed have been used in various studies to demonstrate the validity of each tool and to express the discrepancies within the health care system as it

relates to health literacy. Using these tests patient health literacy can be determined prior to service provision. Of the tests presented above, the REALM is more rapidly administered (taking five – six minutes) than the other tools; is widely used and recognized; and has been proven to be valid and reliable. Though the REALM-R is a shorter version of the REALM, it has not been validated using the two most commonly used methods of testing health literacy the REALM and TOEFHLA; therefore, it will not be used for this research.

Health literacy, adherence and negative health outcomes.

For patients with chronic diseases, inadequate health literacy has impaired ability to understand medical devices and advice for things such as diabetes or hypertension (Williams, Baker, Parker, & Nurss, 1998). This can be identified regarding the understanding of medication by the elderly (Hussey, 1994). It can be observed in those seeking STD care (Fortenberry et al., 2001). It can also be seen in those infected with HIV (Servellen et al., 2003; Servellen et al., 2005; Fourney & Williams, 2003).

Williams et al. (1998), discovered, by using an instrument of their own construction, that of the 402 participants with hypertension 49% had inadequate health literacy, 12% marginal health literacy and 39% adequate health literacy. Of the 114 participants with diabetes, 44% had inadequate health literacy, 11% marginal health literacy, and 45% adequate health literacy. Of those with inadequate health literacy, the researchers found that medical compliance was significantly related to knowledge and health literacy levels. Asthma outcomes and compliance are also related to health literacy (Mancuso & Rincon, 2006). In a study of over 175 patients, for four years, less health

literacy, as measured by the TOFHLA, was directly related to worst physical condition and more emergency room visits for asthma. Patients with less health literacy were less likely to discuss their care with providers (Mancuso & Rincon, 2006). In addition, Bennett et al. (1998) found that those with poor literacy skills presented with advanced stages of prostate cancer than those with higher levels of health literacy as determined by the REALM. Similar findings were discovered concerning delayed diagnosis of HIV based on health literacy measured by the TOFHLA (Mayben et al., 2007). Warfarin adherence has also been related to health literacy (Fang, Machtinger, Want, & Schillinger, 2006). In addition to Warfarin, as stated above, HIV medical adherence has also been linked to health literacy levels (Paasche-Orlow et al., 2006; Van Servellen, Brown, Lombardi, & Herrera, 2003; Van Servellen et al., 2003; Van Serellen et al., 2005; Waite, Paasche-Orlow, Rintamaki, Davis, & Wolf, 2008).

Health literacy and screening for disease.

In addition to impaired medical adherence and negative health outcomes, health literacy has been linked to disease screening reluctance or refusal. HIV test reluctance can be a result of multiple factors; one of these factors is low level of health literacy. In their study, Barragan et al. (2005) discovered that health literacy levels can be used as a "predictor for HIV testing acceptance" (p. 425). Lower levels of health literacy can be due to multiple factors; one includes being a non-native English speaker. A study of Latina immigrants in New York City found that the lower the health literacy level, as measured by the TOFHLA in Spanish, the less likely women were to have had a cervical screening test within the recommended time period or ever (Garbers & Chiasson, 2004).

One point brought up in many of the studies cited regarding chronic care and STDs is that patient knowledge is impacted negatively by low health literacy levels. This holds true for HIV (Wolf et al., 2004) and family planning (Gazmararian, Parker, & Baker, 1999; Rutherford, 2006). Patients in both the Rutherford and Gazmararian et al. studies did not score well on items similar to knowing their own bodies, about the medications they were using, or health related items such as when they were most likely to get pregnant during their menstrual cycle.

Health literacy: Knowledge, understanding, and reproductive health.

Throughout the studies mentioned above, much of the focus was on an individual's ability to gain, understand, and apply knowledge regarding health related issues. One study, the foundation of this research study and mentioned in previous chapters, highlights the impact of health literacy in family planning clinic users. In a study of 505 patients at a family planning clinic in the United Kingdom, Rutherford et al. (2006) found that health literacy could be correlated to both reproductive health knowledge and sexual behavior. Their findings revealed an earlier age of sexual debut, a lack knowledge regarding the most likely time a woman is fertile during her menstrual cycle, and a decreased ability to correctly identify which STDs can be transmitted via oral and anal intercourse. Through this study and those presented previously, health literacy has been shown to impact a large number of health related issues, however this is not the case with all areas of health care and specifically family planning/reproductive health.

Health literacy: Not always a factor

The one area where health literacy was not seen as a factor in family planning specifically was the use of oral contraceptives. Researchers found that there were other factors that related to missed pills and doses of oral contraceptives such as side-effects (Davis et al., 2006). So to say all health related outcomes can be tied to health literacy would be erroneous; however, the literature has not provided adequate indication, at this point, of what areas are or are not impacted by health literacy. As shown in the literature, health literacy can be correlated to many negative health outcomes and patient adherence. In that health literacy, however, has not been linked directly to disease incidence, there is the potential that there is not a correlation between the two variables.

Gaps in the Literature

As shown through the literature reviewed above, health literacy impacts multiple areas of healthcare ranging from chronic care through sexually transmitted infection screening to reproductive healthcare. The literature provides information on reproductive health and health literacy, chronic care and health literacy, HIV and health literacy and even sexually transmitted diseases and health literacy. However, there is limited information that directly looks at reproductive health knowledge, pregnancy prevention methods, STD screening, and knowledge, and health literacy. The research reveals that there is need for more research concerning health literacy and reproductive health in combination with STDs.

Conclusion / Summary

When looking at the studies on health literacy a significant issue surrounds it and health related knowledge and behaviors. Much research is still needed in this area; however, a few solutions have been suggested. They include developing materials which meet the needs of patients attending clinics whether private practice, family planning (Wells, Ruscavage, Parker, & McArthur, 1994) or an HIV clinic. In addition, one proposed solution is to utilize screening tools, such as the REALM, WRAT, New Vital Sign, or TOHFLA, to determine a patient's health literacy level and communicate with that patient on his/her level (Weiss et al., 2005). Using these findings, providers can offer patient specific information, materials, and health care, thereby increasing a patient's ability to control his/her own wellness and health decisions. In order to better assist the field in developing solutions to enhance health outcomes, this study used the REALM to examine if health literacy was related to chlamydia and gonorrhea prevalence, and if health literacy was related to sexual and reproductive health knowledge. It also investigated whether or not a threshold exists regarding chlamydia and gonorrhea increased prevalence and decreased knowledge. In order to examine the correlations between the variables, two instruments were used and are described in the next chapter.

Chapter 3: Method

Introduction

As revealed previously, chlamydia and gonorrhea are both significant issues in the United States and can result in serious lifetime complications, such as infertility. In addition, health literacy has been shown to impact health outcomes relating to areas ranging from diabetes to HIV medical adherence (Williams et al, 1998; Hussey, 1994). Therefore, building on the research regarding the further impact of health literacy and negative outcomes, this study examined the possible correlation between health literacy and chlamydia and gonorrhea prevalence. If an inverse correlation was discovered, it was assumed as stated above, that it may be used to inform preventive practice for STDs in an effort to ultimately decrease the incidence and prevalence of STDs in the United States. Therefore, in an effort to determine the prevalence of chlamydia and gonorrhea as they are related to varying levels of health literacy, women of child bearing age were surveyed and a REALM assessment was conducted. The resulting data were analyzed to determine if the variables were correlated. The population and method for this research project is detailed in this chapter. This chapter also describes the sample size, the population to be studied, how the data was collected and analyzed, and how participants' protection was taken into consideration.

Research Design

The research design for this study was based on the family planning/reproductive health and health literacy study conducted in the United Kingdom by Rutherford et al. (2006). One factor not explored by Rutherford et al., (2006) was the possible correlation

between lower health literacy and the prevalence of chlamydia and gonorrhea. The purpose of this non-experimental cross sectional study was to explore the relationship between health literacy scores and the prevalence of chlamydia and gonorrhea in women attending community-based health clinics providing some type of reproductive health services in an urban community. Thee clinics in my study were located within the five boroughs of New York City and were community-based health clinics providing some type of reproductive health services. To be included, these centers needed to provide services to women in need of services, which included those of varying income levels and insured and underinsured or uninsured women of child bearing age. The study involved collecting two different forms of survey data from women attending urban community-based health clinics providing some form of reproductive health services. The surveys administered include the REALM, used in the Rutherford et al. (2006) study, as well as an adapted reproductive health knowledge assessment. The REALM assessed the health literacy levels of each participant which was then analyzed to determine if a correlation existed to the chlamydia and gonorrhea prevalence and knowledge scores.

Population, Setting, and Sample

The population who received the REALM screening and written survey were English speaking women over the age of 18 years who attended community-based health clinics that provided some form of reproductive health services in the New York City borough of Queens and who volunteered to participate in this research project. The United States Census Bureau [USCB] (2011) estimated the New York City population at 8,175,133 persons. Of the 8,175,133 individuals 52.5% were women or 4,291,944. The

estimated population of the Queens borough, where the study site was located, is 2,230,725 with 51.5% being women (USCB, 2011). This study was conducted at a clinic located in New York City, which serves women from various populations. In 2013, the agency served over 30,000 community residents in four different sites located throughout the borough.

In addition, individual site data was not available; therefore, the amount of one fifth of the 30,000 community residents was used to determine accessible population size. The exact population being served in family planning over the age of 18 could not be determined at the time of the study. Based on statistics from the annual report of a New York City foundation housing community based organizations similar to the data collection agency in size and client services, it is estimated that approximately 10,000 of the female population are served per year in a single borough family planning related clinic (AIDS Healthcare Foundation, 2013). In addition, in 2009, the female chlamydia case rate for the entire borough was 1,624 per 100,000 of the population for women with the total number of cases reported within the same age group being 12,506 (NYCDOHMH, 2014). In 2009, the case rate for gonorrhea was reported at 205 per 100,000 of the population with a total of 1,525 reported cases in women. By taking the size of the population of women attending borough clinics into consideration and other necessary factors the sample size was determined.

According to Dalto (2008) in the book, *Determining Sample Size: Balancing Power, Precision and Practicality*, multiple factors must be considered in determining sample size and include the type of analysis to be conducted, the power and precision of

the data being collected, ethical considerations, and cost. When calculating the sample size for this study, the types of analysis to be conducted, the power and precision of the data, and the cost were considered. The ethical concerns are addressed later in this section. Based the power and precision or sensitivity, G*Power 3.1 power analysis software was used to determine the sample size. G*Power 3.1 has been reported to be a stand-alone power analysis program and is able to calculate power, a priori sample size, and sensitivity analysis for multiple test types including, correlation, logistic regression, multiple linear regressions, and others (Faul, Erdfelder, Buchner, & Lang, 2009).

Using G*Power 3.1, a priori sample size analysis was run for a Pearson's Correlation for two independent samples, a linear multiple regression: fixed model, single regression coefficient and a two tailed *t*-test. According to the G*Power analysis regarding the Pearson's correlation, a sample size of 64 participants per group, for a total of 128 participants, was needed based on an effect size of .6 (moderate) an α error probability of .05, and a power of .95. In addition, according to the G*Power analysis regarding the linear multiple regression, a sample size of 89 was needed based on an effect size of .15 (small), an α error probability of .05 and a power of .95. According to G*Power analysis for two tailed *t*-tests, a sample size of 134 participants was needed to achieve α error probability of .05 and a power of .95. Therefore, a minimum sample size for this study was 134 participants based on the two tailed *t*-test G*Power results.

Inclusion and exclusion criteria

The inclusion criterion for this study restricted the sample population to those women who speak English as their primary or first language. This criterion was

established in an effort to control for possible confounding of the data collected, due to potential word pronunciation issues, in individuals for whom English is a secondary language. In addition, those under the age of 18 were excluded in an effort to ensure and maintain the right of minors who receive confidential reproductive health services. By excluding all those under the age of 18, there was no need for parental consent and, therefore, no risk of harming an individual who is seeking confidential services. Those individuals that cannot read were read the informed consent and the questionnaire. They were asked to read those words they recognized on the REALM.

Women, as the target population, were selected based on the latest New York City epidemiological profile which shows that twice as many women as men are annually reported as newly infected with chlamydia and gonorrhea (NYCDOHMH, 2014). Due to the lower incidence of chlamydia and gonorrhea within the male population of New York City, men have been excluded as part of the sample population. Women screened for inclusion in the study included, individuals who were being seen for the first time, returning for an annual exam, in need of a referral for reproductive health or STD services, picking up birth control pills, being referred for reproductive health services, receiving either a STD check, and/or STD follow-up.

Recruitment of participants and data collection were conducted by this researcher to ensure the consistency of administration procedures. Women attending the community-based clinic were verbally solicited for participation in the study, screened for inclusion, and provided a written informed consent. Once an individual completed the

consent form, she completed the written survey and REALM assessment. In addition, data collection was conducted in a private room or area within each agency.

Instruments

This study was conducted using two research instruments. One of the instruments was administered by meme and the other was self-administered by the participant. The first instrument used was the REALM, an assessment of verbal word pronunciation. The second instrument administered was the demographic and reproductive health/STD knowledge written survey.

The REALM is a verbal word recognition test used to determine levels of health literacy. The data collected were nominal, ordinal, and interval allowing for multiple types of analysis. The REALM is comprised of 66 items/words which are scored based on an individual's pronunciation of each item. Each correctly pronounced word is equal to one point. Individuals who score between 0-18 are thought to have a third grade equivalent or below. Those who score 19-44 are thought to have a sixth grade equivalent or below, those scoring between 45-60 a seventh to eighth grade equivalent, and with those scoring between 61-66 having a ninth grade equivalent or above (Davis et al.1991) further reported that individuals scoring between 0-18 are believed to have low health literacy and may not be able to read or understand medical advice, medication dose instructions, or other medically related information. The researchers reported that individuals with a score between 19-44 years are believed to be able to understand some materials and medical information, but may need additional assistance to fully understand the concepts and information being presented to them (Davis et al., 1991). In addition,

individuals in the third bracket scoring between 45-60 and those in the 61-66 bracket are thought to have a normal to high health literacy level and should be able to readily comprehend oral and written health related information (Davis et al., 1991). The REALM used four brackets for determining health literacy. For this study the first two and the last two ranges of scores were joined together as those with scored below 45 are viewed as being in need of assistance in reading and understanding medical information. Therefore, for the purpose of this study individuals scoring below 44 were considered as having low health literacy and correlations made based on scoring of 0-44 (low health literacy) and 45 - 66 (normal to high health literacy). A copy of the REALM, the survey and raw data, for this research project, is located in the appendix section of this document. The REALM has been shown to have both a high validity and reliability when compared to other instruments. When correlated with the SORT-R, Peabody Individual Achievement Test-Revised (PLAT-R), and the WRAT-R, it yielded coefficients of .97, .96, and .88 respectively ($p < .0001$). When correlated with the TOFHLA, the REALM yielded a correlation coefficient of .84 ($p < .0001$). The REALM's reliability was tested on 100 adults and seven researchers. Both the test-retest and inter-rater reliability were scored at .99. As demonstrated above, the REALM has been shown to be both a valid and reliable instrument for determining levels of health literacy (Davis et al., 1991).

The second instrument used for this research was a combined demographics and STD and reproductive health knowledge questionnaire. Contained within the demographics section were two questions that were designed to examine the self-report STD history. The data collected from the demographic and STD history section was

dichotomous, nominal, and ordinal. These questions were analyzed in relationship to the health literacy scores gathered through administration of the REALM.

The remainder of the reproductive health knowledge/STD questionnaire was a combination of questions taken from a study conducted by Garces-Placio et al. (2007) and a STD sexual health survey (Davis, Yarber, Bauserman, Schreer, & Davis, 1998). In both studies, the survey instruments were validated as compared to other STD and reproductive health questionnaires and through examination by professionals in the field (Garces-Placio et al., 2007; Davis et al., 1998). For this research project, the survey was limited to 20 questions in an effort to ensure brevity while being able to assess basic reproductive health and STD knowledge. The knowledge section of the survey was collected with ordinal and interval data results. The survey demographic questions included race, ethnicity, age, education level, household information, and STD history. Questions in the reproductive health section, which consisted of seven multiple choice questions, were focused specifically on knowledge regarding contraception usage and effectiveness. The STD portion of the survey consisted of 12 true false questions that focus on knowledge regarding STD transmission, symptoms and health related outcomes. The survey questionnaire that was created for this study was evaluated for content validity by two professionals whose focus was on behavioral research, both qualitative and quantitative, and who had knowledge of reproductive or sexual health. Each expert was also asked to evaluate the instrument to determine if the questions were in fact asking questions that would yield desired responses and also determine if the questions were neutral and would not bias the answers.

Data Collection and Analysis

During the study, each woman who entered the community-based clinic setting where the research was being conducted was asked if she would like to participate in this study. Any woman who agreed to participate was screened for eligibility (primary language must be English and over 18 years of age). Once the eligibility criteria were met, each participant reviewed the informed consent for this project and gave verbal approval to continue. After giving approval to continue from the informed consent, each participant was asked to fill out the short survey and was administered the REALM in a private/confidential room or area. The whole process was estimated to last approximately 15 minutes per participant. Data from each participant were entered into a STATA and an SPSS database where statistical analysis was performed. A two tailed *t*-test was performed between the individual REALM scores and chlamydia or gonorrhea history to determine if a relationship existed between the variables and to determine if the null hypothesis was rejected.

The survey data were used to calculate reproductive health and STI knowledge level and determine past chlamydia or gonorrhea history including the number of times each individual reported having each of the diseases. A Pearson's correlation was run on the three main variables; to determine if an inverse correlation existed and the null hypothesis was rejected additional test was run including a multivariable linear regression, and a quasi-chi squared analysis. Prior to running the multivariable linear regression, Spearman's correlations were run between the demographic variables including race, ethnicity, income and education. If correlations existed between any of

the pair combinations, i.e. income and education, one of the variables was not used for the multivariate linear regression. The use of the Spearman's correlations aided the analysis process providing information related to possible confounding variables. The multivariable linear regression was utilized to analyze the demographic variables for confounding and in the analysis determined if a threshold existed regarding health literacy scores and chlamydia or gonorrhea prevalence (see Table 1). An ordered logistic regression and quasi chi squared was also utilized in determining if a threshold between variables existed.

Three key variables were analyzed for correlations, which included health literacy scores (nominal and ordinal), chlamydia/gonorrhea history (dichotomous and ordinal), and reproductive health/STD knowledge (nominal and ordinal). Participants were asked, on the STD questionnaire, two questions relating to their STD history, the first asking if the participant has ever had chlamydia, gonorrhea, syphilis, herpes, HPV/warts, HIV/AIDS, hepatitis B or hepatitis C with an "other" block and space provided allowing for participant clarification. The chlamydia/gonorrhea history was calculated using yes or no to represent history of having each of the infections, analysis to determine the relationship between health literacy and history of chlamydia/gonorrhea was performed using an independent two tailed *t*-test. Additionally, Pearson's Correlation was performed on the number of times the individual has reported being infected with either or both of the two diseases. The overall self-reported prevalence of either and both chlamydia/gonorrhea was calculated using dichotomous yes or no response. These items will be scored 0 and 1, for analysis. In addition, the number of past infections was also

examined in relationship to the raw health literacy scores as well as being bracketed based on a score of between 0-44 and 45-66. In addition, the reproductive health/STD knowledge was analyzed in terms of health literacy scores and again using the 0-44 and 45-66 groupings. Reproductive health/STD knowledge scores analysis was based on the total number of correct answers given by participants (see Table 2). In addition, the health literacy raw scores were examined to discover whether or not a specific score threshold existed that related to an increase in chlamydia and gonorrhea prevalence.

Table 1

Analysis Types and Coding

Analysis Type	Participant #	REALM score	Realm Score – Nominal - Normal to High and Low	CT History	GC History	Either CT/GC	Other STD
Coding		Raw Score	HL-1,2	CT - 0,1or # infections	GC - 0,1 or # infections	BCG - 0,1 or # infections	O - 0,1 or # infections
A = Pearson's Correlation A1 = first set run		A1		# infections	# infections	# infections	# infections
Pearson's Correlation A2 = second set run		A2					
Pearson's Correlation A3 = third set run				A3	A3	A3	
B = Multivariable Linear Regression (confounding variables)		B		B	B	**B**	
C = Ordered Logistic Regression (threshold)				C	C	C	
D = Quasi Chi-Squared (3x3) (threshold)			D= Dependent	I= Independent	I= Independent	I= Independent	
E = Independent two tailed t-test		E		E CT – 0, 1	E GC – 0, 1	E CT/GC – 0, 1	E O – 0, 1
F = Spearman's Correlation (confounders)				F CT 0, 1 & HL	F GC 0, 1 & HL	F CT/GC 0, 1 & HL	F CT/GC 0, 1 & HL

Table 2

Analysis Types and Coding for Questionnaire

Analysis Type	Reproductive Health Score	STD Knowledge Score	Overall Health Knowledge score	Race	Ethnicity	Education	Income	Age
Coding	Raw Score	Raw Score	Raw score	R - 1,2,3,4,5	E - 0,1	ED - 1,2,3,4,5,6,7,8,9	I - 1,2,3,4,5, 6,7,8,9	A-18-24
A = Pearson's Correlation A1 = first set run	A2	A2	A2					
Pearson's Correlation A2 = second set run	A3	A3	A3					
Pearson's Correlation A3 = third set run				B	B	B	B	B
B = Mulitivar. Linear Regression (confounding variables)								
C = Ordered Logistic Regression (threshold)				F	F	F	F	
D = Quasi Chi-Squared (3x3) (threshold)								
E = Independent two tailed t-test								
F = Spearman's Correlation - confounders								

Initially, a Pearson's correlation was performed on the health literacy and chlamydia and gonorrhea prevalence. Once a correlation was discovered to exist between health literacy and the prevalence of chlamydia and/or gonorrhea a linear regression was performed for further clarification of the findings and to determine if health literacy scores were individually predictive of chlamydia and gonorrhea infection. The linear regression was utilized to establish if confounding variables played a role in the prevalence of chlamydia and gonorrhea or if health literacy was independently related to the prevalence, of the diseases, in this population. Confounding variables that were assessed included race, ethnicity, education, household income, and age. Race was assessed using a categorical assignment value and analyzed; education was also divided into categories for analysis, as well as income and age, which was also analyzed by individual ages.

Race, for this project, was separated into five groupings that include Asian/Pacific Islander, White/Caucasian, Black/African American, Native American/Alaskan Native and other. Individuals selecting other were able to place their racial preference in the space provided. Ethnicity was separated into two categories: Hispanic and Non-Hispanic. Age was examined using the following age groups 18-19, 20-24, 25-29, 40-49, 30-39, 50 or over. Education was based on highest level achieved and was include grammar school, vocational/technical, high school/high school equivalent, some college, bachelor’s degree, master’s degree, doctoral degree, professional degree (MD, JD, etc.). As with race, an “other” option and space was provided that allowed the participant to state their education level as they perceived it. Household income was examined using income

brackets. The first being $10,000 and under with the next four falling into ten thousand dollar divisions up to $50,000. The next two brackets were between $50,000 to $100,000 and the final bracket included those whose household income was over $100,000. All information regarding participant demographic and contact information were controlled to protection participants from harm.

Protection of Participants

In an effort to ensure the highest degree of protection to each subject, only those subjects who were above the age of 18 and could give individual consent were allowed to participate in this study. All participants were given an informed consent outlining the scope of the research project, which they read and was reviewed with them. Only those participants understanding their rights and gave permission to continue were allowed to participate. Those individuals who could not read were verbally administered the informed consent and survey instrument. The REALM was administered by asking them to read those words they were could. It was stressed to non-reading individuals that their participation was appreciated and their ability to read or not read did not negatively impact the study in any way nor diminish who they are as individuals.

In order to protect the confidentiality of participants, individuals were asked to participate in this study though the use of standardized information regarding the study and verbal informed consent. Upon entering the waiting room or reception area women were asked if they were willing to participate in the study which involved the use of surveys only, once they agree initially, they were taken to a private room where the full study was explained, fact sheet given, and consent obtained. Once consent is given by the

participant the REALM and survey were administered. All instruments were anonymous and not linked to any individual. This researcher was the only person who administered the instruments, performed data analysis, and who has access to study data. In addition, the IRB approval number for this study is # 05-08-14-0106713.

The methodologies selected for this study, included the inclusion and exclusion criteria for participation, which helped to maintain the integrity of the data and the resulting findings while insuring the protection of the participants of the study. The data analysis as described above provided an opportunity to establish that a correlation existed between the variables and potentially guide interactions with patients, regarding STD prevention, resulting in increased positive health outcomes or decreased chlamydia and gonorrhea prevalence. The data analysis and discussion of the findings will be presented in chapters 4 and 5.

Conclusion / Summary

This study was designed to examine the relationships between health literacy, reproductive health/STD knowledge, and prevalence of chlamydia and gonorrhea. The population studied was women over the age of 18, whose first language was English, and who were receiving services at a clinic providing reproductive health services of some type. Data were collected using two instruments the REALM and a reproductive health/STD questionnaire. Data were analyzed using STATA and SPSS and are discussed in the next two chapters.

Chapter 4: Results

Introduction

The purpose of the study was to determine if a correlation exists between health literacy and the prevalence of chlamydia and gonorrhea in women over 18 years of age, who attend health clinics in the New York City metropolitan area. More specifically, this study was conducted to determine if health literacy is inversely correlated to self-reported chlamydia and gonorrhea prevalence and reproductive health/STD knowledge. The study was also conducted to determine if lower reproductive health and STD knowledge scores are inversely correlated with an increased case prevalence of chlamydia and gonorrhea. Finally, with this study, the hope was to determine if a health literacy threshold exists in which chlamydia and gonorrhea prevalence increases.

Variables

The primary variables under investigation in this study included health literacy, history of contracting specific STDs, number of times each disease was contracted, reproductive health knowledge, STD knowledge, and reproductive health/STD knowledge combined. As stated previously, health literacy was measured using the 66-point REALM instrument. In addition, based on the original health literacy study using the REALM, the REALM scores were stratified into four levels, third grade and below, fourth to sixth grade, seventh to eighth grade, and high school. Scores between 0-18 were categorized as third grade and below, those between 19-44 in to fourth to sixth grade, those between 45-60 into seventh to eighth grade, and scores between 61-66 were placed

into the category of high school. Analysis of the data was performed using both STATA and SPSS for accuracy and variability in statistical tests used.

Process for Data Collection

The number of participants required for this study was 134 women, over the age of 18, whose primary language is English. There were 152 individuals who began the study and 150 who participated in the study completing both the REALM and survey. Of the 150 women who participated, 114 (76%) completed the REALM and entire survey, including the STD history portion of the survey. As a result, the final response rate was 76% (114/150) of those enrolled in the study. Data analysis of STD prevalence and STD/reproductive health knowledge was restricted to the 114 who completed the REALM and the survey in its entirety.

In order to collect the data needed, an agreement was made with the New York City based a community-based organization with two satellite offices and a large client base who are in need of services from food pantry access to reproductive health referrals. Data for this study were collected at two New York City community based organization clinic sites. By securing those locations, it appears that the data may have been more representative of the overall population found in the majority of the surrounding boroughs. This community based organization was able to provide two of the five sites projected for use in this study.

Data were collected over a 12-week period, typically on Monday and Tuesday mornings, days where a high volume of women came to one of the community based organizations clinic sites used for this study. Most of those individuals attending the

clinic were seeking food pantry, housing assistance, and medical referral services. For this study, only women were solicited for participation. Women were asked if they would like to participate in the study, after their needs (reason for their attending the clinic) had been met by the agency. This process was used to reduce the appearance or impression of coercion. Each of the women was read the informed consent, again asked if she would like to participate based on what she heard, and then had to specifically state that she agreed to participate. It was made clear to each participant that they could withdraw from the study at any point and for any reason. As stated above, two women withdrew from the study after beginning the REALM assessment. Those participants were asked, how they were feeling and if they would like to talk to anyone about their experience and feelings. Both women declined, stating they were uncomfortable answering the questions and were fine.

The 150 individuals who completed the REALM were asked to complete a demographics and STD/reproductive health knowledge survey. All of the participants completed the demographics section of the survey; however, several women chose not to complete or to leave some knowledge questions blank. Three of the participants did not answer the knowledge questions and were removed from the sample while analyzing health literacy as it relates to STD/reproductive health knowledge. In addition, 36 participants chose not to provide information on their STD history. Demographics, STD history, and STD/reproductive health findings, for both the 114 who completed the entire study, and the 36 who did not complete the sexual history, will be discussed in further detail in the following sections.

Demographic Characteristics of Participants

The individuals in this study, who completed all components of the REALM and STD reproductive health survey (114), were reflective of diverse racial backgrounds, ethnic backgrounds, age groups, education levels, and annual household incomes. The majority of responses for each variable included those reporting their race as Black/African American at 58.5%, their ethnicity as Non-Hispanic at 62.3%, their age as over 50 years of age at 36.0%, an annual household income below $10,000 at 40.4%, and their highest level of education being high school or high school equivalent at 47.4%.

Of the 114 women that were included in this study, the demographic diversity was examined in further detail. Variables analyzed included race, ethnicity, gender, annual income, and highest level of education. Analysis of age groups revealed that 41 (36.0%) reported their age as 50 years or older. The second largest age group reported was from those between the ages of 45–49 years with 18 individuals or 15.8 %. There were 13 (15.0%) women between 35–39 years of age. Another 12 (10.5%) reported their ages between 25–29 years. In addition, eight (7.0%) women reported their ages between 30–34 years of age. The smallest number of participants five or 3.3% reported their ages being between 19-24 years. In that 36.0% of the study population reported being 50 years or older, the findings of this study may have been impacted. This limitation will be discussed, in more detail, later in the chapter. The age group representation was contrary to the results that were anticipated during the design phase of the study. It was believed that the lower age groups would be seen more often at the clinic locations than the higher age groups.

Table 3

Demographic Characteristics of Participants

Demographic Variable*	*n*	%
Race		
Asian/Pacific Islander	10	8.80
Black/African American	67	58.80
White/Caucasian	17	14.90
Other	20	17.50
Ethnicity		
Hispanic	30	26.30
Non-Hispanic	71	62.30
No Answer	13	14.40
Age		
19-24	4	3.50
25-29	12	10.50
30-34	8	7.00
35-39	15	13.20
40-44	16	14.00
45-49	18	15.80
50 and Over	41	36.00
Level of Education		
Grammar School	13	11.40
High School/HS Equivalent	41	47.40
Vocational/Tech School	6	5.30
Some College	21	18.40
Bachelor	20	17.50
Master	10	8.80
Professional (MD, JD)	1	0.90
Other	2	1.80
Income Level		
Under $10,000	46	40.40
$10,000-$19,000	12	10.50
$20,000-$29,000	20	17.50
$30,000-$39,000	11	9.60
$40,000-$49,000	12	10.50
$50,000-$74,000	5	4.40
$75,000-$100,000	4	3.50
Over $100,000	4	3.50

Note. $N = 114$.
*Native American/Alaskan Native and Doctoral Degree were excluded due to lack of respondents.

Analysis of the racial data indicated that Black/African Americans represented the highest racial group reported by participants (67 or 58.8%) followed by individuals reporting “Other” as their racial category (20 or 17.5%). Of those participating in the study, 14.9% (17) reported being White/Caucasian and 10 (14.9%) reported being

Asian/Pacific Islander. In addition, over 62% (71) reported their ethnicity as non-Hispanic, while 26.3% (30) women reported their ethnicity as Hispanic. Of the women who participated in the study, 13 (14.4%) did not list any ethnicity (see Table 3).Just under half of the respondents, 47.4% (41), indicated that their highest level of education was high school/high school equivalent, 17.5% (20) reported a bachelor's degree, 18.4% (21) reported some college, 11.4% (13) reported some grammar school, 5.3% (6) stated vocational school, and 8.8% (10) reported master's degree, 0.9% (1) reported a professional degree, and 1.8% (2) reported other as their highest level of education. Participants of this study reported annual household incomes ranging from below $10,000 to over $100,000. Of those participating in the study, the largest percentage of participants reported having incomes below $10,000, 40.4% (46). The second largest proportion of participant's 17.5% (20) reported an annual household income of $20,000 - $29,000. In addition, 12 (10.5%) participants reported having and income of between $40,000 - 49,000 per year while another 12 (10.5%) individuals reported a household income of $10,000 - $19,000. Each of the demographic variables will be examined further for their impact on the relationships between the dependent variables and health literacy. In the next section, the analysis of those who did not answer the sexual heath portion of the STD/reproductive health survey and their demographics is presented.

Demographic Cross Tabulation Information: No Answer Responses to Sexual History

Out of the 150 participants who began the study, 24.0% (36) chose not to answer the sexual history component of the survey. Of the 36 women who did not answer the sexual history (see Table 4), analysis revealed that the highest percentage of each demographic variable included Black/African American, 69.4%, $\chi^2 = 1.53$, $p < .216$; 69.4%, $\chi^2 = .177$, $p < .674$; non-Hispanic, 36.1%, $\chi^2 = .609$, $p < .435$ between the ages of 45 – 49 years; 34.7%, $\chi^2 = .045$, $p < .009$ high school/high school equivalent level of education; and 55.6%, $\chi^2 = .250$, $p < .109$ annual income level under $10,000. The only demographic variables showing a significant relationship was in those not answering the sexual health questions and who reported their age between 4 –49 years, in spite of the high percentages represented with other demographic variables. In addition, scores on the STD/reproductive health survey ranged from zero to 15 out of 20 and showed a strong relationship, $\chi^2 = 33.19$, $p < .007$, to those choosing not to answer the sexual history section of the survey. Analysis revealed that participant demographics in relationship to participants who did not answer the sexual health section were weakly related, $p > .05 < .10$. The demographic variable and no sexual history analysis included those who had an educational level of vocational/technical school, $\chi^2 = 2.99$, $p < .083$, and some college, $\chi^2 = .314$, $p < .076$. There were no significant relationships between any other demographic variables and the participant choosing not to answer the sexual history component of the survey (see Table 4).

Table 4

Cross Tabulation: Demographic Variables by No Answer

Demographic Variable	*n*	%	*df*	χ^2	*sig*
Race					
Asian/Pacific Islander	4	11.10	1	.177	.674
Black/African American	25	69.40	1	1.53	.216
White/Caucasian	4	11.10	1	.328	.567
Other	3	8.40	1	1.79	.182
Ethnicity					
Hispanic	8	22.20	1	.242	.622
Non-Hispanic	25	69.40	1	.609	.435
No Answer	3	8.40	1	.271	.603
Age					
19-24	1	2.80	1	.045	.831
25-29	1	2.80	2	2.44	.296
30-34	5	13.90	1	1.00	.201
35-39	4	11.10	1	1.63	.748
40-44	3	8.30	1	.804	.370
45-49	13	36.10	1	6.89	.009
50 and Over	9	25.00	2	2.12	.346
Level of Education					
Grammar School	7	13.30	1	1.53	.216
High School / HS	11	34.70	1	.250	.617
Equivalent					
Vocational/Tech School	6	8.00	1	2.99	.083
Some College	2	15.30	1	3.14	.076
Bachelor	8	18.70	1	3.94	.530
Master	1	7.30	1	1.45	.229
Professional (MD, JD)	1	1.30	1	.751	.386
Household Income					
Under $10,000	20	55.60	1	.250	.109
$10,000-$19,000	3	8.30	1	.146	.702
$20,000-$29,000	5	13.90	2	.492	.782
$30,000-$39,000	2	5.60	1	.579	.447
$40,000-$49,000	4	11.10	1	.010	.921
$50,000-$74,000	2	5.60	1	.084	.772

Note. N= 36.

When answer/no-answer data were examined in relationship to health literacy level, the relationship, although not significant, $\chi^2 = 7.548$, $p < .056$, showed a stronger relationship than that of REALM health literacy scores, $\chi^2 = 46.38$, $p < .077$. Analysis of each of the health literacy levels revealed a significant relationship exists between those with a health literacy level of third grade and below, $\chi^2 = 4.42$, $p < .035$. The other

relationships were non-significant, although the relationship between the health literacy level high school and no answer was weakly significant, $p < .058$.

Data Analysis

Primary data analysis focused on three key variables including health literacy, prevalence of chlamydia and gonorrhea, and level of knowledge regarding STD and reproductive health knowledge. As stated previously, health literacy was measured using the REALM. The STD history and knowledge assessment used a self-reported history and written survey. Each variable will be described in relationship to age, race, ethnicity, highest level of education, and annual household income. In addition, following the descriptive overview of the values, correlation of the relationships between the variables, multivariate analysis, and linear regression will be discussed.

Sexually Transmitted Diseases

Additional descriptive analysis was conducted on the number of individuals reporting infection with chlamydia, gonorrhea and chlamydia and gonorrhea combined. Of the 150 individuals who participated in the study, 36 did not report their sexual history. An analysis of the 114 women who answered the sexual history questions revealed a prevalence of 5.3% for chlamydia; 5.3% for gonorrhea, and 7.0% for chlamydia and/or gonorrhea. Of those who reported ever having chlamydia, 66.8%, $\chi^2 = .200$, $p < .655$, reported being Black/African American, with the remaining cases that were reported being White/Caucasian at 33.2%, $\chi^2 = .1.69$, $p < .193$ (see Table 5). The analysis found no significant relationship between chlamydia and a participant's race.

The analysis further revealed, of those individuals reporting ever having gonorrhea, 66.7%, $\chi^2 = .200$, $p < .655$ reporting were Black/African American, 16.7%, $\chi^2 = .015$, $p < .901$, reporting were White/Caucasian, and 16.7%, $\chi^2 = .015$, $p < .901$ reporting race as other. The majority of individuals, 94.7%, did not report any instance of chlamydia. Of those individuals reporting ever having chlamydia and/or gonorrhea 62.5%, $\chi^2 = .075$, $p < .784$, were Black/African American, 25.0%, $\chi^2 = .690$, $p < .406$ were White/Caucasian, and 12.5%, $\chi^2 = .201$, $p < .645$ reporting self-classified as other.

Table 5

Sexually Transmitted Disease by Race

Race	*No Disease*	*Disease*	*Percent Disease*	*df*	χ^2	*sig*
Chlamydia Infection by Race						
All Races	108	6	5.3	3	3.18	.365
Asian/Pacific Islander	10	0	0.00	1	.827	.363
Black/African American	62	4	66.7	1	.200	.655
White/Caucasian	15	2	33.3	1	1.69	.193
Other	21	0	0.00	1	1.43	.232
Gonorrhea Infection by Race						
All Races	108	6	5.3	3	.639	.888
Asian/Pacific Islander	10	0	0.0	1	.609	.453
Black/African American	63	4	66.7	1	.200	.655
White/Caucasian	16	1	16.7	1	.015	.901
Other	19	1	16.7	1	.609	.435
Chlamydia and/or Gonorrhea Infection by Race						
All Races	106	8	7.02	3	1.49	.685
Asian/Pacific Islander	10	0	0.0	1	.827	.363
Black/African American	61	5	62.5	1	.075	.784
White/Caucasian	15	2	25.0	1	.690	.406
Other	20	1	12.5	1	.201	.654
Any Sexually Transmitted Disease by Race						
All Races	86	28	24.6	1	4.65	.199
Asian/Pacific Islander	28	0	0.0	1	3.57	.059
Black/African American	50	16	57.1	1	.009	.926
White/Caucasian	11	6	21.4	1	1.24	.265
Other	14	6	21.4	1	.387	.534

Note. $N = 114$.
*Native American/Alaskan Native was excluded due to lack of respondents.

The majority of individuals, 71.3%, did not report any instance of gonorrhea. As with chlamydia, 23.3% of those surveyed chose not to answer some or all of the questions regarding their sexual history. Analysis of race and those reporting ever having chlamydia, gonorrhea, and gonorrhea and/or chlamydia combined, showed significant relationship between the variables. Additional analysis was conducted on the remaining demographic variables in relationship to chlamydia, gonorrhea and gonorrhea and/or chlamydia combined.

Analyses of chlamydia, gonorrhea, and chlamydia (see Table 6) and/or gonorrhea revealed that individually age group was not a significantly related to chlamydia nor gonorrhea. Analysis did reveal significant relationships between specific age groups and chlamydia and/or gonorrhea combined. Individuals reporting ever having chlamydia and/or gonorrhea and between the ages of 40 – 45, $\chi^2 = .393$, $p < .048$, and 50 years of older, $\chi^2 = 14.50$, $p < .001$, revealed significant relationships.

Analysis of the data, for those who reported ever having had chlamydia and their education level, revealed that 50% of those reporting having graduated high school or had a high school equivalent, $\chi^2 = .618$, $p < .432$. The only significant relationship was found between chlamydia and individuals having gone to vocational or technical school, $\chi^2 = .10.01$, $p < .002$ (see Table 7). Those reporting ever had gonorrhea had similar findings as 50%, $\chi^2 = .618$, $p < .432$ reported high school /high school equivalent as the highest level of education. For each of the following levels of education, grammar school, $\chi^2 = .174$, $p < .667$; vocational/technical school, $\chi^2 = 1.65$, $p < .199$; and bachelor's degree 16.7%, χ^2

= .003, $p < .954$, reported ever having gonorrhea, there were no significant relationships found between level of education and history of gonorrhea.

Table 6

Sexually Transmitted Disease by Age Group

Age Group	*No Disease*	*Disease*	*Percent Disease*	*df*	χ^2	*sig*
Chlamydia by Age Group						
19-24 Years	4	0	0.0	1	.230	.631
25-29 Years	12	0	0.0	2	.815	.665
30-34 Years	8	0	0.0	1	.478	.489
35-39 Years	15	0	0.0	1	.960	.327
40-44 Years	14	2	33.3	1	1.95	.162
45-49 Years	17	1	16.7	1	.004	.952
50 Years and Older	38	3	50.0	2	.507	.776
Gonorrhea by Age Group						
19-24 Years	4	0	0.0	1	.230	.631
25-29 Years	12	0	0.0	2	.815	.665
30-34 Years	8	0	0.0	1	.478	.489
35-39 Years	15	0	0.0	1	.960	.327
40-44 Years	14	2	33.3	1	1.95	.162
45-49 Years	17	1	16.7	1	.004	.952
50 Years and Older	38	3	50.0	2	.507	.776
Chlamydia and/or Gonorrhea by Age Group						
19-24 Years	4	0	0.0	1	.313	.576
25-29 Years	12	0	0.0	1	1.11	.575
30-34 Years	8	0	0.0	1	.649	.420
35-39 Years	15	0	0.0	1	1.30	.254
40-44 Years	13	3	37.5	1	3.93	.048
45-49 Years	17	1	12.5	1	.070	.791
50 Years and Older	37	4	50.0	1	14.5	.001
Any Sexually Transmitted Disease by Age Group						
19-24 Years	3	1	3.6	1	.000	.983
25-29 Years	10	2	7.1	1	.805	.669
30-34 Years	8	0	0.0	1	2.80	.094
35-39 Years	14	1	3.6	1	2.98	.084
40-44 Years	11	5	17.9	1	.449	.503
45-49 Years	11	7	25.0	1	2.37	.124
50 Years and Older	30	12	42.9	1	3.88	.143

Note. *N = 114*.

Table 7

Sexually Transmitted Diseases by Education Level

Education Level	*No Disease*	*Disease*	*Percent Disease*	*df*	χ^2	*sig*
Chlamydia by Educational Level						
Grammar	13	0	0.0	1	.815	.367
High School or High School Equivalent	38	3	50.0	1	.618	.432
Vocational or Technical School	4	2	33.3	1	10.01	.002
Some College	21	0	0.0	1	1.35	.246
Bachelor's Degree	19	1	16.7	1	.003	.954
Master's Degree	10	0	0.0	1	.609	.435
Professional Degree	1	0	0.0	1	.056	.813
Other Education	2	0	0.0	1	.113	.737
Gonorrhea by Educational Level						
Grammar	12	1	16.7	1	.174	.667
High School or High School Equivalent	38	3	50.0	1	.618	.432
Vocational or Technical School	5	1	16.7	1	1.65	.199
Some College	21	0	0.0	1	1.35	.246
Bachelor's Degree	19	1	16.7	1	.003	.954
Master's Degree	10	0	0.0	1	.609	.435
Professional Degree	1	0	0.0	1	.056	.813
Other Education	2	0	0.0	1	.113	.737
Chlamydia and/ or Gonorrhea by Educational Level						
Grammar	12	1	12.5	1	.010	.919
High School or High School Equivalent	37	4	50.0	1	.840	.359
Vocational or Technical School	4	2	25.0	1	6.72	.010
Some College	21	0	0.0	1	1.83	.176
Bachelor's Degree	19	1	12.5	1	.151	.697
Master's Degree	10	0	0.0	1	.827	.363
Professional Degree	1	0	0.0	1	.076	.783
Other Education	2	0	0.0	1	.154	.695
Any Sexually Transmitted Disease by Educational Level						
Grammar	6	7	25.0	1	6.79	.009
High School or High School Equivalent	31	9	32.1	1	.141	.707
Vocational or Technical School	3	3	10.7	1	2.21	.137
Some College	17	3	10.7	1	1.20	.274
Bachelor's Degree	17	3	10.7	1	1.20	.274
Master's Degree	8	2	7.1	1	.123	.726
Professional Degree	1	0	0.0	1	.328	.567
Other Education	1	1	3.6	1	.711	.399

Note. *N = 114*.

Analysis of the data, for those who reported ever having had chlamydia and their education level, revealed that 50% of those reporting having graduated high school or had a high school equivalent, $\chi^2 = .618$, $p < .432$. The only significant relationship was found between chlamydia and individuals having gone to vocational or technical school, $\chi^2 = .10.01$, $p < .002$ (see Table 7). Those reporting ever had gonorrhea had similar findings as 50%, $\chi^2 = .618$, $p < .432$ reported high school /high school equivalent as the highest level of education. For each of the following levels of education, grammar school, $\chi^2 = .174$, $p < .667$; vocational/technical school, $\chi^2 = 1.65$, $p < .199$; and bachelor's degree 16.7%, $\chi^2 = .003$, $p < .954$, reported ever having gonorrhea, there were no significant relationships found between level of education and history of gonorrhea.

Of those reporting chlamydia and/or gonorrhea, 50%, $\chi^2 = .840$, $p < .359$, had high school/high school equivalent as their highest education level. Of those reporting, either or both diseases, 25%, $\chi^2 = 6.72$, $p < .010$, stated that their highest education level was vocational or technical school, while 12.5%, reported their highest education level as grammar school, $\chi^2 = .010$, $p < .919$, or bachelor's degree $\chi^2 = .151$, $p < .697$ (see Table 7). Of the three STDs examined in relationship to level of education, the only significant relationships were observed in those reporting vocational or technical school in conjunction with chlamydia and chlamydia and/or gonorrhea.

Table 8

Sexually Transmitted Disease by Annual Household Income Level

Household Income	*No Infection*	*Infection*	*Percent Infection*	*df*	χ^2	*sig*
Chlamydia by Household Income						
Under $10,000	42	4	66.7	1	1.82	.177
$10,000-$19,000	12	0	0.0	1	.745	.388
$20,000-$29,000	19	1	16.7	1	.056	.972
$30,000-$39,000	10	1	16.7	1	.358	.550
$40,000-$49,000	12	0	0.0	1	.745	.388
$50,000-$74,000	5	0	0.0	1	.291	.590
$75,000-$100,000	4	0	0.0	1	.230	.631
Over $100,000	5	0	0.0	1	.291	.590
Gonorrhea by House Hold Income						
Under $10,000	43	3	50.00	1	.245	.621
$10,000-$19,000	12	0	0.0	1	.745	.388
$20,000-$29,000	18	2	33.3	1	1.30	.521
$30,000-$39,000	10	1	16.7	1	.358	.550
$40,000-$49,000	12	0	0.0	1	.745	.388
$50,000-$74,000	5	0	0.0	1	.291	.590
$75,000-$100,000	4	0	0.0	1	.230	.631
Over $100,000	5	0	0.0	1	.291	.590
Chlamydia and/ or Gonorrhea by Household						
Under $10,000	41	5	62.5	1	1.75	.185
$10,000-$19,000	12	0	0.0	1	1.01	.314
$20,000-$29,000	17	2	25.0	1	.492	.782
$30,000-$39,000	10	1	12.5	1	.080	.777
$40,000-$49,000	12	0	0.0	1	1.01	.314
$50,000-$74,000	5	0	0.0	1	.395	.530
$75,000-$100,000	4	0	0.0	1	.313	.576
Over $100,000	5	0	0.0	1	.395	.530
Any Sexually Transmitted Disease by Household						
Under $10,000	30	16	57.1	1	4.39	.037
$10,000-$19,000	12	0	0.0	1	4.37	.137
$20,000-$29,000	15	4	14.3	1	.500	.779
$30,000-$39,000	7	4	14.3	1	.915	.339
$40,000-$49,000	11	1	3.6	1	1.90	.167
$50,000-$74,000	4	1	3.6	1	.059	.809
$75,000-$100,000	3	1	3.6	1	.000	.983
Over $100,000	4	1	3.6	1	.059	.809

Note. *N = 114*.

Analysis of the STD data in comparison to annual income revealed that there were no significant relationships and disease was reported in only three of the income levels of those reporting chlamydia and/or gonorrhea combined. Of those reporting

chlamydia and/or gonorrhea, 62.5%, $\chi^2 = 1.75$, $p < .185$, reported a household income of below $10,000. Of those reporting, either or both diseases, 25.0% $\chi^2 = .492$, $p < .782$, stated that their annual income was $20,000 - $29,000 while 12.5%, reported their annual income as between $30,000 - $39,000, $\chi^2 = .080$, $p < .777$ (see Table 8).

In addition to the analysis performed on chlamydia, gonorrhea, and chlamydia and/or gonorrhea, further analysis was conducted on the demographic variables and "any STD". The analysis revealed significant relationships between those reporting any STD and their highest level of education as grammar school at 25.0%, $\chi^2 = 6.70$, $p < .009$, or having an income of under $10,000 at 57.1%, $\chi^2 = .4.39$, $p < .037$. Education level, specifically vocational or technical school showed a significant relationship for multiple STD analysis. Vocational or technical school showed a significant relationship between reporting a history of chlamydia or both chlamydia and gonorrhea. In addition, to the demographic comparisons for each of the STDs, analysis was run on the STD and reproductive health knowledge survey and will be explained in the next section.

STD and reproductive health knowledge survey

All of the subjects filled out a STD and reproductive health knowledge survey. The survey was examined by score most common answers to questions and demographics. The survey consisted of eight reproductive health and 12 STD focused questions. The reproductive health section consisted of multiple choice questions. The STD section consisted of true and false questions.

Table 9

STD/Reproductive Health Survey ANOVA by Demographic Variable

Demographic Variable	*Mean*	*n*	*df*	*F*	*sig*
Race					
Asian/Pacific Islander	8.60	10	1	.423	.517
Black/African American	9.73	67	1	2.66	.106
White/Caucasian	9.27	17	1	.423	.517
Other	8.14	20	1	2.84	.095
Ethnicity					
No Answer	8.62	13	1	.542	.463
Hispanic	9.18	30	1	.227	.600
Non-Hispanic	9.28	71	1	.000	.997
Age					
19-24	12.75	4	1	4.30	.400
25-29	10.33	12	1	1.25	.266
30-34	6.63	8	1	5.27	.023
35-39	6.87	15	1	9.03	.003
40-44	10.25	16	1	1.47	.228
45-49	10.56	18	1	2.96	.088
50 and Over	9.31	42	1	.005	.946
Level of Education					
Grammar School	7.69	13	1	3.16	.078
High School/HS Equivalent	8.20	40	1	6.31	.013
Vocational/Tech School	8.67	6	1	.199	.657
Some College	9.30	20	1	.009	.978
Bachelor	10.60	20	1	3.62	.060
Master	12.80	10	1	12.53	.001
Professional (MD, JD)	14.00	1	1	1.90	.171
Other	9.28	2	1	.008	.928
Household Income					
Under $10,000	9.81	46	1	4.04	.047
$10,000-$19,000	7.33	12	1	4.39	.038
$20,000-$29,000	8.65	20	1	.807	.371
$30,000-$39,000	11.09	11	1	3.41	.067
$40,000-$49,000	11.6	12	1	6.23	.014
$50,000-$74,000	10.80	5	1	1.01	.317
$75,000-$100,000	12.00	4	1	2.60	.109
Over $100,000	11.40	5	1	1.98	.162
Health Literacy Level					
3rd Grade and Below	3.67	3	1	8.69	.004
4th to 6th Grade	6.90	10	1	5.41	.022
7th to 8th Grade	8.89	35	1	2.77	.067
High School and Above	10.23	65	1	12.61	.001

Note. *N = 114*.

Out of a 20 possible point score, the average score was 9.28 or 46.4%. Each section had few questions; however, of the eight possible points for the reproductive health section the average score was 2.68 points or 33.5%. Of the 12 points possible on the STD portion of the test, the average score was 6.61 points or 55.1%. Of the women in the study, 15 scored 10 points, which was the most frequent score at 13.20%. The next highest score was 12 with 13 women attaining that score. The highest mean scores were reported by Black/African American's [$F(1,112) = 2.66$, $p < .106$], Non-Hispanic's [$F(1,112) = .000$, $p < .095$], those between the ages of 19-24 years [$F(1,112) = 4.30$, $p < .400$], with the highest level of education as a professional degree [$F(1,112) = 1.90$, $p < .171$], and a household income of $75,000 - $100,000 [$F(1,112) = 2.60$, $p < .109$]. In addition, the highest mean scores were reported in those with a health literacy level of high school and above, $F(1,112) = 2.66$, $p < .106$ (see Table 9). There was only one individual with a professional degree; therefore, a more meaning full mean score was the second highest mean score from women who reported having a master's degree, $F(1,112) = 12.53$, $p < .001$.

In addition to the demographic variables, analyses were run on each of the questions asked in the STD and reproductive health knowledge survey. The five most often answer correctly were, "chlamydia can cause pain during urination" with 89 correct responses; "You can get gonorrhea through anal sex" with 80 correct responses, "chlamydia can lead to infertility in women" with 77 correct responses; "Some people are immune to (protected from getting) sexually transmitted infections" with 70 correct responses; and "A woman can look at her body and tell if she has gonorrhea" with 72

correct responses. The four questions answered incorrectly most often were, “A woman is most likely to become pregnant (no matter how long or short her menstrual cycle) if she has sexual intercourse – 2 weeks before menstruation begins” with 94 incorrect responses; “Over a one year period, what is the likelihood that a sexually active woman who uses no birth control will become pregnant – 9 in 10” with 87 incorrect responses; “A woman can get pregnant - a few minutes, hours or days after sexual intercourse (all of the above) with 83 incorrect responses; and “The pill: prevents ovulation” with 80 incorrect responses. Overall, there were more correct answers than incorrect answers given for the STD and reproductive health survey. Those answers with the most incorrect answers may lend to the understanding of other public health issues including unintended pregnancy. The overall survey score was analyzed in conjunction to the health literacy score and will be discussed in more detail in the following sections.

Health literacy

Health literacy data were analyzed using REALM scores and stratified health literacy categories comprising third to fourth grade, fifth to sixth grade, seventh to eighth grade, and high school or above. The scale and definitions indicate that individuals who fall into the third and fourth grade level will have extreme difficulty in reading lowest literacy education and informational materials. Individuals scoring in the fifth to sixth grade level may have difficulty with medication and prescription labels. They will need low literacy patient education materials. Individuals who classify as seventh to eighth grade level, will labor understanding the majority of patent education materials; while those in the high school grade level will be able to understand most education and

informational materials (Davis, Croch, Long, & Green, 1993). The average participant score on the REALM was 55.27 points. The standard deviation for scores was 14.77. A mean score of 55.27 represents a mean grade equivalent of seventh to eighth grade.

Table 1

Frequency Health Literacy Level by Participant Race

Demographic Variable/ Health Literacy Level	*3rd Grade & Below*	*4th to 6th Grade*	*7th to 8th Grade*	*High School & Above*
Count				
Asian/Pacific Islander	0 (0.0%)	1 (0.9%)	1 (0.9%)	8 (7.0%)
Black/African American	1 (0.9%)	7 (6.1%)	22 (19.3%)	37 (32.5%)
White/Caucasian	2 (1.9%)	1 (0.9%)	5 (4.4%)	9 (7.9%)
Other	0 (0.0%)	1 (0.9%)	8 (7.0%)	11 (9.6%)

Note. *N =114.* *Native American/Alaskan Native was excluded due to lack of responses.

Table 2

Frequency Health Literacy Level by Participant Ethnicity

Demographic Variable / Health Literacy Level	3rd Grade & Below	4th to 6th Grade	7th to 8th Grade	High School & Above
Count				
Non-Hispanic	1 (0.9%)	7 (6/1%)	19 (16.7)	44 (38.6%)
Hispanic	1 (0.9%)	1 (0.9%)	13 (11.4%)	15 (13.2%)
No Answer	1 (0.9%)	2 (1.8%)	4 (6.5%)	6 (5.3%)

Note. *N =114*

The demographic information presented is based on the categorical grade equivalents. The data are presented in count frequency and by percentages for each demographic variable explored. As stated above, examining the mean score and grade equivalent, the average participant will find some difficulty in understanding patient education. Analysis of health literacy level by race showed the majority of participant regardless of race had a health literacy level grade equivalent of high school and above]57%] (see Table 10). Analysis of the participant grade equivalent by ethnicity revealed

that those who were Non-Hispanic had a health literacy level of high school and above] 38.6%] (see Table 11).

Table 3

Frequency Health Literacy Level by Participant Education Level

Demographic Variable/ Health Literacy Level	*3rd Grade & Below*	*4th to 6th Grade*	*7th to 8th Grade*	*High School & Above*
Count				
Grammar School	0 (0.0%)	1 (0.7%)	4 (2.7%)	8 (5.3%)
High School/HS Equivalent	3 (2.0%)	6 (4.0%)	19 (12.7%)	13 (8.7%)
Vocational/Tech School	0 (0.0%)	2 (1.3%)	2 (1.3%)	2 (1.3%)
Some College	0 (0.0%)	0 (0.0%)	3 (2.0%)	18 (12.0%)
Bachelor	0 (0.0%)	0 (0.0%)	5 (3.3%)	15 (10.0%)
Master	0 (0.0%)	0 (0.0%)	2 (1.3%)	8 (5.3%)
Professional (MD, JD)	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (0.7%)
Other	0 (0.0%)	1 (0.7%)	1 (0.7%)	0 (0.0%)

Note. *N =114.*

Table 4

Frequency Health Literacy Level by Participant Annual Income Level

Demographic Variable/ Health Literacy Level	*3rd Grade & Below*	*4th to 6th Grade*	*7th to 8th Grade*	*High School & Above*
Count				
Under $10,000	2 (1.8%)	4 (3.5%)	13 (11.4%)	27 (23.7%)
$10,000-$19,000	0 (0.0%)	1 (0.9%)	4 (3.5%)	7 (6.1%)
$20,000-$29,000	0 (0.0%)	4 (3.5%)	10 (8.8%)	6 (5.3%)
$30,000-$39,000	1(0.9%)	1 (0.9%)	1 (0.9%)	8 (7.0%)
$40,000-$49,000	0 (0.0%)	0 (0.0%)	2 (1.8%)	10 (8.8%)
$50,000-$74,000	0 (0.0%)	0 (0.0%)	2 (1.8%)	3 (2.6%)
$75,000-$100,000	0 (0.0%)	0 (0.0%)	3 (2.6%)	1 (0.9%)
Over $100,000	0 (0.0%)	0 (0.0%)	1 (0.9%)	3 (2.6%)

Note. *N =114.*

Those individuals with the highest health literacy levels reported their highest level of education as being some college (12%) or bachelor's degree [10%] (See Table 12). Analysis further revealed, those with the highest level of health literacy reported having the lowest level annual household income of under $10,000 [23.7%] (See Table

13). This finding is contrary to expected results. Analysis of the health literacy levels by demographic variables revealed that individuals with higher health literacy levels may, not necessarily, have a higher socioeconomic status. In addition, analysis revealed that the largest number of women (16.7%), with the highest level of health literacy were 50 years and older [16.7%] (see table 14).

Table 5

Frequency Health Literacy Level by Participant Age Group

Demographic Variable/ Health Literacy Level	*3rd Grade & Below*	*4th to 6th Grade*	*7th to 8th Grade*	*High School & Above*
Count				
19 -24 Years	0 (0.0%)	0 (0.0%)	1 (0.9%)	3 (2.6%)
25 – 29 Years	0 (0.0%)	0 (0.0%)	4 (3.5%)	8 (7.0%)
30 – 34 Years	0 (0.0%)	2 (1.7%)	1 (0.9%)	5 (4.4%)
35 – 39 Years	0 (0.0%)	2 (1.7%)	6 (5.2%)	7 (6.1%)
40 – 44 Years	10 (8.8%)	1 (0.9%)	2 (1.7%)	12 (10.5%)
45 – 49 Years	1 (0.9%)	0 (0.0%)	6 (5.2%)	11 (9.6%)
50 Years and Older	1 (0.9%)	5 (4.4%)	16 (14.0%)	19 (16.7%)

Note. *N =114.*

Analysis was also performed on those who chose not to report their sexual history. Of those not reporting their sexual history, 14 women had a health literacy level of high school and above. Another 12 women had a health literacy level of seventh to eighth grade. Women who had lower health literacy levels were less likely to decline answering the STD history questions. Those women who have higher health literacy levels were more likely to answer the questions. The majority of individuals not responding to the sexual history section, 52.7% had a health literacy level of high school and above (see Table 15).

Table 15

Health Literacy Level by Sexual History Answer/No Answer

Demographic Variable/ Health Literacy Level	*3rd Grade & Below*	*4th to 6th Grade*	*7th to 8th Grade*	*High School & Above*
Count				
Answer	3 (2.0%)	10 (6.7%)	36 (24. 0%)	65 (43.9%)
No Answer	4 (2.7%)	6 (4.0)	12 (8.0%)	14 (9.3%)

Note. *N =114.*

Analysis of the health literacy scores as they related to STD prevalence was focused on the 114 women who completed the sexual history portion of the survey. Focus was placed on analysis of data relating to chlamydia, gonorrhea, and both diseases combined. The mean score, as measured by the REALM, of those individuals reporting chlamydia was 57.36; gonorrhea was 58.11; and chlamydia and/or gonorrhea was 47.88 on the REALM. Further analysis of the REALM and chlamydia, gonorrhea, chlamydia and gonorrhea, syphilis, and other STDs will be discussed further in the next section. In addition, statistical analysis of the REALM and the STD and reproductive health survey scores and the relationship between health literacy and STD and reproductive health knowledge will be discussed in the next section.

Correlation, Linear Regression and Analysis of Variance

In order to determine if confounding variables existed and impacted the findings, a Spearman's ranked correlation was used to analyze the relationship between each of the demographic variables and the REALM. Two analyses were performed on the REALM and the demographic variables. The first analysis focused on demographics as ordinal values and the second dichotomous demographic variables. Here the ordinal analysis revealed a positive correlation between REALM score and level of education, $r_s = .327$, p

< .000. Based on this finding, a more in depth analysis was performed on each of the variables. Further, this analyses showed that a relationship existed between health literacy with specific education levels and annual income levels. Analysis of the relationships, using dichotomous variables (see Table 16), revealed that health literacy was inversely correlated with high school/high school equivalent r_s = -.383, p < .000; positively correlated with some college r_s = .377, p < .000, and positively correlated with master's degree r_s =-.185, p < .049. Health literacy was also correlated with an annual income of $20,000 – $29,000 r_s = -.235, p < .012.

Using Spearman's correlation demonstrated, significant relationships between relationship the REALM scores and reported history of chlamydia; syphilis; herpes; HPV/warts; hepatitis C; and an individual not answering the sexual history component of the written survey. An inverse correlation was found between health literacy and ever having gonorrhea, r_s = -.194, p < .038, and the prevalence of gonorrhea, r_s = -.194, p < .038, therefore the null hypothesis is rejected and the hypothesis is accepted. In addition, the null hypothesis, that a positive correlation exists between health literacy and STD/reproductive health knowledge, is rejected. Health literacy is positively correlated with each component of the STD and reproductive health knowledge survey. Analysis revealed that, both STD, r_s = .347, p < .00 and reproductive health knowledge, r_s = .201, p < 0.32, sections as well as the entire reproductive health knowledge survey were statistically significant r_s = .369, p < .000 (see Table 17).

Table 16

Spearman's Correlation - Health Literacy by Demographic Variable

Variable	r_s	*p value*
Black/African American	-.023	.805
White/Caucasian	-.075	.427
Asian/Pacific Islander	.169	.073
Race Other	-.024	.798
Hispanic	-.092	.333
Non-Hispanic	.159	.090
19 - 24 Years	.123	.192
25 - 29 Years	.104	.270
30 - 34 Years	-.002	.982
35 - 39 Years	-.029	.760
40 - 44 Years	.055	.560
45 - 49 Years	-.026	.783
50 Years and Older	-.111	.178
Grammar School	-.047	.621
High School/High School Equivalent	-.383**	.000
Vocational/Technical School	-.124	.190
Some College	.377**	.000
Bachelor's Degree	.132	.160
Master's Degree	.185*	.049
Professional Degree	-.010	.915
Other Education	-.163	.083
Under $10,000	-.028	.769
$10,000 - $19,000	.048	.609
$20,000 - $29,000	-.235*	.012
$30,000 - $39,000	.048	.615
$40,000 - $49,000	.164	.081
$50,000 - $74,000	.084	.372
$75,000 - $100,000	.020	.836
Over $100,000	.052	.580

Note. *N =114*. ** Correlation is significant at the 0.01 level (2-tailed). * Correlation is significant at the 0.05 level (2-tailed).

Table 17

Spearman's Correlation - Health Literacy and Sexual History

Variable	r_s	*p value*
Chlamydia	-.049	.608
Gonorrhea	-.194*	.038
Chlamydia and/or Gonorrhea	-.149	.114
Syphilis	-.046	.626
Herpes	-.007	.945
HPV/Warts	-.067	.478
HIV/AIDS	-.097	.306
Hepatitis C	.003	.975
Other STD	-.120	.202
Any STD	-.118	.210
Number of Times Chlamydia	-.049	.606
Number of Times Gonorrhea	-.194*	.038
Number of Times Chlamydia and/or Gonorrhea	-.143	.130
Number of Times Syphilis	-.138	.142
Number of Times Other STDs	-.136	.148
Number of Times Any STD	-.164	.081
Reproductive Health Knowledge	.201*	.032
STD Health Knowledge	.347**	.000
Complete Survey Score	.369**	.000

Note. *N =114.* ** Correlation is significant at the 0.01 level (2-tailed). * Correlation is significant at the .05 level (2-tailed).

Multivariate analysis was conducted between health literacy and the independent variables, which included the number of individuals who reported ever having chlamydia, gonorrhea, chlamydia/gonorrhea, syphilis, herpes, HPV/warts, HIV/AIDS, hepatitis C, other STDs, any STD, number of different STD types, number of times chlamydia/gonorrhea, number of times chlamydia, number of times gonorrhea, number of times syphilis, number of times any STD, if there was no answer to the sexual history component, complete survey scores, reproductive health section scores, and STD section

scores. Analysis revealed a significant main effect for health literacy and the aforementioned independent variables, Wilks'λ = .60, $F(19, 91) = 3.4$, $p < .000$ (see Table 18). Based on these findings the remaining analysis was focused on the REALM in relationship to the independent variables without controlling for education or income levels.

Table 18

Multivariate Test of Health Literacy, High School, Some College, Master's Degree, and Household income between $20,000-$29,000

Effect	*Test*	*Value*	*F*	*Hypothesis df*	*Error df*	*Sig.*
REALM	Pillai's Trace	0.40	3.4	18.00	91.00	0.00
	Wilks' Lambda	0.60	3.4	18.00	91.00	0.00
	Hotelling's Trace	0.68	3.4	18.00	91.00	0.00
	Roy's Largest Root	0.68	3.4	18.00	91.00	0.00
High School / High School Equivalent	Pillai's Trace	0.17	1.0	18.00	91.00	0.44
	Wilks' Lambda	0.83	1.0	18.00	91.00	0.44
	Hotelling's Trace	0.20	1.0	18.00	91.00	0.44
	Roy's Largest Root	0.20	1.0	18.00	91.00	0.44
Some College	Pillai's Trace	0.11	.62	18.00	91.00	0.87
	Wilks' Lambda	0.89	.62	18.00	91.00	0.87
	Hotelling's Trace	0.12	.62	18.00	91.00	0.87
	Roy's Largest Root	0.12	.62	18.00	91.00	0.87
Master's Degree	Pillai's Trace	0.16	.65	18.00	91.00	0.53
	Wilks' Lambda	0.84	.65	18.00	91.00	0.53
	Hotelling's Trace	0.19	.65	18.00	91.00	0.53
	Roy's Largest Root	0.19	.65	18.00	91.00	0.53
$20,000 - $29,000	Pillai's Trace	0.18	1.12	18.00	91.00	0.35
	Wilks' Lambda	0.82	1.12	18.00	91.00	0.35
	Hotelling's Trace	0.22	1.12	18.00	91.00	0.35
	Roy's Largest Root	0.22	1.12	18.00	91.00	0.35

Note. *N =114*.

Multivariate analysis of the dependent variables and health literacy, revealed a main effect between health literacy and individual reporting at some point in their life had contracted gonorrhea, $F(1,112) = 9.56$, $p < .003$; number of times they reported having gonorrhea $F(1,112) = 9.56$, $p < .003$; having ever reported chlamydia and/or gonorrhea, $F(1,112) = 5.46$, $p < .02$; and having other STDs, $F(1,112) = 5.61$, $p < .020$. In addition, a main effect was observed between health literacy and STD/reproductive health survey scores $F(1,112) = 22.26$, $p < .000$. Main effects were also found between health literacy and STD knowledge $F(1,112) = 20.35$, $p < .000$, and reproductive health knowledge $F(1,112) = 6.49$, $p < .012$ independently (see Table 19).

Based on these findings, the hypothesis that a significant relationship exists between health literacy and the prevalence of chlamydia and gonorrhea in women over 18 years of age, who attend health clinics in the New York City metropolitan area, was not proven and the null hypothesis was accepted. Had the hypothesis been that either chlamydia or gonorrhea prevalence would be significantly related to health literacy the null hypothesis would have been rejected. Health literacy and gonorrhea prevalence showed a significant relationship, while a non-significant relationship with chlamydia $F(1,112) = .029$, $p < .866$. In addition, as stated above, a significant relationship was found between health literacy and reporting of ever having chlamydia and/or gonorrhea infection combined $F(1,112) = 5.46$, $p < .021$.

Table 19

Multivariate Analysis Health Literacy by Sexually Transmitted Disease

Dependent Variable	r^2	r^2 *adjusted*	*df*	*Residual*	*F*	*sig*
Chlamydia	.000	-.009	1	112	.029	.866
Gonorrhea	.079	.070	1	112	9.56	.003
Chlamydia/Gonorrhea	.046	.038	1	112	5.46	.021
Syphilis	.000	-.009	1	112	.000	.997
Herpes	.019	.011	1	112	2.21	.140
HPV/Warts	.017	.008	1	112	1.93	.167
HIV/AIDS	.015	.006	1	112	1.70	.195
Hepatitis C	.019	.011	1	112	2.21	.140
Other STDs	.048	.039	1	112	5.61	.020
Any STD	.018	.009	1	112	2.03	.158
Number of Times CT	.000	-.009	1	112	.042	.839
Number of Times GC	.079	.070	1	112	9.56	.003
Number of Times CT/GC	.007	-.001	1	112	.844	.360
Number of Times Syphilis	.004	-.004	1	112	.495	.483
Number of Times Other STDs	.012	.003	1	112	1.38	.242
Number of Times Any STD	.016	.007	1	112	1.85	.177
Complete Survey Scores	.166	.158	1	112	22.26	.000
Reproductive Health Section Score	.055	.046	1	112	6.49	.012
STD Section	.154	.146	1	112	20.35	.000

Note. *N = 114*.

In that the null hypothesis was accepted regarding the relationship between the prevalence of chlamydia and gonorrhea and health literacy, an analysis to determine if a health literacy/disease was not conducted. In addition, analysis of each of the STDs, the reported prevalence for each in relationship to STD/reproductive health knowledge revealed that no significant relationships existed between any of the variables. Implications regarding the findings, limitations, and the need for additional research will be discussed in the next chapter.

Conclusion / Summary

Data analysis was conducted on 114 participant's results. Of the 150 who completed both surveys, 36 did not report their history of STDs, therefore, their questionnaires were not used in the analysis. Data analyzed included health literacy, reproductive health/STD knowledge, and STD prevalence. The data were analyzed included cross tabulation, correlation, ANOVA, and multivariable logistic regression. The findings of the analysis will be discussed in the next chapter.

Chapter 5: Discussion, Conclusions, and Recommendations

Introduction

This study was conducted to evaluate the nature of the relationship between health literacy and disease prevalence, health literacy and reproductive/STD knowledge, reproductive/STD knowledge and disease prevalence. The main diseases examined were chlamydia and/or gonorrhea. As stated previously, health literacy was measured using the REALM and self-administered survey. The survey focused on participant demographics, disease prevalence, and reproductive/STD knowledge.

Summary and Explanation of Findings

Hypothesis 1: Health literacy as measured by the REALM instrument is inversely correlated to the prevalence of chlamydia and gonorrhea in women receiving services at community clinics that provide reproductive health services. Data analysis revealed that an inverse correlation does exist between health literacy level and whether or not a person reported ever having gonorrhea; however, no significant relationship was found between health literacy and ever having chlamydia. Further analysis revealed a significant inverse correlation between health literacy and ever having gonorrhea and chlamydia combined, at some point in their life. In addition, an inverse relationship exists between the number of times a person reporting having had gonorrhea and health literacy, yet again there was no relationship found to exist between the number of times a person reported chlamydia and health literacy. Multivariate analysis supported the Spearman's correlation showing significant relationships between health literacy and ever having gonorrhea as well as health literacy and ever having gonorrhea and/or chlamydia. As a result, the hypothesis

regarding both gonorrhea and chlamydia prevalence was rejected as a whole and the null hypothesis was accepted. That being said, part of the hypothesis was proven as gonorrhea prevalence and gonorrhea and/or chlamydia prevalence were significantly related to health literacy. If we look at gonorrhea prevalence alone, the null hypothesis would be rejected and the hypothesis would be accepted. The same holds true for reporting chlamydia and/or gonorrhea. The findings for gonorrhea and/or chlamydia prevalence, however, may in fact be a result of the gonorrhea prevalence's influence on the findings.

Secondary findings revealed that individuals reporting ever having any STD including gonorrhea, chlamydia, syphilis, herpes, human papilloma virus, HIV/AIDS, hepatitis C, and other STDs had no relationship with the race of a participant. There was, however, a relationship discovered between reporting either having chlamydia and/or gonorrhea and individuals over the age of 50 years, but not for age overall. Only one level of education reported showed a significant relationship with having an STD. Those reporting their highest level of education as vocational or technical school revealed a statistical relationship between chlamydia and/or gonorrhea. Overall, level of education showed no relationship with ever having a STD. As with the other demographic variables, level of income was not related to ever reporting having an STD overall, but was related to two levels of annual income. The only statistical relationship regarding income was between those reporting ever having any STD and those having incomes of below $10,000 or between $10,000 and $19,000. Overall, there was no significant relationship between reporting ever having an STD and race, ethnicity, level of

education, age range, or income. Limitations regarding these findings will be discussed later in this chapter.

Hypothesis 2: Lower health literacy scores are positively correlated with a lower knowledge scores regarding reproductive health and STDs. Data analysis for health literacy and reproductive health/STD scores revealed that a positive correlation exists. Not only was health literacy related to reproductive health/STD knowledge as a whole but also to each of the individual knowledge sections. Significant correlations were discovered between health literacy scores and reproductive health knowledge as well as health literacy and STD knowledge. In addition, a positive relationship was discovered between reproductive health/STD knowledge scores reporting an age of 19–24, highest level of education of master's degree, or having an annual income of $40,000 - $49,000. Significant inverse correlations were found between reproductive health/STD knowledge and reporting an age of 30–34 or 35–39, highest level of education of high school/high school equivalent, or having an income under $10,000 and $10,000 - $19,000. These findings indicate that health literacy and reproductive health/STD knowledge may not be generalizable across age groups, income levels, and annual income. These results were contrary to the anticipated findings for positive correlations across all demographic factors; higher reproductive health/STD knowledge was significantly related to lower annual incomes and individual falling into the media age groups. The implication of this finding will be discussed later in the section.

Hypothesis 3: Lower knowledge scores regarding reproductive health and STDs are inversely correlated with prevalence of chlamydia and gonorrhea in women receiving

services at community clinics that provide reproductive health services clinics. Data analysis conducted on reproductive health/STD knowledge and prevalence of STDs revealed a positive correlation exists between the number of times a participant reported she had an STD other than chlamydia and/or gonorrhea and her reproductive health/STD knowledge. In that no significant relationship was found between reproductive health/STD knowledge and chlamydia and gonorrhea, the null hypothesis was not refuted and the hypothesis was rejected.

Hypothesis 4: Using the REALM, a specific score threshold exists in which chlamydia and/or gonorrhea prevalence significantly increases. Analysis of REALM score with gonorrhea prevalence revealed that there is no threshold that is predictive of an increase in prevalence. The same was also found with regards to chlamydia and/or gonorrhea. Being unable to establish a threshold may be a result of the limited number of gonorrhea and chlamydia diagnosis reported. This and other limitations will be discussed later in this chapter.

Integration of Findings with Past Literature

In reviewing the two primary studies used as the foundation for this research study, they showed that there were areas where they converged and diverged from this research study (Rutherford et al., 2006; Fortenberry et al, 2001). The majority of the areas that converged and diverge were related to the demographic variables examined in each of the studies. In addition, areas of convergence include health literacy level in relationship to reproductive health knowledge (Rutherford, et al., 2006). Specific areas of

divergence include REALM range of scores (Rutherford et al., 2006) and REALM median scores (Fortenberry et al., 2001).

Rutherford et al. (2006) reported, in their study of 505 women over the age of 16, lower health literacy scores were related to not knowing when women are fertile within a women's mistral cycle, the ability to identify sexually transmitted infections, and how STDs are transmitted. The findings of this study converged with those of the Rutherford et al. (2006) study with regard to women with lower health literacy scored were less likely to be able to identify sexually transmitted infections and to know how they were transmitted. In addition, this study found the level of education to be in agreement with a study of 809 subjects (Fortenberry et al., 2001), which showed that lower health literacy scores were associated with individuals reporting lower levels of education. As a result, both the Fortenberry et al. (2001) study and this study diverged from expectations regarding the demographic data analysis and that lower socioeconomic status impacts health literacy level. In addition, the mean REALM scores for each of the studies were also comparable at 61.3 (*SD* = 4.6; Rutherford et al., 2006); 56.50 (*SD* = 12.78; Fortenberry et al., 2001); and 57.32 (*SD* = 12.01) for this study. For all three studies, the data were negatively skewed with individuals having higher health literacy levels than anticipated. The areas of convergence may be indicative of the health literacy levels of those attending agencies and clinics serving uninsured and underinsured individuals. Not only were there areas of convergence between this study and the two foundation studies used but there were also specific areas of divergence.

Although this study was in agreement with both the Fortenberry et al. (2001) study and the Rutherford et al. (2006) study regarding the overall demographic findings, divergence, was discovered through categorical variable data analysis and specifically between health literacy and level of education and income. A significant inverse relationship was discovered between health literacy and those who reported their highest level of education as high school or high school equivalent. In contrast, there was a significant positive correlation when reporting some college or having a master's degree as the highest level of education. There was no relationship in those who reported having an education level below high school or high school equivalent. The only age group discovered to have a significant correlation with health literacy was having an annual income of $20,000 - $29,000. The relationship between these variables was inverse. In addition, an inverse correlation exists between health literacy and the reporting of ever having gonorrhea and the number of times individuals reporting having had gonorrhea; whereas, in the study of health literacy and gonorrhea (Fortenberry et al., 2001), there was no significant relationship discovered between the two. The divergence may have been a result of differing hypotheses or as a result of limitations of this study. This divergence will be discussed further in the implications section.

Limitations

When examining this study in comparison to the two primary studies used as the building blocks for this project, it is possible that the areas of divergence were a result of sampling error. This study had a smaller number of participants at 114, where the Fortenberry et al (2001) study included 930 individuals. Further, this study only

examined women over the age of 18, whereas their study included both male and female participants. In addition, the original intent of this study was to gather data from clinics that focused solely on reproductive and women's health with the staff providing referrals for any other services.

Due to the difficulty in securing a location or locations for data collection, the primary agency and satellite sites ultimately obtained for this study served a wider representation of underserved and underinsured individuals whose needs and concerns spanned well beyond just those of reproductive health. Although this was a limitation on one hand, as it was not the intended population, it provided a broader view of health literacy than was intended. In addition, due to the small number of participants it may not be generalizable to the general population and indicates the need for further research that is more representative of women over the age of 18 in Queens, New York, or the nation as a whole. Participants may have confused chlamydia with gonorrhea, not knowing which disease they had contracted, but knowing that they had received treatment for one or the other. In addition, the majority of women were not adolescents or young adults between the ages of 18and 29. Each of these factors individually or collectively may have impacted the findings of this study.

Implications for Social Change

The lack of correlation between health literacy, race, and ethnicity revealed a need for practitioners to be cautious when presenting information regarding health literacy, "at risk" populations, and demographic information. Beyond that, the findings demonstrated that health literacy was positively correlated with reproductive health and/or STD

knowledge, and therefore, additional attention should be given to how reproductive health and STD health information is presented to clients. Finally, these findings may assist in the efforts to decrease STD prevalence.

Of the findings presented, the most intriguing were the correlations between health literacy and the specific levels of education. Those reporting a highest level of education as high school or high school equivalent were inversely correlated with health literacy, while those reporting some college or having a master's degree were positively correlated. The assumption that those with lower levels of education were more likely to have lower health literacy levels was not demonstrated. In addition, reproductive health and STD knowledge were shown to be inversely correlated with those between the age of 30–39 years and those with incomes of $10,000 - $19,000 and $40,000 - $49,000 and not to the other demographic variables.

Recommendation for Action

This study examined the relationship between health literacy and chlamydia and gonorrhea prevalence, health literacy and reproductive health/STD knowledge, and reproductive health/STD knowledge and chlamydia and gonorrhea prevalence. The findings revealed that a relationship does exist between health literacy and disease prevalence, health literacy and reproductive health/STD knowledge,, and reproductive health/STD knowledge and chlamydia and gonorrhea prevalence, indicating health literacy needs to be considered when performing informational prevention interactions with women over the age of 18. In addition, the findings express the need for health

literacy to be viewed as an independent factor when providing reproductive health/STD informational prevention interactions and not directly related to socioeconomic status.

Service providers should assess health literacy levels in an effort not to stigmatize those individuals who have lower education and annual income. The findings of this study in combination with the other two studies presented (Rutherford et al., 2006; Fortenberry et al, 2001), may assist in creating a positive social change by decreasing social stigmatization of issues relating to race, income, and education when discussing, studying or creating materials using health literacy as guide.

Recommendations for Further Research

One of the primary questions for further research is, "what other factors impact STD and reproductive health knowledge?" For example, is it possible that the populations surveyed are routinely targeted for HIV, STD, and reproductive health prevention messages? Being exposed to repetitive messages regarding sexual health and disease to individuals' representative of a specific socioeconomic status, may skew analysis conducted on reproductive health/STD knowledge and/or health literacy levels, including this study.

Of note, the findings of this study were not conclusive regarding the relationship between health literacy and STD prevalence. Although a significant relationship was found between health literacy and gonorrhea prevalence and chlamydia and/or gonorrhea no relationship was discovered between health literacy and chlamydia prevalence. The impact of the health literacy and gonorrhea prevalence in relationship to health literacy and chlamydia and/or gonorrhea needs to be explored to determine if the findings for

gonorrhea alone were the main factor in combined chlamydia and gonorrhea prevalence findings. Further research is needed to determine if these findings were a result of a lack of knowledge regarding the different types of STDs or were results for gonorrhea intended as answers for chlamydia and vice versa. In addition, research is needed examining individual's representative of various genders, ages, races, ethnicities, economic levels, and education levels, which are expanded beyond service agencies focusing on STDs, HIV, or reproductive health related conditions. If possible, a means of data collection other than self-reported should be explored, though it may be more feasible in non-reproductive health type settings other than health services organizations.

Conclusion

This study revealed that health literacy is related to self-reported disease prevalence for gonorrhea, chlamydia and/or gonorrhea, and reproductive health/STD knowledge. It also demonstrated that the paradigms that health literacy is relating to race, ethnicity, education, and age are not necessarily accurate and care needs to be taken when providing services and when judging a person as having low health literacy based on their demographic background. Further, the data analysis revealed that more research is needed that includes a wide range of participants who are served in settings more representative of the general population as a whole.

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Appendix A

Reproductive health/STD knowledge assessment

Please Check All That Apply

RACE

- o Asian/Pacific Islander
- o Black/African American
- o White/Caucasian
- o Native American/Alaskan Native
- o Other

_____

ETHNICITY

- o Hispanic
- o Non-Hispanic

AGE

- o 18-19
- o 20-24
- o 25-29
- o 30-39
- o 40-49
- o 50 or over

GENDER

- o Male
- o Female
- o Transgender Female

- o Transgender Male

EDUCATION (Highest Level Completed)

- o Grammar School
- o High School / High School Equivalent
- o Vocational / Technical School
- o Some College
- o Bachelor's Degree
- o Master's Degree
- o Doctoral Degree
- o Professional Degree (MD, JD, etc.)
- o Other

_____

HOUSEHOLD INCOME (Round to nearest thousand)

- o Under $10,000
- o $10,000 - $19,000
- o $20,000 - $29,000
- o $30,000 - $39,000
- o $40,000 - $49,000
- o $50,000 - $74,000
- o $75,000 - $100,000
- o Over $100,000

SEXUALLY TRANSMITTED INFECTION HISTORY (Please mark all that apply) Have you ever been diagnosed with or had any of the following?

- o Chlamydia
- o Gonorrhea
- o Syphilis
- o Herpes
- o HPV / Warts
- o HIV/AIDS
- o Hepatitis B
- o Hepatitis C
- o Other
- o None

_____

Date last tested for HIV (date of diagnosis or last HIV negative test) _____

Numbers of times you remember being infected with a sexually transmitted infection

Chlamydia: _____

Gonorrhea: _____

Syphilis: _____ Other: _____/ # times

_____

(PLEASE CONTINUE TO NEXTT PAGE)

Please circle the most correct answer --

1. The pill:
    a. Prevents ovulation
    b. Keeps cervical mucus very thin
    c. Changes the lining of the uterus to make implantation unlikely

d. Both A & C

e. All of the above

2. According to the most accepted current thought, the IUD's effectiveness is due to :

a. Changing levels of hormones

b. Changed functioning of the fallopian tubes

c. Preventing implantation of the fertilized egg

d. Preventing ovulation

e. All of the above

3. A diaphragm should be used:

a. Without any cream or jelly

b. With any type of lubricant

c. With spermicidal jelly or cream inside it

d. Either with or without spermicidal jelly

4. Contraceptive foam is most effective in preventing pregnancy when inserted inside the vagina:

a. Right before intercourse

b. 2-4 hours before intercourse

c. Right after intercourse

d. All of the above

5. The use of a condom when having sexual intercourse is recommended because:

a. If used right, it usually prevents getting or giving gonorrhea

b. It can be bought in a drug store by both men and women

c. It does not have dangerous side effects

d. All of the above

6. A woman can get pregnant:

a. A few minutes after sexual intercourse

b. A few hours after sexual intercourse

c. A few days after sexual intercourse

d. All of the above

e. A and B

7. Over a one-year period what is the likelihood that a sexually active woman who uses no birth control will become pregnant?

a. 1 in 10

b. 5 in 10

c. 7 in 10

d. 9 in 10

8. A woman is most likely to become pregnant (no matter how long or short her menstrual cycle) if she has sexual intercourse about:

a. 1 week before menstruation begins

b. 2 weeks after menstruation begins

c. 2 weeks before menstruation begins

d. 1 week after menstruation begins

(PLEASE CONTINUE TO NEXTT PAGE)

SEXUALLY TRANSMITTED IFFECTION KNOWLEDGE

Please answer the following True/False Questions

T=True F=False DK=Don't Know

QUESTION	True	False	Don't Know
1. Frequent urinary infections can cause Chlamydia.	**T**	**F**	**DK**
2. A person can get Gonorrhea from anal sex.	**T**	**F**	**DK**
3. During vaginal sex, a woman is more likely to become infected with HIV from a man than a man is to become infected from a woman.	**T**	**F**	**DK**
4. Some people are immune to (protected from getting) Sexually Transmitted Infections.	**T**	**F**	**DK**
5. There is a cure for Chlamydia.	**T**	**F**	**DK**
6. A woman can look at her body and tell if she has Gonorrhea.	**T**	**F**	**DK**
7. Chlamydia can cause pain during urination (peeing).	**T**	**F**	**DK**
8. Sexually Transmitted diseases are all related to the same virus.	**T**	**F**	**DK**
9. A woman can tell that she has Chlamydia if she has a bad smelling odor from her vagina.	**T**	**F**	**DK**
10. There is a vaccine available to prevent a person from getting Gonorrhea.	**T**	**F**	**DK**
11. A doctor can remove Genital Warts.	**T**	**F**	**DK**
12. Chlamydia can lead to infertility in women.	**T**	**F**	**DK**

Appendix B

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    - The online version of this report is available at http://www.cdc.gov/std/stats.http://www.cdc.gov/std/stats
- REALM Scoring Kit
    - I have obtained a legal copy of the manual or scoring kit.
    - Obtained legal copy from Louisiana State University.
- Reproductive Health/STD Survey Component Instrument and Article

  Excerpts of the Handbook of Sexually-Related Measures were used to create the Reproductive Health/STD knowledge survey.
    - I have confirmed that the tool is public domain: Davis, C., Yarber, W., Bauserman, R., Schreer, G., & Davis, S. (1998). Handbook of Sexually-Related Measures (p.562). Thousand Oaks, CA: SAGE Publications.
    - I have received copyright permission to use components of this article for use designing the Garces-Palacio, I. Altarac, M., & Scarinci, I. (2008). Contraceptive knowledge and use among low-income Hispanic immigrant women and non-Hispanic women. Contraception, 77, 270-275.