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Associations Between Social Determinants of Health and Chlamydia Infections Among Georgia Counties

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Associations Between Social Determinants of Health and Chlamydia Infections Among Georgia Counties

A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy at Virginia Commonwealth University

by

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Dedication

This dissertation is dedicated to my grandmother, Revonia Peters. Although you were unable to witness this journey, your perseverance and strength guided me.

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ABSTRACT

ASSOCIATIONS BETWEEN SOCIAL DETERMINANTS OF HEALTH AND CHLAMYDIA INFECTIONS AMONG GEORGIA COUNTIES

By Bre'Auna K. Beasley

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Chlamydia is a growing public health concern that disproportionately impacts southern states. While social determinants of health are not direct causes of chlamydia infections, studies have found that these determinants do influence infections by creating environments that promote or hinder health seeking behaviors, as well as exposure to risk factors. Guided by the Social Ecological Model of Public Health and the Healthy People 2030 Social Determinants of Health Conceptual Framework, this dissertation study aimed to examine the associations between social determinants of health and chlamydia infections among Georgia counties. This study employed a correlational research design. Aggregate-level secondary data for all 159 Georgia counties were extracted from GeorgiaData, the state of Georgia's online data repository.

Results showed that the following social determinants were positively associated with chlamydia infections among Georgia counties: proportion identifying as Black, African American, proportion between 15 and 29 years of age, proportion at or below the poverty threshold, proportion above 25 years of age with less than a high school diploma or its equivalency, physician rate, proportion of single parent-headed households, proportion residing in a rural area,

and total crime rate. Additionally, the following social determinants were found to be negatively associated with chlamydia infections among Georgia counties: unemployment rate, proportion under 65 years of age and uninsured, and civic participation. The results of this study had implications for local governments related to the development and implementation of targeted multi-level public policy initiatives and prevention interventions.

Keywords: chlamydia, Georgia, Healthy People 2030, Social Ecological Model of Public Health, social determinants of health

Chapter 1: Introduction

Introduction

Sexual health is a fundamental component of the overall health, well-being, and vitality of individuals and communities, and includes, "the ability to understand the benefits, risks, and responsibilities of sexual behavior; the prevention and care of disease, and other adverse outcomes…" (CDC, 2018; DHHS, 2012). Per the World Health Organization (WHO), sexual health related issues are wide ranging and encompass a bevy of topics including pregnancy and reproductive health, as well as the prevention, contraction, and transmission of sexually transmitted diseases/infections (WHO, 2018). While previous scholars have examined sexual health outcomes, particularly sexually transmitted infections, through the lens of individual level and behavioral factors, a growing body of research considers the role of social determinants in shaping the environments that inhibit or promote the health seeking behaviors and risk factors (CDC, 2019; DHHS, 2012; ODPHP, 2019; Stumbar, Garba, & Holder, 2018; WHO, 2018). The purpose of this dissertation study was to examine the associations between multiple social determinants of health and chlamydia infections among Georgia counties.

According to the Centers for Disease Control and Prevention (CDC) (2018), the number of newly reported cases of sexually transmitted diseases approached nearly 3 million, which corresponds to the highest number ever reported in the United States (CDC, 2018). Approximately 1.8 million newly reported cases were chlamydia infections, which corresponded to an annual rate of 539.9 cases per 100,000 of the population (CDC, 2018). Sexually transmitted diseases are public health problems that render physical, community, and economic consequences (Blankenship, Friedman, Dworkin, & Mantell, 2006; CDC, 2018; Kozhimannil, Enns, Blauer-Peterson, Farris, Kahn, & Kulasingam, 2014; Leichlitter, Seiler, & Wohlfeiler,

2017). The CDC reported that newly acquired sexually transmitted diseases cost the United States healthcare system $16 billion annually (CDC, 2018). More specifically, the costs to contain, treat, and prevent chlamydia costs $691 million in 2018 (CDC, 2018).

Historically, prevention efforts regarding sexually transmitted infections have focused on individual level behaviors, attitudes, and risk factors. The scope of these studies ranged from examining the impact of behavioral counseling, condom usage, and number of sexual partners to other risky sexual behaviors on the contraction of sexually transmitted diseases, as well as subsequent policy development, intervention implementation, and the appropriation of funding at the federal and state levels (Aral & Peterman, 1996; Hiltabiddle, 1996; Farshabaf-khalili, Shahnazi, Salei-pourmehr, Farivdvand, & Asgarloo, 2014; O'Reilly & Piot, 1996; Salazar et al., 2010; Zak-Place & Stern, 2004; Xia & Yang, 2005). Nevertheless, recent studies have found that policies and interventions targeting the modification of individual behaviors (consistent with individual and intrapersonal approaches) may not lead to long-term prevention, as behavior and individual characteristics do not exist in a vacuum. While social determinants such as neighborhood poverty, crime, educational attainment, and social cohesion are not direct causes of health outcomes, these factors have been found to promote or limit access to health seeking behaviors and risks of exposure (Baral, Logie, Grosso, Wirtz, & Beyrer, 2013; CDC, 2019; ODPHP, 2019; Kozhimannil et al., 2015; Krieger, 1994; Salazar et al., 2010; Thomas et al., 1999). Further, emerging evidence suggests that certain determinants may exert an equal, if not greater, effect than individual characteristics on health behaviors and subsequent health outcomes (DiClemente, Salazar, & Crosby, 2007; Maton, 2000).

Background of the Study

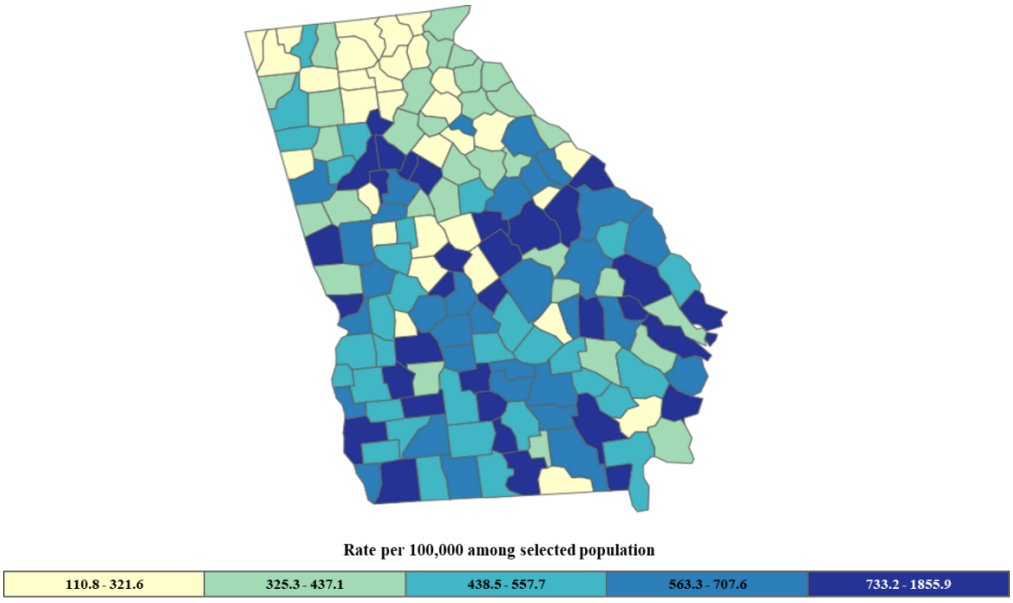
Of the 3 million cases reported to federal, state, and local healthcare organizations in the United States during 2018, new chlamydia infections accounted for 1.8 million, making chlamydia one of the most reported sexually transmitted diseases (CDC, 2018). The number of newly reported cases corresponds to an annual chlamydia infection incidence rate of 539.9 cases per 100,000 of the population (CDC, 2018). Chlamydia is a sexually transmitted infection caused by exposure to the *chlamydia trachomatis* bacteria during anal, vaginal, and oral penetration, or direct contact with infected tissue. Symptoms of chlamydia infections range from abnormal vaginal discharge, discomfort, and bleeding in females to swollen testicles and cloudy discharge in males (CDC, 2017; Fleming & Wasserheit, 1999; Malhotra et al., 2013). While chlamydia is easily curable with antibiotics, 70% of women and 50% of men are asymptomatic (Malhotra et al., 2013; Oakeshott, Kerry, & Aghauizu, 2010; Pinto, Dorn, Chinchilli, & Du, 2018; Torrone, Papp, & Weinstock, 2014). Untreated infections may lead to heightened transmission of chlamydia and susceptibility to contracting the human immunodeficiency virus (HIV), among other reproductive challenges (CDC, 2018; Malhotra et al., 2013).

The highest rates of chlamydia infection were concentrated among southern states (CDC, 2018). The state of Georgia, nestled in the southeastern part of the United States and surrounded by Florida, Tennessee, South Carolina, and Alabama, ranked sixth, among the 50 states and District of Columbia, in terms of newly reported cases of chlamydia infections (CDC, 2018). Specifically, the CDC found 65,104 newly reported chlamydia infections in Georgia, which equated to a rate of 631.4 cases per 100,000 of the population (CDC, 2018). Georgia's chlamydia rate far exceeded the average national rate of 539.9 cases per 100,000 of the population and southern states' average of 560.4 cases per 100,000 of the population (CDC, 2018). As shown in

Figure 1, in 2018. Counties located at the center and southern regions of Georgia had the highest reported rates of chlamydia.

Figure 1

County-level Chlamydia Rates, 2018



Source: Centers for Disease Control and Prevention, Sexually Transmitted Diseases — County Reported Cases and Rates of Reported Cases per 100,000 Population, Georgia, NCHHSTP AtlasPlus. Available from: https://www.cdc.gov/nchhstp/atlas/index.htm.

While the higher rates of chlamydia infections among southern states and in particular Georgia are prominent public health concerns, there has been limited inquiry into social and environmental factors contributing to chlamydia rates among Georgia counties (Raychowdhury, Tedders, & Jones, 2008).

Trends and Disparities in Chlamydia Infections

Although chlamydia has been considered a nationally notifiable disease since 1994, all 50 states and the District of Columbia were only required to begin reporting chlamydia infections in 2000. National, state, and local estimates of chlamydia infections and rates prior to 2000 should be interpreted with caution. Chlamydia infections are typically asymptomatic, and the number of new infections reported to the CDC may increase as a greater number of persons are screened,

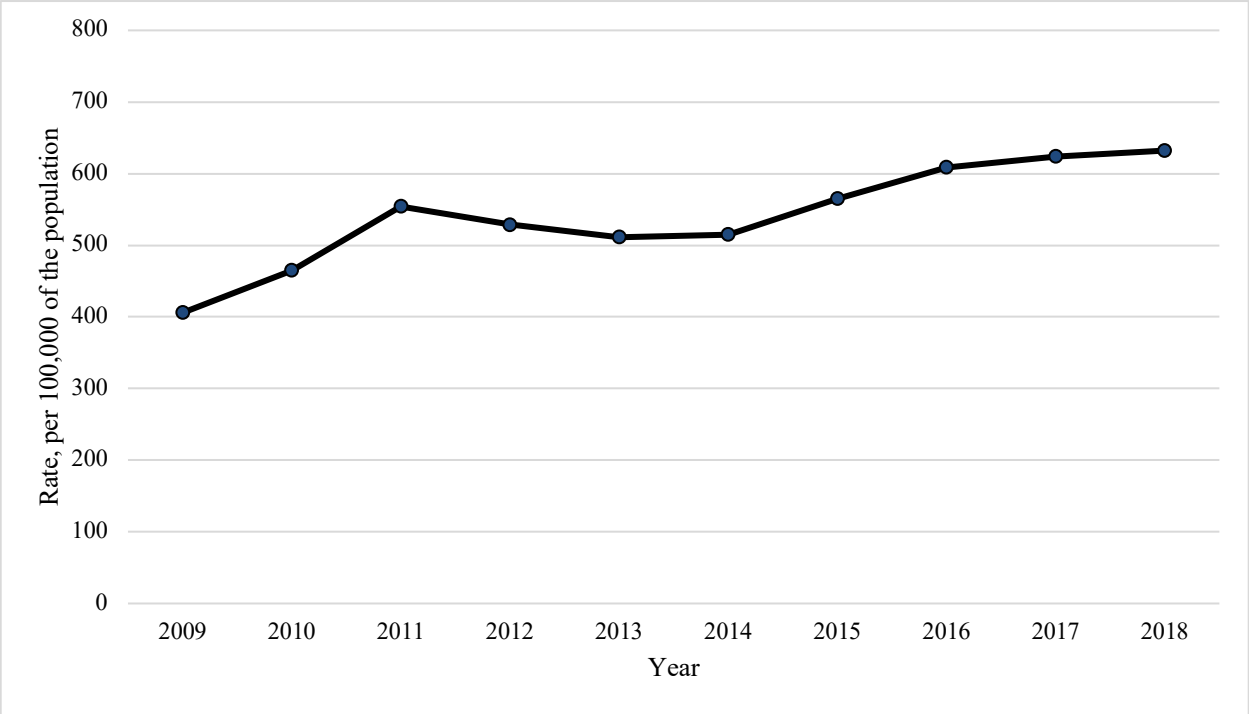
even when incidence is constant or declining. Over the past 10 years, there has been a surge in the utilization of more sensitive diagnostic testing, such as nucleic acid amplification tests, which may explain variances in the number of infections identified and reported (CDC, 2018).

Georgia Trends

As shown in Figure 2, chlamydia rates in Georgia increased from 405.8 cases per 100,000 of the population in 2009 to 554.5 cases per 100,000 of the population in 2011. From 2011 to 2014 a decrease was reported to a rate of 515.1 cases. After 2014, the chlamydia rate increased each year until the peak in 2018.

Figure 2

Georgia Trends in Chlamydia Rates, 2009-2018



Source: Centers for Disease Control and Prevention, Sexually Transmitted Diseases — Reported Cases and Rates of Reported Cases per 100,000 Population, Georgia, NCHHSTP AtlasPlus. Available from: https://www.cdc.gov/nchhstp/atlas/index.htm.

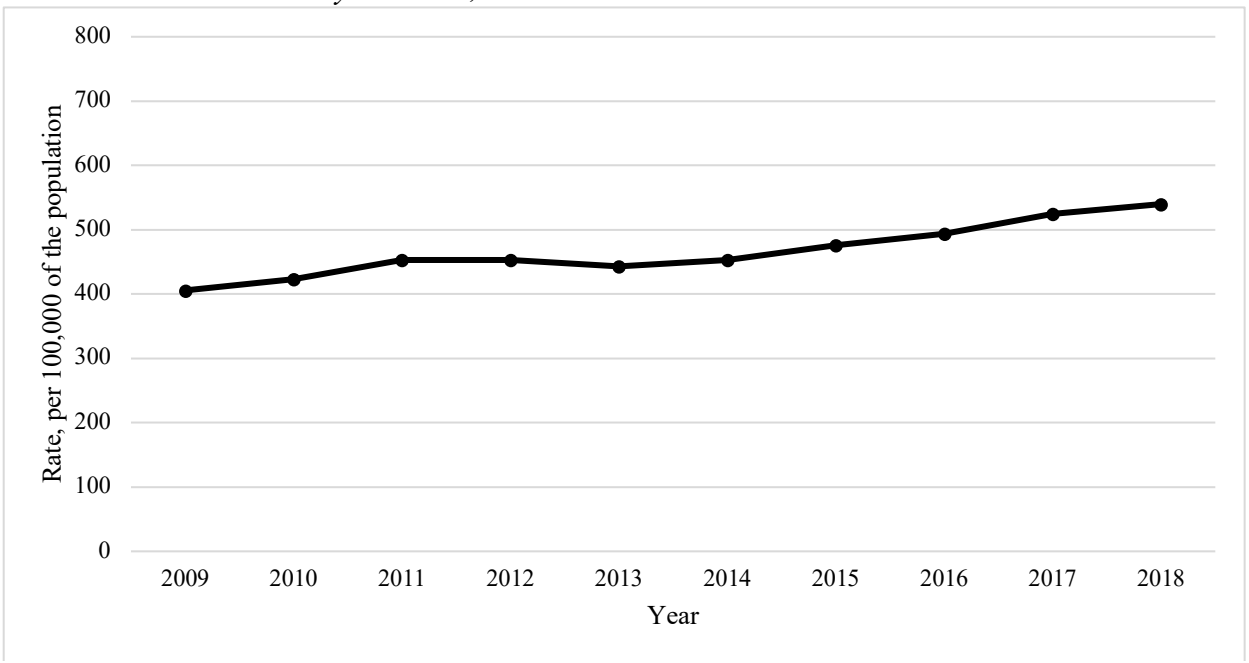
National Trends

The annual rates of newly reported chlamydia infections have generally increased (CDC, 2018). As shown in Figure 3, the CDC (2018) estimated that from 2009 to 2011, the national rate

of reported chlamydia infections increased from 405.7 to 453.3 cases per 100,000 of the population (CDC, 2018). From 2011 to 2013, the national rate of newly reported chlamydia infection decreased to approximately 443.3 cases per 100,000 of the population but was followed by an increase over the next three years (CDC, 2018). From 2016 to 2018, the rate of chlamydia infections increased by 9.1%, from a rate of 494.7 to 539.9 newly reported cases per 100,000 of the population (CDC, 2018). Nevertheless, most infected persons are asymptomatic and do not seek diagnostic services (CDC, 2018). The CDC (2018) estimates that the annual occurrence of new chlamydia infections among the United States population is approximately three million cases (CDC, 2018).

Figure 3

National Trends in Chlamydia Rates, 2009-2018



Source: Centers for Disease Control and Prevention, Sexually Transmitted Diseases — Reported Cases and Rates of Reported Cases per 100,000 Population, United States, 1941–2018. Available from: https://www.cdc.gov/std/stats18/tables/1.htm.

Disparities in Chlamydia Infections

Despite ongoing efforts by public policymakers, scholars, and practitioners to develop, fund, and implement preventative interventions, chlamydia infections have continued to rise nationally, as age, gender, racial/ethnic, and geographic disparities persist.

Age. Chlamydia infections render disproportionate effects across age groups (CDC, 2018). The CDC has reported that the rate of chlamydia is significantly higher among adolescents and young adults aged 15 to 24 years than in other age groups (CDC, 2018). For instance, in 2015, it was found that the reported rate of chlamydia cases among those aged 15-19 years and 20-24 years was 1857.8 and 2574.9 cases per 100,000 of the population, respectively (CDC, 2018).

G**ender.** Chlamydia infection rates for females have consistently remained higher than those for males (CDC, 2015-2018). In 2011, the chlamydia rate among females was 643.4 cases per 100,000 of the population, compared to 258.5 cases per 100, 000 of the population for males (CDC, 2018). This trend continued and in 2015, the overall rate of reported chlamydial infection in the United States among women (627.2 cases per 100,000 females) was an excess of two times the rate among men (302.8 cases per 100,000 males) (CDC, 2018).

Race/Ethnicity. Sexually transmitted diseases disproportionately impact racial minority populations in the United States (Hamilton & Morris, 2015). In a 2015 Office of Management and Budgeting (OMB) report detailing chlamydia infections within the 50 states, it was noted that newly reported cases of chlamydia infections were the highest among African Americans (OMB, 2015). According to the CDC, (2018), the rate of reported chlamydia cases among African Americans was nearly six times greater than the rate reported among Whites. The rates corresponded to 1097.6 and 187.2 reported cases per 100,000 of the population, respectively

(CDC, 2018). The chlamydia rate among American Indians and Alaska Natives was nearly four (4) times the rate among White Americans.

Hispanic Americans were reported to have a chlamydia rate of 372.7 cases per 100,000 of the population, which was approximately two (2) times the rate of White Americans (CDC, 2018). Additionally, yearly changes in rates varied by racial and ethnic group. From 2011 to 2015, rates of reported chlamydia infections increased among White and multi-racial Americans by 14.6 and 43.1 percent respectively (CDC, 2018). Rates among American Indians and Alaska Natives decreased by 3.5 percent from 2011 to 2015. Chlamydia rates among African Americans decreased by 11.2 percent during this time period, even though the total rate of Chlamydia among African Americans was disproportionately greater than that of other racial and ethnic groups (CDC, 2018).

Geographic Location. In general, the chlamydia rates for all regions in the United States have increased (CDC, 2018). However, chlamydia infections are far more pronounced in the southern region of the United States (CDC, 2018). In 2014, it was found that the rate of reported chlamydia infections in the South was approximately 492.3 cases per 100,000 of the population, compared to Chlamydia rates of 448.9 cases per 100,000 of the population and 441.8 cases per 100,000 of the population in the Midwest and Northeast, respectively (CDC, 2018).

Statement of the Problem

Previous research has examined individual risk factors such as age, intravenous drug use, and engaging in sexual activity with multiple partners, and their impact on sexually transmitted disease contraction (Brauemeister, Zimmerman, Caldwell, Xue, & Gee; 2010; CDC, 2018; Loza et al., 2010; Navarro, Jolly, Nair, & Chen, 2002). Although there is evidence to support the use of individually focused approaches aimed at mitigating risk of transmission and contraction,

scholars have found that these interventions are unable to sustain long-term impacts of disease prevention, as individual behavior is only a small component of health determination (Aral & Peterman, 1996; Brewster, 1994; CSDH, 2008; Dean & Fenton, 2013; Thoits, 2011).

Evidence suggests that social determinants exert a significant role in the prevalence of sexually transmitted diseases by impacting access to healthy behaviors, access to healthcare services, and risk factors. Prevention interventions that target these determinants of health may aid local governments in sustained preventative efforts. However, existing research regarding the association between social determinants and chlamydia infections is scarce. For instance, while the CDC, WHO, and the Institute of Medicine (IOM) have used ecological frameworks to examine the social determinants impacting HIV/AIDs, interpersonal violence, and adolescent pregnancy, widespread application to chlamydia infections has not yet occurred (CDC, 2016; IOM, 2018; WHO, 2017). To ensure Georgia counties have the tools and resources needed to implement effective prevention strategies that target chlamydia infections, research must explore the ways social determinants are associated with chlamydia infections among Georgia counties.

Theoretical Framework

Scholars have proposed social ecological frameworks to explain the complex relationships between broader social factors and health outcomes, as well as to develop possible intervention strategies. These frameworks are grounded in the work of human ecology and development scholars, such as Urie Bronfenbrenner. The two guiding principles of the Social Ecological Model are (1) behavior affects and is affected by multiple levels of environmental influence and (2) behavior both shapes and is shaped by the social environment one was born, lives, works, and grows (Bronfenbrenner, 1989; Bronfenbrenner, 1994; Tudge, Mokrova, Hatfield, & Karnik, 2009).

The Social Ecological Model of Public Health was introduced by Stokols and McLeroy and applies the theoretical concepts of Bronfenbrenner's theory of social ecology to public health contexts and health outcomes (Stokols, 1994; McLeroy, Biebeau, Steckler, & Glanz, 1988). The Social Ecological Model of Public Health, unlike those theoretical frameworks used to explore underlying individual motivators for behaviors, such as the Health Belief Model, aims to situate health outcomes and behaviors within the broader context of physical, social, and policy environments (Sallis, Owen, & Fisher, 2008; Stokols, 1996). This theoretical model considers the complex interplay among five overlapping levels (intrapersonal, interpersonal, institutional, community, and public policy) on public health (CDC, 2019; Stokols, 1994; McLeroy et al., 1988). See Table 1.

Table 1

Levels of the Social Ecological Model of Public Health

Level	**Definition**
Intrapersonal	*Individual characteristics that influence behavior knowledge, attitude, genetic characteristics*
Interpersonal	*Interpersonal processes and primary groups that provide social support and social identity*
Institutional	*Rules, regulations, policies, and informal structures, which may constrain or promote related behaviors*
Community	*Social networks and norms, or standards, which exist as formal or informal among individuals, groups, and organizations*
Public Policy	*Local, state, and federal policies and laws that regulate or support healthy actions and practices for disease prevention, early detection, control, and management*

The application of the Social Ecological Model of Public Health can advance further injury into which areas of influence should be targeted for policies, interventions, and funding.

One challenge of employing a social ecological model is the difficulty encountered when attempting to operationalize concepts for empirical analyses and the development of subsequent interventions. As McLeroy and colleagues stated, "One of the problems with many ecological models of social behavior is that they lack sufficient specificity to guide conceptualization of a specific problem or to identify appropriate interventions" (McLeroy, Biebeau, Steckler, & lanz, 1988, p. 355). While the Social Ecological Model of Public Health was used to better understand the roles social and environmental factors exert on human behavior and, subsequently, health outcomes, the Healthy People 2030 Social Determinants of Health Conceptual Framework was used to further operationalize social and environmental concepts provided in the Social Ecological Model of Public Health, develop measurable variables, and answer the research questions.

Conceptual Framework

Conceptual frameworks have been utilized to explore the mechanisms that link social and environmental factors to population health outcomes. However, few, if any, frameworks have been utilized to link social and environmental factors to chlamydia. The Healthy People 2030 Social Determinants of Health Conceptual Framework is proposed for this study because it clearly groups each social determinant of health into defined categories, defines priority areas, and allows for the operationalization of concepts noted in the Social Ecological Model of Public Health. While each installment of the Healthy People series has acknowledged the critical influence of determinants of health, such as biological, behavioral, and social factors, the Healthy People 2030 builds on the previous version to further embrace a comprehensive social determinants of health approach to examining and improving population health outcomes (DHHS, 2014; Koh et al., 2011; WHO, 2014). Healthy People 2020 and Healthy People 2030

highlight the importance of addressing the social and environmental determinants of health by including the following as one of the four overarching goals for the decade: “Create social and physical environments that promote good health for all”. (DHHS, 2014).

Social determinants of health are the conditions within the environment in which people are born, live, learn, work, and age (CDC, 2013; DHHS, 2014; WHO, 2014). These complex social, economic, and physical conditions within various environments and communities impact a range of health, functionality, and quality of life outcomes. The environmentally driven organizational framework of the Healthy People 2030 reflects the following five key areas:

- Education
- Economic stability
- Health and healthcare
- Neighborhood and built environment
- Social and community contexts

  Each of the five critical determinant areas consists of between three and five proxy measures that comprise the underlying social determinants of health within a given population. These proxy measures, as shown in Figure 4, will be operationalized, and the relative and marginal effects of each measure will be empirically analyzed, as a means of providing a more comprehensive view of the effects which social determinants have on the prevalence of chlamydia.

Figure 4

Social Determinants of Health Domains and Proxy Measures

	Social determinants of health areas				
	Economic stability	*Education*	*Social and community context*	*Health and health care*	*Neighborhood and built environment*
Critical components/ key issues	Poverty	High school graduation rates	Family structure	Access to health services	Quality of housing
	Employment status	School policies that support health promotion	Social cohesion	Access to primary care	Crime and violence
	Access to employment	School environments that are safe and conducive to learning	Perceptions of discrimination and equity	Health technology	Environmental conditions
	Housing stability	Enrollment in higher education	Civic participation		Access to healthy foods
			Incarceration/ institutionalization		

Note. Department of Health and Human Services (US), Office of Disease Prevention and Health Promotion. Healthy People 2030: social determinants of health. Available from: https://health.gov/healthypeople/objectives-and-data/social-determinants-health

Purpose of the Study

The dissertation aimed to advance the discourse surrounding chlamydia infections and possible preventions beyond the realm of individual behaviors and behavioral modifications by examining the associations between social determinants of health and chlamydia infections among Georgia counties. The selected theoretical framework, the Social Ecological Model of Public Health provided the initial framework for understanding the influence of social and environmental factors on health outcomes and possibilities for interventions. The Healthy People 2030 Social Determinants of Health Conceptual Framework and its corresponding social determinant of health proxy measures represented various levels of the Social Ecological Model of Public Health and were used to develop measurable variables for analysis (ISDJJS, 2013).

Research Questions

The purpose of dissertation study was to examine the association between multiple social determinants of health and chlamydia infections among Georgia counties. The research questions listed below guided the dissertation study.

1. Is there a bivariate association between each social determinant of health and chlamydia infections among Georgia counites?
2. If an association exists, (a) what is the strength and direction of the association, and (b) when considering other social determinants of health, does the association remain?
3. Which social determinant of health exerts the most relative influence on chlamydia infections among Georgia counties?

Overview of the Study and Procedures

To answer the research questions, this dissertation study employed a correlational research design, with an ecological focus. Because all independent and dependent variables were measured at the county-level, the dissertation was ecological in nature. The study collected and analyzed secondary data extracted from Georgia's electronic data repository, GeorgiaData. The online data repository contained information for all Georgia counties regarding a variety of measurements related to geography, agriculture, crime, economics, education, government, population health, health care systems, and demographics. A bivariate Pearson Correlation test was used to examine the direction and strength of the association between each social determinant of health and chlamydia infections among Georgia counties, while linear regression was used to examine the relative strength and direction of the relationships. Regression analysis was also used to identify the most influential social determinants of health. Data was analyzed using IBM SPSS Statistics Version 27.

Significance of the Study

Chlamydia infections pose potential detriments for Georgia counties, making it a significant public health and policy issue. This dissertation study poses significant benefits for public policy and practice. First, the results of this study may help identify associations between

social determinants of health and chlamydia among Georgia's counties. Second, the results of this study may aid state and local policymakers and practitioners in establishing and revising existing interventions and policies that address the determinants influencing chlamydia infections. Further, the results of this dissertation may be used to direct federal and state funding for local programs and interventions among Georgia counties. The results of the study could also lead to future interregional partnerships to establish advanced health care polices and preventative measures, such recruitment and retention strategies for health professional, providing affordable diagnostic services, and developing widely accessible public awareness programs among high-risk counties that minimize barriers to health seeking behaviors.

This dissertation study posed significant benefits for the field of research. Instead of measuring each variable at the individual level, this study examined measurements at the group level. Few studies have analyzed theoretical models and a broad range of social determinants of health and sexually transmitted diseases at a group level, particularly chlamydia, in one study. Further, this study used an ecological research design to expand upon the work of Bronfenbrenner and Stokols, as well as the Healthy People 2030 Social Determinants of Health framework, and empirically examined the most prevalent sexually transmitted infection in the state of Georgia.

Limitations of the Study

This study relied on secondary data analysis. Because data was extracted from GeorgiaData, an electronic data repository, the researcher was unable to exert complete control over the data collection process, accuracy of data, and representativeness of the data. Additionally, the variables in the study were limited to the data contained in GeorgiaData. Data examining various proxy measures of Health and Health Care determinants were unavailable, as

well as measures assessing the outermost layer of the Social Ecological Model of Public Health, public policy. Further, the results of this study cannot be generalized to counties in all southern states or extrapolated to all counties in the United States. Next, the results of this study were based on data measured and collected at the county-level, which impedes the ability to make any conclusions regarding the relationship between the social determinants of health and chlamydia among individuals. Lastly, the results of this study cannot be generalized to all sexually transmitted infections.

Conclusion

This chapter introduced the problem of chlamydia and situated this dissertation study within a social and environmental context. Chapter 2 details a concise, but thorough, review of the significance of chlamydia infections and noted disparities, as well as prevention-based public policy interventions, and recent shifts toward a more environmental approach that considers social determinants. The chapter situates the dissertation study in the context of the Social Ecological Model of Public Health and the supplementary, Healthy People 2030 Social Determinants of Health Framework. Lastly, Chapter 2 provides a review of the relevant literature and empirical studies that document the relationships and associations between the proxy measures of social determinants of health and general population health and sexual health outcomes, with an emphasis on chlamydia infections.

Chapter 2: Literature Review

Introduction

The state of Georgia is ranked sixth among the 50 states and the District of Columbia in terms the rate of newly reported chlamydia infections (CDC, 2018). In 2018, the CDC reported 65,104 new cases of infection, which corresponded to a chlamydia infection rate of 540.4 newly reported cases per 100,000 of the population (CDC, 2018). The purpose of this dissertation study was to examine the associations between social determinants of health and chlamydia infections among Georgia counties.

First, this chapter provides an epidemiological review of chlamydia trachomatis. Second, the chapter examines previous federal and state sexually transmitted disease prevention policies and interventions, as well as recent shifts toward a more ecological approach to prevention. Third, this chapter presents the Social Ecological Framework as a mechanism by which to understand the influence social and environmental factors may exert on behavior and, subsequently, outcomes, as well as specific applications in public health. Next, this chapter conceptualizes the levels of the Social Ecological Model of Public Health by supplementing the theory with a conceptual framework coined by the CDC, the Healthy People 2030 Social Determinants of Health Conceptual Framework. Lastly, the chapter reviews relevant literature that documents the associations between social determinants of health and population sexual health outcomes, as well as gaps in the literature.

Literature Search Criteria

Several publicly accessible search engines were used to gather articles for review, including PubMed, Google Scholar, JSTOR, and ProQuest. Multiple combinations of the

following search terms were used to generate relevant articles: *age*, *chlamydia*, *ecological model*, *economics*, *educational attainment*, *Georgia*, *healthcare*, *health care*, *Healthy People 2030*, *neighborhood*, *population health*, *sexually transmitted disease/infection, social capital*, *social determinants of health*, *sexual health,* and *youth*. Published articles in the English language and set in the United States, from 1980 to November 2021, were retrieved. Federal, state, and local government documents from the CDC, United States Census, Department of Health and Human Services, Department of Agriculture, State Office of Rural Health, and National Rural Health Association were reviewed for statistical purposes.

Chlamydia

Chlamydia, an infection caused by the *chlamydia trachomatis* bacteria, is transmitted through anal, vaginal, and oral penetration, or direct contact with infected tissue. Chlamydia trachomatis targets the cells of the mucous membrane and has been known to infect the following areas: the urethra, vagina, cervix, fallopian tubes, anus, and rectum, lining of eyelid, and throat (CDC, 2018).

Females infected with chlamydia may experience the following symptoms: abnormal vaginal discharge, bleeding between menstrual periods, abdominal pain, itching or burning around the vaginal, and painful urination. Infected males may experience small amounts of clear or cloudy discharge from the penis, painful urination, burning or itching sensations around the penis, and painful or swollen testicles (CDC, 2018, IOM, 1997; Fleming & Wasserheit, 1999).

While chlamydia infections can be easily cured with antibiotics, infections may occur without symptoms and often go untreated, which can lead to the continued spread of the bacteria (CDC, 2017; Fleming & Wasserheit, 1999; Hills, Black, Newhall, Walsh, & Groseclose, 1995; Nalhotra, Sood, Mukherjee, Mauralidhar & Bala, 2013; Oakeshott, Kerry, & Aghauizu, 2010;

Pinto, Dorn, Chinchilli, & Du, 2018; Torrone, Papp, & Weinstock, 2014; WHO, 2015). The CDC, along with multiple studies, have noted that an estimated seventy-five percent of infected women and nearly half of all infected men are asymptomatic (CDC, 2017; Oakeshott, 2010; Pinto et al., 2018; Torrone et al., 2014). Untreated chlamydia infections have the potential to render severe detriments and may result in pelvic inflammatory disease (PID), infertility, salpingitis, ectopic pregnancy, and chronic pelvic pain among up to 40 percent of females (CDC, 2017; Hills et al., 1995; Malhotra et al., 2013). Pregnant women with untreated chlamydia infections, may transmit the infection to their infants during labor and delivery, potentially resulting in neonatal conjunctivitis, pneumonia, and congenital birth defects such as deafness and blindness (Malhotra, 2013; Stamm, 2008; Scholes, Stergachis, & Heidrich, 1996; Torroneet al. 2014). Untreated infections in males, may spread to the testicles, causing epididymitis, which in rare cases may lead to sterility (Miller, 2006). It is estimated that untreated chlamydia infections lead to more than 250,000 cases of epididymitis and between 250,000 and 500,000 of cases of PID annually in the United States (CDC, 2017).

As with other sexually transmitted infections, chlamydia infections may influence the contraction and transmission of human immunodeficiency virus (HIV) (CDC, 2015-2017; Fleming & Wasserheit, 1999; Peterman, Newman, Maddox, Schmitt, & Shriver, 2014). Those infected with chlamydia may experience greater susceptibility to contraction due to the increased concentration of genital secretion cells that may act as targets for HIV (CDC, 2015-2017; Fleming & Wasserheit, 1999; Peterman, Newman, Maddox, Schmitt, & Shriver, 2014). Fleming and Wasserheit (1999) found that persons simultaneously infected with chlamydia are between two to five times more likely than uninfected persons to contract HIV, if they are exposed to the

virus through sexual contact (Flemming & Wasserheit, 1999). Further, persons infected with chlamydia are at an increased risk of transmitting the HIV virus to sexual partners (CDC, 2015).

In addition to consequences for individuals, studies have found that chlamydia infections render consequences for communities (CDC, 2018; Cheeson, Blandford, Gift, Tao, & Irvin, 2004; Hull, Kelley, & Clark, 2017; Pultorak, Wong, Rabins, & Mehta, 2009). Direct costs may be incurred during the initial treatment and diagnosis of chlamydia infections, as well as the management of the disease, if left untreated or under-treated (Hull et al., 2017). The CDC (2017) estimated new sexually transmitted infections cost the United States healthcare system $16 billion annually (CDC, 2017). Chesson and colleagues assessed the estimated lifetime medical costs per case of sexually transmitted diseases and found that the estimated costs of diagnosing and treating each new case of chlamydia in Illinois ranged from $23 to $109 (Chesson et al., 2004). In addition, they found that an average cost of $144 to $684 was incurred for the treatment of each case of epididymitis and pelvic inflammatory disease in males and females, respectively, caused by untreated and under-treated chlamydia infections (Cheeson et al., 2004). Each case of chlamydia thar results in an ectopic pregnancy or treated infertility netted financial burdens ranging from $1,060 to $3,626 (Cheeson et al., 2004). In a more recent study of the economic burdens of sexually transmitted diseases among Illinois adolescents and young adults, Pultorak and colleagues found that direct medical and morbidity costs of chlamydia approached $29 million, and racial and ethnic minorities, as well as women, bore the most significant burden (Pultoraket al. 2009).

STD Prevention Policies and Interventions

Public policies, defined as the laws, regulations, and administrative actions or practices of government institutions, exert a significant influence over sexual health by serving as barriers or

facilitators to sexual health seeking behaviors and goals (Leichliter, Seller, & Wohlfeiler, 2016). Optimal sexual health is contingent upon populations having quality access to comprehensive information and resources about sex and knowledge of the risks impacting vulnerable persons, as well as living in environments that affirm and promote adequate sexual health. Public policies set national and state sexual health priorities and serve has the foundation for prevention intervention and resource allocation related to achieving sexual health (Stumbar, Garba, Holder, 2018).

Federal Prevention Initiatives

The federal government has traditionally addressed sexually transmitted disease prevention through the funding and support of AIDS/HIV and adolescent pregnancy prevention programs that are predominantly focused on individual and interpersonal level factors and interventions (Carbonero, Martin-Anton, Otero, & Monsalyo, 2017; Gosling, Colman, Trenholm, Terzian, & Morre, 2014; Kirby, 2007; Kirby, Barth, Leland, & Fetro, 1991; Maness, 2015). Since 1981, Congress has provided funding for abstinence-only-until-marriage programs through five streams: 1) the Adolescent Family Life Act in 1981; 2) Title V abstinence-only-until-marriage program in 1996; 3) Community-Based Abstinence Education in 2000; 4) Competitive Abstinence Education in 2021; 5) and Sexual Risk Avoidance Education program in 2016 (Carbonero et al., 2017; Gosling et al., 2014; Kirby, 2007; Kirby et al., 1991; Maness, 2015). These funding streams required grantees to adhere to the exclusive purpose of abstinence education, and any programs or materials that promoted the use of contraceptives or sexually transmitted disease prevention were not eligible for funding.

In a shift toward inclusion of sexually transmitted disease prevention policies, the Personal Responsibility Education Program was created as part of the Patient Protection and

Affordable Care Act (Campa, Leff, & Tuffs, 2018; Carbonero, Martin-Anton, Otero, & Monsalvo, 2017; Maness, 2015; USDHHS, 2019). The Personal Responsibility Education Program (PREP), administered through the Family and Youth Services Bureau, provides $75 million to support state agencies in the delivery of prevention interventions related to adolescent pregnancy and sexually transmitted disease (Maness, 2015; USDHHS, 2019). Approved state projects are based on evidence-based models that have been found to delay sexual activity, increase condom or contraceptive use, and reduce pregnancy (Campa et al., 2018; Carbonero et al., 2017; Maness, 2015; USDHHS, 2019). In addition, state projects funded by the grant must emphasize services that prepare youth for adulthood including, but not limited to building healthy relationships, development of health attitudes regarding body image and diversity, financial literacy, and parent-child communication skills (Campaet al. 2018; Carbonero et al., 2017; USDHHS, 2019). Specific funding is allotted to areas with the highest rates of teen pregnancy and sexual transmitted infection contraction. In fiscal year 2017, which is the most recent fiscal year with applicable data, the state of Georgia received Personal Responsibility Education Program funding totaling nearly $1.7 million.

The Teen Pregnancy Prevention Program was established in 2010 by a congressional mandate to fund medically accurate and age-appropriate sexual health program. Specific funding is allocated for implementing evidence-based prevention programs for teen pregnancy and sexually transmitted infections, addressing individual and behavioral risk factors, building community capacity, and developing new testing strategies. The Teen Pregnancy Prevention, through the Office of Population Affairs (OPA), currently funds 91 grants (Maness, 2015; USDHHS, 2019). In fiscal year 2017, local counties in Georgia received Teen Pregnancy Prevention Program funding totaling nearly $3 million (SIECUS, 2018).

The Ryan White Comprehensive AIDS Resources Emergency Act of 1990 established the Ryan White HIV/AIDS Program and became the first federal legislation to provide funding for community-based HIV care and support services for low-income persons living with HIV/AIDS. The Ryan White HIV/AIDS Program is comprised of four components; however, the components most closely associated with non-HIV/AIDS specific sexually transmitted diseases, is part C (HRSA, 2019). Part C provides grant funding to local community-based organizations to support outpatient ambulatory health and support services through Early Intervention Services program grants (HRSA, 2019). Specific emphasis is placed on programs that service the early intervention and detection of co-occurring sexually transmitted diseases, such as chlamydia and gonorrhea, as well as other health outcomes (HRSA, 2019)

Most recently, and in response to the rise in sexually transmitted diseases, the Office of the Assistant Secretary for Health (OASH) through the Office of Infectious Disease and HIV/AIDS (OIDP) began collaborating with additional federal partners to develop an inaugural federal action plan for the prevention, diagnosis, and treatment of sexually transmitted infections, with particular emphasis on the four most common sexually transmitted diseases, chlamydia, syphilis, gonorrhea, and human papillomavirus (USDHHS, 2019). The STI Federal Action Plan will contain substantial, achievable, and measurable goals, as well as funding opportunities, that aim to improve sexual health outcomes and will be released in 2020 (USDHHS, 2019). Per the Department of Health and Human Services, the vision of the STI Federal Action Plan is listed below.

> The United States will be a place where sexually transmitted infections are prevented and where every person has high quality STI prevention, care and treatment, and lives free from stigma and discrimination. This vision includes all people, regardless of age, gender, disability, race, ethnicity, sexual orientation, gender identity, or socio-economic circumstance (USDHHS, 2019).

The Office of the Assistant Secretary for Health (OASH) and its collaborative partners have established the following four goals for the STI Federal Action Plan: 1) Prevent new STIs; 2) Improve the health of people by reducing adverse outcomes of STIs; 3) Reduce STI-related health disparities; 4) and achieve integrated, coordinated efforts that address the sexually transmitted infection epidemic across federal programs (USDHHS, 2019). The STI Federal Action Plan aims to achieve the proposed goals by adopting an ecological approach to increasing access to related health services, removing structural barriers to care and treatment for marginalized populations most affected by sexually transmitted infections, and improving the monitoring and evaluation of evidence-based interventions (USDHHS, 2019). Further, the STI Federal Action Plan will contain an emphasis on social determinants of health, disparities, and discrimination.

The Patient Protection and Affordable Care Act (ACA) was enacted on March 23, 2010 and later amended by the Health Care and Education Reconciliation Act on March 30, 2010. The ACA contained several provisions that may impact sexually transmitted infection prevention, including but not limited to, increased access to health insurance and requirements for coverage of sexually transmitted infection related prevention services (Leichliter, Seiler, & Wohlfeiler, 2016). All new private individual and small group plans, as well as those for individuals newly covered under the Medicaid expansion, Grade A and Grade B preventative services, as recommended by the U.S. Preventive Services Task Force (USPSTF), the CDC's Advisory Committee on Immunization Practices (ACIP), and the Health Resources and Service Administration (HRSA) (Leichliter et al., 2016). Sexually transmitted infection prevention services included in Grade A and Grade B include but are not limited to the following: chlamydia and gonorrhea screenings for sexually active women 24 years and younger and older

women; sexually transmitted infection counseling for all sexually active adolescents and adults who are at risk of contraction; and syphilis screening for all persons at an increased risk for infection (Leichliter et al., 2016).

Georgia Prevention Initiatives

Statewide sexually transmitted disease prevention in Georgia includes efforts to quickly treat partners of infected persons, distribute federal aid to localities in the form of block grants, and predominately promote screening interventions and abstinence-focused sexuality education and programs. Georgia has a statewide mandate in support of expediated partner therapy (EPT), which aims to reduce the incidence of sexually transmitted diseases and prevent adverse consequences of pregnancy associated with untreated or undetected infections. In 2017, Georgia enacted GA Code § 31-17-7.1 to allow health care providers to prescribe medication and treatment for sexually transmitted infections to an infected patient's partner(s) without prior evaluation of such partner(s). Per GA Code § 31-17-7.1, "A licensed practitioner who diagnoses a patient to be infected with chlamydia or gonorrhea may utilize expedited partner therapy in accordance with any rules and regulations established by the department for the management of the health of such patient's sexual partner or partners."(Ga. Code Ann., § 31-17-7.1, 2017). The CDC conducted a random controlled trial of 1,787 women in six cities to examine recurrent chlamydia infections among patients referred by EPT and those using traditional office visits to access treatment (CDC, 2006). Recurrent infection was documented in 12% of women receiving treatment via EPT, compared to 15% of those using traditional methods (CDC, 2006).

The Georgia Department of Public Health (GDPH) administers the Comprehensive STD Prevention grant, made possible by a federal grant disbursed by the Division of Adolescent and School Health to local communities, to reduce the transmission and contraction, morbidity

associated with infection, and occurrence of additional complications of sexually transmitted infections. Specifically, the activities implemented by the grant include interventions to reduce the number of adolescents and young adults reporting chlamydia trachomatis infections. The GDPH aims to fund coordinated, comprehensive prevention, screening, and treatment services through surveillance of sexually transmitted infections, as well as planning training, monitoring and evaluation services in the public and private sectors (GDPH, 2021). These efforts do not include social and environmental factors contributing to infection. For instance, as a component of the Comprehensive STD Prevention grant, the GDPH distributes Infertility Prevention Project (IPP) funds to applicable local governments. Funding supports education related interventions that aim to reduce the prevalence of chlamydia and gonorrhea infection in Georgia through promoting statewide awareness of the two infections, as well as the following complications: pelvic inflammatory disease, chronic pelvic pain, and infertility (GDPH, 2021).

In the state of Georgia, sexuality education programs serve as the primary tool for sexually transmitted infection awareness and prevention. Georgia Code Annotated §§ 20-2-143 required publicly funded schools to teach sex education and HIV/AIDS prevention education by July 1, 1989 (CDC, 2018; Georgia Code §§ 20-2-143, 2006). While sexually transmitted diseases are most commonly reported in the youth population, the state of Georgia has no law or regulation requiring the provision of comprehensive sexually transmitted disease prevention in schools (CDC, 2020). Per Georgia statute, the state board of education is vested with the authority to determine minimum guidelines that programs must satisfy. The Georgia Board of Education Rule 160-4-2.12 states, that sex education should promote, “high self-esteem, local community values, and abstinence from sexual activity as an effective method of prevention of pregnancy, sexually transmitted diseases, and AIDS.” (CDC, 2018; Georgia Board of Education

Rule 160, 2018). Also, Georgia has received federal grants related to the prevention of sexually transmitted disease infections. In fiscal year 2017, the state received $65,000 from the Division of Adolescent and School Health, $1.6 million from the Personal Responsibility Education Programs (PREP), and nearly $2.8 million from the Title V Abstinence-Only-Until-Marriage Program. Educational programs funded through PREP must discuss abstinence and contraception, with a substantial emphasis placed on both, while Title V educational programs must exclusively promote "education on sexual avoidance" (SIECUS, 2018).

In 2015, the CDC released the School Health Profiles, which measures school health policies and practices. Data on which health topics were taught in schools across the country were reported by school principals and health education teachers. In 2017, of the 16 critical sexual health education topics prescribed by the CDC, 10.6% of Georgia's secondary schools taught all 16 critical sexual health education topics in middle school, while 32% of high schools taught all 16 critical sexual health education topics (SIECUS, 2017). Further, 14.4% of Georgia's secondary schools taught students who to properly use a condom, and 21% taught students about all seven contraceptives in grades 9-12 (SIECUS, 2017).

Theoretical Framework

Theoretical models of public health such as Health Belief and Stages of Change emphasize the singular influence of individual characteristics and beliefs on health seeking behaviors, and subsequent health outcomes; however, these theories do not explicitly consider the interactions between broader social and environmental factors and the resulting influences on health seeking behaviors and outcomes. Social ecology, as described by Bronfenbrenner (1994), suggests that one's development and subsequent behavioral patterns are best understood by enlisting a comprehensive examination of all aspects of the ecological environment the

individual operates. The levels exert varying influence on the development of the individual (Bronfenbrenner, 1994) Therefore, it is necessary to examine each level of influence for its significant and contribution to behaviors and outcomes. Chlamydia infections, when viewed through an ecological lens, is conceptualized as being influenced by multiple factors across a range of individual, social, community, geographic location, and socio-political contexts. These factors do not directly cause chlamydia infections, but they mediate risk factors and exposure.

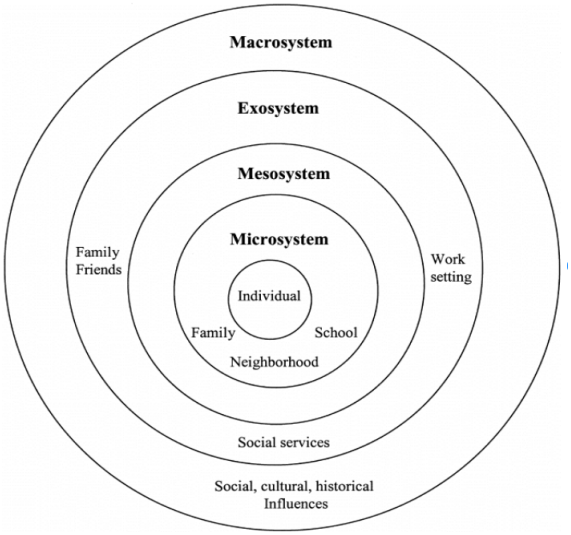
Social Ecological Model

Communities are the most frequent context in which health behaviors occur. Scholars have used social ecological frameworks to explain the complex interrelationships among broader social and environmental factors, individual characteristics, and population health outcomes. These frameworks are grounded in the work of human ecology and development developed by scholars, such as Urie Bronfenbrenner, where human behavior development, and subsequent outcomes, are embedded in multiple spheres of influence ranging from those that are more proximal, such as the family, to those that are more distal, such as local, state, and federal level policies that exert influences in the developmental process (CDC, 2017; Institute of Medicine, 2003; WHO, 2018). The two guiding principles of the Social Ecological Model are (1) an individual's behavior affects and is affected by multiple levels of influence and (2) an individual's behavior both shapes and is shaped by the social environment he/she was born, lives, works, and grows (Bronfenbrenner, 1989; Bronfenbrenner, 1994; Tudge, Mokrova, Hatfield, & Karnik, 2009). Those resulting behaviors impact health outcomes (Bronfenbrenner, 1994).

In the social ecology theory proposed by Bronfenbrenner (1994), four overlapping levels exist and interact to influence the development of the individual, as illustrated in Figure 5.

Figure 5

Illustration of Bronfenbrenner's Theory of Social Ecology



The most influential factors are contained within those closest to the individual, and as the levels progress outward, the direct influence on the individual weakens. The layer closest to the individual and believed to be the most influential level is the microsystem. The microsystem includes each setting in which the individual has direct, face-to-face relationships with significant people, such as friends, parents, co-workers, and peers and often serves as the cornerstone of the individual's foundational principles, life skills, and actions. The cross-relationship between the small settings found in the microsystem such as, interactions between parents and friends, and their connections form the mesosystem (Bronfenbrenner, 1989; Bronfenbrenner, 1994). The exosystem is the larger social system in which the individual belongs but does not directly function. The structures in the exosystem impact the individual's development and behavior by interacting with various structures in the microsystem. The value

of the exosystem can be captured by examining factors such as influences of the workplace, social networks, and religious ties (Bronfenbrenner, 1994). For instance, a parent or spouse's employer who doesn't offer healthcare benefits that cover reproductive health services would be considered a component of the exosystem. The macrosystem is the larger community context and includes cultural attitudes and social conditions within the culture the individual resides. The macrosystem is the outermost layer of influence and while it does not have a direct influence on the individual, these widely shared customs, beliefs, laws, and cultural values, do exert a cascading impact on the interactions of the others (Bronfenbrenner, 1994).

Social Ecological Model of Public Health

The Social Ecological Model of Public Health was introduced by Stokols and McLeroy and applies the theoretical concepts of Bronfenbrenner's theory of social ecology to public health contexts and health outcomes (McLeroy, Biebeau, Steckler, & Glanz, 1988; Stokols, 1994). The Social Ecological Model of Public Health situates health outcomes and behaviors in the broader context of physical, social, and policy environments and risk factors (Stokols, 1996; McLeroy et al., 1988).

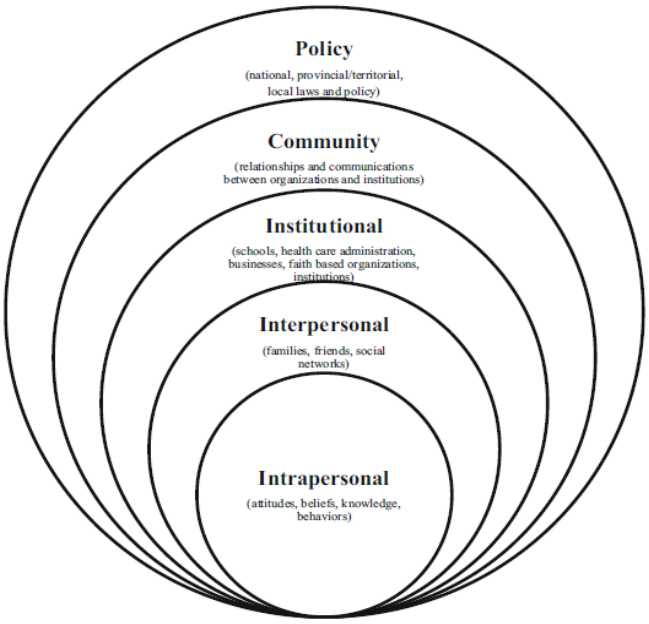
The Social Ecological Model of Public Health makes the following four assumptions: 1) healthfulness of a situation and population are influenced by multiple facets of the physical and social environment; 2) analysis of health and health promotion should address the complex nature of human environments (i.e. physical and social components); 3) the participants in an environment can be studied at varying levels including individual, group, organization, and population using multiple levels of analysis and a multidisciplinary approach to research and interventions; 4) the social-ecological approach incorporates components of a system theory to

understand the dynamic and mutually relationship between people and their environments (Stokols, 1996; McLeroy et al., 1988).

The Social Ecological Model of Public Health considers the complex interplay between five overlapping levels of (intrapersonal, interpersonal, institutional, community, and public policy) and has been used to examine various health outcomes such as obesity, human immunodeficiency virus, and interpersonal violence, as well as subsequent targeted prevention interventions (CDC, 2019; Stokols, 1994; McLeroy et al., 1988). The levels impact health outcomes by promoting or hindering access to health seeking behaviors and resources. Similar to the social ecology theoretical framework, as the layers closest to the center exert the most direct influence on the individual or population, as illustrated in Figure 6. That is not to say that the outermost level does not exert influence. Public policies, such as those governing the provision of funding for preventative health care, workforce development, or the administration of county-wide sexuality education programming in K-12, can have a cascading impact on the layers closer to the center and either support or hinder access to health seeking behaviors and resources such as condom use and diagnostic testing, which can affect health outcomes (Stokols, 1994).

Figure 6

Illustration of the Social Ecological Model of Public Health



Source: Adopted from the Centers for Disease Control and Prevention (CDC), The Social Ecological Model, https://www.cdc.gov/nccdphp/dnpao/state-local-programs/health-equity/framing-the-issue.html. (Retrieved December 2,2019)

Intrapersonal Level

The intrapersonal level is the layer closest to the individual and exerts the most direct impact. This level includes biologic or behavioral characteristics associated with vulnerability to acquire or transmit an illness or infection such as gender, age, attitudes, behaviors, skills, and knowledge (CDC, 2018; McLeroy et al., 1988; Stokols, 1995). Targeted interventions at the intrapersonal level promote sexual health skills training and changes in health seeking attitudes, beliefs, and behaviors (McLeroy et al., 1988; Stokols, 1996).

Interpersonal Level

The interpersonal level includes the social network such as family, friends, peers, and health care provider characteristics that may directly affect the health seeking behaviors of the

individual, and subsequently health outcomes (Salihu, Wilson, King, Marty, & Whiteman, 2015). For example, family stability may impact adolescents' knowledge of sexual health behaviors, such as condom use and intercourse with multiple partners, and subsequent health outcomes such as, adolescent pregnancy and sexually transmitted disease contraction, by influencing parental supervision, exposure to interpersonal dating norms, and financial resources. Interventions at the interpersonal level may include family-focused prevention programs and peer and mentoring programs designed to foster problem solving skills and promote healthy relationships (McLeroy et al., 1988; Stokols, 1996).

Institutional Level

Institutional level factors include institutions that have formal or informal policies and structures (Simpson, 2015). These may include distribution of and access to healthcare providers, healthcare organizations, and delivery of reproductive health services (McLeroy et al., 1988; Stokols, 1996).

Community Level

Community level factors describe the relationship among organizations and institutions, as well as community norms (McLeroy et al., 1988; Stokols, 1996). These factors may include community income level, lack of neighborhood organization, level of civic participation, and percent of renters.

Policy Level

The policy level is the fifth and outermost layer of the Social Ecological Model. It exerts indirect influence over the individuals and subsequent behaviors, surrounds the community layer, and represents the prevention activities at the policy level (McLeroy et al., 1988; Stokols, 1996). Policy level factors may include local, state, and national legislation and policies that allocate

resources to creating and maintaining coalitions that serve to connect groups of people to sexual health and medical diagnostic and prevention services and sexual health education programs (i.e., federal and state policies that guide access to health insurance and coverage). Other policies may include those that provide behavioral incentives, such as reducing taxes on contraceptives or subsidizing sexually transmitted disease tests for at-risk groups. Additional policies may restrict behavior, such as those policies that criminalize the transmission of sexually transmitted disease. The public policy level has a cascading influence on the interactions of the other levels of the Social Ecological Model of Public Health. For example, state funding for a workforce development program targeting single women may positively impact access to better paying jobs, childcare or extracurricular activities for children, health care services, and financial stability. These positive effects may promote access to reproductive health services and contraceptives, as well as diagnostic testing and improved health literacy for her family. In the example, the interpersonal, intrapersonal, institutional, and community levels were impacted by the public policy level.

The Social Ecological Model of Public Health has been used to understand the influence of social and environmental factors on various health outcomes such as obesity and HIV transmission. For instance, Baral, Logie, Grosso, Wirtz, and Beyrer (2013) applied a modified social ecological model to examine the structural and social factors contributing to HIV vulnerabilities such as social, economic, organizational, and political inequalities (Baral, Logie, Grosso, Wirtz, & Beyer, 2013). The modified social ecological model was comprised of five layers of risk including: individual, network, community, policy, and HIV epidemic stage. While individual risks, such as engaging in sexual activity with multiple partners, unprotected sexual intercourse, and intravenous drug use were found to be contributing factors of HIV infections,

the authors found that social and environmental level risk factors were far more influential and required more pressing action, too. The findings suggest that prevention research and interventions aimed at decreasing HIV incidence require the examination of multiple levels of risk (Baral et al., 2013).

While the Social Ecological Model of Public Health does provide a useful framework for understanding the interrelationship between social and environmental factors and health outcomes, limitations do exist. Scholars have found the framework difficult to empirically examine, as it is expansive and involves a multitude of variables (Reilly et al., 2011; Richard, Gauvin, & Raine, 2011; Rowley et al., 2015). To address these concerns, the Social Ecological Model of Public Health was supplemented with a conceptual framework, the Healthy People 2030 Social Determinants of Health Conceptual Framework. This conceptual framework breaks down each social determinant of health into discrete and measurable areas including, education, economic stability, neighborhood and built environment, social and community context, and health and health care. Also, scholars have noted that the planning, implementation, and evaluation of multi-leveled interventions over an extended period can become costly, cumbersome, and logistically complex.

Healthy People 2030 Social Determinants of Health Conceptual Framework

Healthy People is a product of the collaboration among federal agencies, such as the Department of Health and Human Services, CDC, state public health agencies, community-based organizations, and WHO (Chrvala & Bulger, 1999; Koh, Piotrowski, Kumanyika, & Fielding, 2011; Secretary's Advisory Committee on National Health Promotion and Disease Prevention Objectives for 2020, 2010). The Health People initiative serves as the nation's agenda and vision for improving health and achieving health equality by promoting a comprehensive strategic

framework that unites health promotion and disease prevention (Chrvala & Bulger, 1999; Koh et al., 2011). Each Healthy People initiative consists of a set of science-based, measurable objectives and applicable targets to be achieved by the nation within the target 10-year period and highlights the biological, behavioral, and physical determinants of health outcomes (Koh et al., 2011).

Like Healthy People 2020, Healthy People 2030 is expansive with more than 42 topic areas, 580 objectives, and 1,200 measures. Healthy People 2020 marked the first national emphasis on examining and addressing the causal factors affecting disease and health inequality, as highlighted by its overarching goals, specifically goal three, as shown in Table 2 (CDC, 2017; Chrvala & Bulger, 1999; Koh et al., 2011; Secretary's Advisory Committee on National Health Promotion and Disease Prevention Objectives for 2020, 2010). Healthy People 2030 continues the work of its predecessor in outlining the pivotal role sexual health contributes to eliminating health disparities and ensuring the overall health of communities. (Stumbar, Garba, & Holder, 2018).

Table 2

Overarching Goals of Healthy People 2030

1. Attain high-quality, longer lives free of preventable disease, disability, injury, and premature death
2. Eliminate health disparities, achieve health equity, and attain health literacy to improve the health and well-being of all.
3. Create social, physical, and economic environments that promote attaining full potential for health and well-being for all.
4. Promote healthy development, healthy behaviors, and well-being across all life stages.
5. Engage leadership, key constituents, and the public across multiple sectors to take action and design policies that improve the health and well-being of all.

The Healthy People 2030 Social Determinants of Health Framework adopts an ecological approach by considering the interconnectedness of social determinants of health and health outcomes (Secretary's Advisory Committee on National Health Promotion and Disease Prevention Objectives for 2030, 2018). The National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention (NCHHSTP) defines social determinants of health as, "the circumstances in which people are born, grow up, live, work, and age" and are socially defined, constructed, and perpetuated by a broader set of structural factors (CDC, 2018; Friedman et al., 2018; Hogben & Leichliter, 2018). These complex, integrated, and overlapping forces include the social environment, community and physical environment, and access to health services and are shaped by the distribution of money, power, policy, and community resources, as illustrated in Figure 5 (CDC, 2018; Dean & Fenton, 2013). Further, the Healthy People 2030 Social Determinants of Health consists of five key social determinants of health domains (CDC, 2018). See Figure 7. Each of these five domains reflect a component of social determinants of health. Also, each of the five key determinant domains consists of three to five proxy measures or key issues that comprise the underlying factors in the domains (CDC, 2018).

Figure 7

Healthy People 2030 Social Determinants of Health

Note: Reprinted from "Social Determinants of Health." 2019, U.S. Department of Health and Human Services. https://www.healthypeople.gov/2020/topics-objectives/topic/social-determinants-of-health

The economic stability domain reflects the connection between an individual or population's financial resources, such as income and socio-economic status, and their health (CDC, 2017; Koh et al., 2011; Secretary's Advisory Committee on National Health Promotion and Disease Prevention Objectives for 2020, 2010). This domain includes the following proxy measures: poverty, employment, food security, and housing stability (CDC, 2017; Koh et al., 2011; Secretary's Advisory Committee on National Health Promotion and Disease Prevention Objectives for 2020, 2010). The second domain is education, which reflects the connection between aspects of an individual or population's education and their health and well-being (CDC, 2017; Koh et al., 2011; Secretary's Advisory Committee on National Health Promotion and Disease Prevention Objectives for 2020, 2010). Specific key domain areas include high school graduation, enrollment in higher education, language and literacy, and early childhood education and development (CDC, 2017; Koh et al., 2011; Secretary's Advisory Committee on

National Health Promotion and Disease Prevention Objectives for 2020, 2010). The third domain is health and health care. This domain reflects the connection between an individual or population's access to and understanding of health resources and health outcomes (CDC, 2017; Koh et al., 2011; Secretary's Advisory Committee on National Health Promotion and Disease Prevention Objectives for 2020, 2010). Specific key domain areas include health care, access to primary care, and health literacy. The fourth domain is neighborhood and built environment, which reflects the connection between where an individual or population's residence and their health. Specific key domain areas include access to healthy food, quality and stability of housing, crime and violence, and environmental conditions (CDC, 2017; Koh et al., 2011; Secretary's Advisory Committee on National Health Promotion and Disease Prevention Objectives for 2020, 2010). The final domain is social and community context which reflects the connection between aspects of social environment and health (CDC, 2017; Koh et al., 2011; Secretary's Advisory Committee on National Health Promotion and Disease Prevention Objectives for 2020, 2010). Specific key domains include social cohesion, civic participation, incarceration, and discrimination. See Table 3 for specific definitions for key social determinant of health domains and proxy measures.

Table 3

Definitions of Key Healthy People 2030 Social Determinant of Health Domains and Proxy Measures

Term	Definition
Access to Primary Care	The ease with which an individual can obtain the medical services of a general health care practitioner (USDHHS, 2014).
Civic Participation	Individual and collective actions designed to identify and address issues of public concerns (USDHHS, 2014).
Crime	Includes violent crimes, property crimes, and any victimization from violent crimes (USDHHS, 2014).
Enrollment in Higher Education	Full-time or part-time enrollment in a post-secondary institution of higher learning (USDHHS, 2014).
Environmental Conditions	State of the environment. Safe air, physical land, and water are fundamental to a healthy community environment. Environmental hazards may cause disease and other health problems (USDHHS, 2015; EPA, 2016).
Employment Status	Whether an individual in the civilian non-institutional population did engage in paid work within the last week or were absent from employment within the last week (U.S. Census, 2015).
Family Structure	The combination of relatives that comprise a family. Classification of this term considers the presence or absence of legally married spouses or common law partners; children; and, in the case of economic family, other relatives (Sharma, 2013).
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 (USDHHS, 2016).
High School Graduation Rates	The number of students who graduate in four years with a regular high school diploma or its equivalent divided by the number of students who form the adjusted cohort for the graduation class (USDE, 2014).
Housing Stability	Having difficulty paying rent, spending more than 50% of household income on housing, having frequent moves, living in overcrowded conditions, or doubling up with friends and relatives (USDHHS, 2014).
Incarceration/Institutionalization	Being held in a private or publicly sponsored prison, jail, or other confined correctional facility (USDHHS, 2014).
Neighborhood and Built Environment	*Built Environment*: Encompasses all buildings, spaces, and products that are created or modified by people. The spatial effects of built environment and poorer community development, specifically, inadequate environmental conditions and poverty and crime may increase exposure to sexual vulnerability among populations (USDHHS, 2014; Villanueva, Pereira, & Knuiman, 2013). *Neighborhood*: An umbrella terms that, also, refers to the broader aspects of historical, political, and economic forces that shape the social environment; may shape or constrain local informal social controls and residents' abilities to effectively mobilize around safe sexual behaviors and outcomes. (USDHHS, 2014; Villanueva, Pereira, & Knuiman, 2013).
Quality Housing	Quality of the internal and external structure of a dwelling and aspects of the internal environment; includes factors such as ventilation, lighting, disease vectors in the dwelling, and overcrowding, which can exert influences on health (WHO, 2015).

Physical Environment	The structure and function of the environment and how it impacts health (USDHHS, 2014).
Poverty	A state or condition in which a person or community lacks the financial resources and essentials to enjoy a minimum standard of living. The poverty level is based on monetary income and thresholds reflect family size and composition (Census, 2015; USDHHS, 2014).
Social and Community Context:	*Social Context*: The immediate physical setting in which people reside; may include culture and group affiliations (USDOT, 2005). *Community Context*: A perspective inclusive of the people residing within a common locality or area; may include geographic setting, standards of living, social interaction, and common ties (CDC, 2008; Holtgrave & Crosby, 2003).
Social Cohesion	Willingness of members and groups within a society to cooperate with each and maintain solidarity (Ellen, Jennings, Meyers, Chung, & Taylor, 2004; CDC, 2014).
Social Determinant of Health	The conditions in which people are born, grow, live, work, and age. These circumstances are shaped by the distribution of money, power, and resources at multiple levels of government (CSDH, 2008; USDHHS, 2014).
Social Environment	The aggregate of social and cultural institutions, patterns, beliefs, and processes that influence the life and health outcomes of an individual or population (USDHHS, 2014).
School Policies that Support Health Promotion	Policies that consistently strengthen the school's capacity to serve as a healthy setting; may include presence of district-sponsored comprehensive sexuality education programming (USDHHS, 2013).

Application of Healthy People Social Determinants of Health Conceptual Frameworks

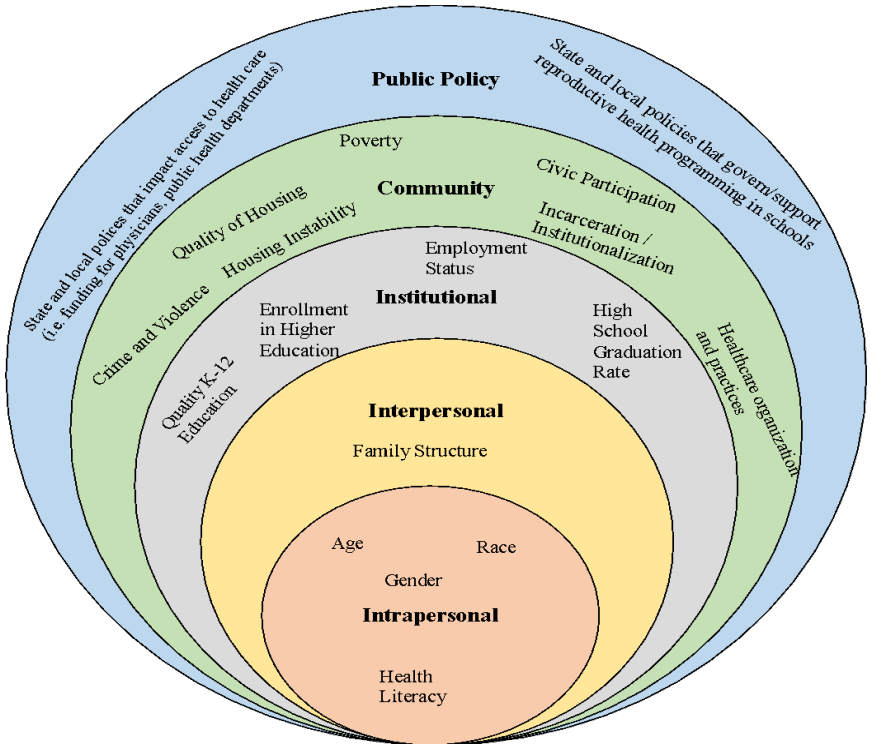
Maness and colleagues (2016) used the Healthy People 2020 Conceptual Framework to assess influences of social determinants of health on teen pregnancy. The authors used an ecological framework to guide the study, and the Healthy People 2020 Social Determinants of Health Framework was used to identify proxy measures of social determinants of health that measured the population's environment. These proxy measures allowed the researchers to operationalize aspects of the social determinants of health domains, identify needs for increased research, intervention, and funding focused on specific domains, and assess linkages between and among various domains, and teen pregnancy.

In this dissertation study, the Social Ecological Model of Public Health was the guiding theoretical framework for understanding the effects of social and environmental factors on health outcomes, as well as determining leverage points for disease prevention and health promotion.

The Healthy People 2030 Social Determinants of Health Conceptual Framework allows one to take the abstract levels from the Social Ecological Model of Public Health and drive the data collection process by connecting those to operationalized variables that can be measured, in an effort to examine the association between social determinants of health, as well as to assess previous studies. See Figure 8.

Figure 8

Application of Theoretical and Conceptual Frameworks



Literature Review of Social Determinants of Health and Chlamydia

Social determinants shape health-promoting and harming behavioral choices of individuals and populations (CDC, 2010; Dean, Williams, & Fenton, 2013; Dean & Fenton, 2013; Penman-Aguilar, Harrison, & Dean, 2013). Understanding how social determinants of health are distributed within a given population may not only aid in explaining how health

outcomes vary among social gradients, but, also, how to effectively address disparities in sexual health outcomes among social gradients.

Intrapersonal Risk Factors (Age, Sex, Race/Ethnicity)

Intrapersonal risk factors are those characteristics of the individual that may explain health status or behavior (CDC, 2010). Studies have identified correlations between several intrapersonal risk factors such as age, gender, and race and ethnicity and sexually transmitted diseases. First, younger age has been found to be associated with increased risks of chlamydia infections among sexually active persons (CDC, 2018; Navarro et al., 2002). Scholars have identified a number of biological and behavioral factors that may lead to an increased risk of chlamydia infection among younger persons. Studies have found that higher risks in sexually transmitted disease contraction among younger persons, particularly adolescent females, may be associated with the persistence of columnar epithelium on the cervix, changes in the vaginal flora and mucus production, as well as a developing immune system (Berman & Hein, 1999; Milkbank, 2002; Navarro et al., 2002; Nguyet, Maheaux, Beland, & Price, 1994).

Studies have found that differences in sexual behavior are contributors. Adolescents are less likely to use condoms and contraceptives effectively and consistently than those who are older (Bauermeister et al., 2010; Crockett, Raffaelli, & Jones, 2010; Milibank, 2002). For instance, Sales and colleagues found that younger adolescents reported less confidence in their ability to use a condom correctly, less partner communication, lower sex refusal, and were found to have lower levels of sexually transmitted disease knowledge compared to those who were older (Sales et al., 2012). Additionally, younger adolescents were found to be more impulsive and engage in more short-term relationships (Sales et al., 2012; Santelli et al., 1998). Therefore,

scholars have recommended prevention programming that highlights proactive sexual health education strategies for adolescents and young adults, as well as increasing access to screenings.

Second, scholars found that females are more susceptible to contracting chlamydia than males, due to increased biological risks (CDC, 2018; Sales et al., 2012; Santelli et al., 1998). The columnar epithelium found in adolescent females supports the growth of chlamydia, and the cervical mucus, which is normally protective, is more easily penetrated by chlamydia trachomatis. Further, studies have found that sexually transmitted diseases are more easily transmitted from males to females. For example, while no study has explored chlamydia specifically, it has been found that a female has a 60-90% chance of contracting gonorrhea from an infected male partner after sexual intercourse, while a male has a 20-30% chance of contraction from an infected female partner (Hopper et al., 1988; Platt, Rice, & McCormack, 1983; Wong, Singh, Mann, Hansen, & McMahon, 2004). Also, the risk of transmitting genital herpes from male to female partner has been found to be 19%, while it's five percent for transmission from female to male partner (Wong et al., 2004). Oral contraceptives increase vulnerability to contracting sexually transmitted diseases among females (Wong et al., 2004). Little is known about the biological susceptibility of males, except that circumcision reduces the risk of contracting a sexually transmitted disease (Wong et al., 2004).

Beydoun, Dail, Tamim, Ugwu, & Beydoun (2010) conducted a cross-sectional, secondary analysis of 5,611 adults between the ages of 20 and 39 years of age to examine gender and age-related disparities in the contraction of chlamydia and found different results. Of the 5,611 individuals included in the study, 120 were identified as having recently contracted chlamydia. This equated to an estimated chlamydia infection rate of 1.6% (95% CI 1.3%-1.9%). The study found that those under 25 years of age had an infection rate of 2.8%, which was

greater than the infection rate of those older than 25 year of age (1.3%). The results were statistically significant. Interestingly, and unlike other studies, the prevalence of chlamydia was not found to differ by gender. There were, also, no gender related differences were found when the authors controlled for age.

Men who have sex with men (MSM) are disproportionately affected by sexually transmitted infections (Batteiger, 2017; Chow et al., 2016; Jin et. al, 2010; Oster et. al, 2013; Rank & Yeruva, 2014; Woestenberg et al., 2020). For instance, Abara, Hess, Fanfair, Bernstein, and Paz-Bailey (2016) found that in the United States, the prevalence rates of primary and secondary syphilis and HIV were the highest among MSM, particularly racial minority and young MSM. Jensen et.al (2020) conducted a nationwide, cross-sectional study that included 2,203 MSM, to gauge STI prevalence among MSM and found that overall sexually transmitted infections prevalence was 30.1%. Fox and colleagues conducted a cross-sectional study that compared the prevalence of gonococcal urethritis cases among MSM and heterosexual men. The authors found that MSM accounted for a 9 percent point increased in gonococcal urethritis prevalence in sexually transmitted disease clinics. Studies have found that MSM who test positive for rectal chlamydia are at a greater risk of contracting HIV (Jin et al., 2010, Katz, Dombrowski, Bell, Kerani, & Golden, 2017; Panthela, Braunstein, Blank, & Schillinger, 2013).

Studies have noted racial and ethnic disparities in sexually transmitted infections among MSM. Sullivan and colleagues (2017) conducted a state-level ecological surveillance of HIV and syphilis rates in 2015 and 2016. The researchers found that state specific rates of new HIV diagnoses were higher for Black and Hispanic MSM than White MSM (Sullivan et.al, 2017). Black MSM were found to have significantly higher rates of syphilis than White (Sullivan et.al, 2017). Kelley et al (2015) conducted a longitudinal cohort study of 562 Black and white HIV-

negative, sexually active MSM in Georgia' state capital, Atlanta. The authors found high incidence rates for all sexually transmitted infections, particularly among Black MSM. Further, the CDC (2018) found that disparities among MSM reflect the disparities among the general population with racial minorities who are unemployed, young, and of lower financial stability bearing the brunt of the incidence.

Dewart et al (2018) conducted a systematic review of 115 eligible reports published between January 2000 and November 2016 and found that the overall prevalence of rectal chlamydia among MSM was similar to cisgender women. The authors found that the prevalence of rectal chlamydia was similar among MSM and cisgender women (Dewart et al, 2018). MSM were found to have a median prevalence of 7.9% and a weighted average of 9.0%, while cisgender women were found to have a median prevalence of 7.1% and a weighted average of 8.7% (Dewart et al, 2018).

Studies have hypothesized that engaging in high-risk sexual behaviors impact the disproportionate prevalence of sexually transmitted infections among MSM. For instance, Jensen et. al (2020) found that 73% of respondents engaged in sexual intercourse without using a condom. Hoff, Chakravarty, Beougher, Neilands, and Darbes (2012) found similar results. The authors found that in a study of 566 MSM couples, nearly 65% engaged in unprotected anal intercourse, and 22% of the sampled MSM reported engaging in at least one episode of unprotected sexual intercourse with an outside partner (Hoff, 2012). Further, Tieu and colleagues found the high incidence of sexually transmitted diseases among MSM may be related to the number of lifetime sex partners, rate of partner exchange, interconnectedness and concurrency of sexual partners, and possibly limited access to healthcare (Tieu et al., 2014). Balaji and colleagues hypothesized that experiences of stigma are associated with increased sexual risk

taking among MSM (Balaji et al., 2012). Studies have found that most rectal sexually transmitted infections are acquired through receptive anal intercourse, which some data supporting possible transmission through oral-anal contact (Chow et al., 2016; Chesson et al., 2013; Rank & Yeruva, 2014; Yeruva et al., 2013; Heijne et al, 2017). To reduce the transmission and contraction of sexually transmitted diseases, the CDC has developed screening and diagnostic testing guidelines specifically for MSM (CDC 2018, Kent et. al, 2005). These guidelines include, but are not limited to, the following recommendations for chlamydia and gonorrhea infections: annual urine screenings for infections among sexually active MSM and rectal chlamydia cultures for those who have receptive, rectal sexual intercourse (Kent et al, 2005).

Third, scholars and governmental organizations have highlighted a long history of racial disparities in the incidence of reportable sexually transmitted diseases (Adimora, Ramirez, Schoenbach, & Cohen, 2014; CDC, 2012-2019; Sullivan et al., 2014). While the increased susceptibility of racial minorities is not influenced by biological measures, correlations with social and environmental factors have been noted. Possible causes of racial disparities were found to be multi-dimensional. For instance, Hamilton and Morris (2014) found evidence that the structure of local sexual networks among communities of racial minorities contribute more toward the observed racial disparities in sexually transmitted diseases than demographic risk factors. Kotchick, Shaffer, Forehand, and Miller (2001) found that differences in sexually transmitted disease prevalence among various racial groups may be correlated to differences in cultural expectations, access to community resources, education, and poorer family environment (Kotchick et al., 2001). Others have found that the racial composition of neighborhoods, including residing in neighborhood with higher proportions of minority populations, has been

linked to risky sexual behaviors (Brester, 1994; Dembo, Childes, Belenko, Schmeidler, & Wareham, 2010; Driscoll, Sugland, Manlove, & Papillo, 2005).

Studies have found that race and socioeconomic status are often significantly correlated. Race and socioeconomic status are predictors of healthcare seeking and preventative behaviors, as poor, uninsured, minority patients may be less likely seek to timely medical care than their more affluent, insured, nonminority counterparts (Navarro, 2002; Toomey, Moran, & Rafferty, 1993).

Miller, Ford, Morris, and Handcock (2004) conducted a cross-sectional analysis of a nationally representative sample of 14,322 young adults between the ages of 18 and 26 to examine the prevalence of chlamydia and gonococcal infections among various demographic subgroups and geographic locations. In-home interviews were conducted across the United States for Wave III of the National Longitudinal Study of Adolescent Health from April 2, 2001 to May 9, 2002. The authors found that the overall prevalence of chlamydial infection was 4.19%, with women significantly more likely to be infected than men, as women had an overall prevalence rate of 4.47% and men had an overall prevalence rate of 3.67% (Miller et al., 2004). The study, also, found grave differences in the prevalence of chlamydial infection among racial groups. In general, the prevalence of black men and women was more than six times the prevalence of white men and women at 12.54% and 1.94%, respectively. Black women were found to have had a prevalence of chlamydia that nearly exceeded 13.9%, which was the greatest, while black men were a close second with a chlamydial prevalence rate of 11.12%. The lowest prevalence rates were among Asian men (1.14%), white men (1.38%), and white women (2.52%). Differences in race and gender were similar to those noted in chlamydial infections (Miller et al., 2004).

Hamilton and Morris (2015) conducted a quantitative study to assess racial disparities in sexually transmitted infections/diseases in the United States and social networks. Data were extracted from the Longitudinal Survey of Adolescent Health Wave III. After controlling for demographic characteristics including, age, sex, marital status, and education, the authors found a strong association between race and chlamydia. Non-Hispanic Black Americans were 5.23 times more likely to contract chlamydia when compared to the reference group of Non-Hispanic White Americans (Hamilton & Morris, 2015).

While the previously mentioned articles examined individual risk factors, such as age, gender, and race and ethnicity, and their associated sexual transmitted disease disparities, a more recent body of recent literature has sought to investigate the complex influence, and often compounding, influence of health, socioeconomic status, social capital, and neighborhood characteristics.

Health and Healthcare

Access to comprehensive, quality health care services is vital in the promotion and maintenance of health, as well as the prevention and management of disease and reduction of premature death (CDC, 2018; Denison, Bromhead, Grainger, Dennison & Jutel, 2017; Kavilanz, 2011; Tilson et al., 2004). Uninsured or underinsured persons have been found to be less likely to receive preventative medical care and experience poorer health outcomes and higher rates of morbidity than those with adequate health coverage (CDC, 2015; Denison et al., 2017; Kavilanz, 2011; Mugavero, Norton, & Saag; 2011; Tilson et al., 2004). The availability of highly skilled physicians and healthcare professionals within a community has been found to be associated with lower occurrences of sexually transmitted diseases (Jacobs, Ir, Bigdeh, Annear, & Van Damme, 2011). These components have the potential to render challenges regarding unmet

health needs and delays in receiving appropriate preventive healthcare and sexual health services.

Further, Haley and colleagues conducted a cross-sectional multilevel analysis of the association between neighborhood health care access and the prevalence of sexually transmitted diseases among 845 women in the southern portion of the United States (Haley et al., 2018). The authors' outcome variable was defined as having a laboratory-confirmed diagnosis of chlamydia, gonorrhea, trichomoniasis, or early syphilis. Neighborhood health care access was measured by gauging the percentage of residents with a primary care provider and the percentage of residents with health insurance in the census tracts where the sampled women lived (Haley et al. 2018). The authors found an inverse relationship between the census tract's percentage of residents with a primary care provider and having a sexually transmitted disease. When controlling for individual level characteristics, the authors found that a four unit increase in the percentage of tract residents with a primary care provider was associated with a 39% lower risk of having a sexually transmitted disease (Haley et al., 2018).

Extended travel time to a healthcare provider has been identified as a measure of healthcare accessibility. There have been conflicting findings regarding the association between travel time to health care facility and sexually transmitted diseases (Booney et al., 2012; Goldenberg, Shoveller, Ostry, & Koehoorn, 2008; Monnet et al., 2008; Olonilua et al., 2008). For instance, Bonney and colleagues (2012) conducted an empirical study of sexual behavior, sexually transmitted diseases, and healthcare utilization among African American adults in a public housing community in Atlanta, Georgia from 2008 to 2009. One hundred and eight adults were sampled in the study. Unlike similar studies, the authors found a curvilinear relationship between travel time and likelihood of testing positive for a sexually transmitted disease (Bonney

et al., 2012). The study found that when travel times were less than 48 minutes, higher travel times were associated with a greater likelihood of testing positive for at least one sexually transmitted disease; however, when travel time was greater than 48 minutes, higher travel times were associated with a lower likelihood of testing positive (Bonney et al., 2013). Further studies found that sexually transmitted diseases were more pronounced in areas where residents have limited access to primary health care and disease treatment than when care is more accessible and care seeking delays are shorter. Nevertheless, other scholars found that greater travel time is not associated with care delay or the likelihood of diagnosis (Monett et al., 2008; Olonilua, 2008).

In areas where travel times were high and access to health care professionals was challenged, the literature suggests several strategies to improve access to sexually transmitted disease care. Bauer and colleagues (2004) recommended providing sexually transmitted disease prevention, diagnostic, and treatment services in non-traditional settings, such as schools, as these locations are frequented by marginalized populations and those who typically do not have access to health care services. At-home sexually transmitted disease testing may serve as a benefit. Also, better integration of sexually transmitted disease service delivery in emergency rooms and local clinics would benefit those lower-income individuals with limited access to a primary physician or health care provider or funds (Bauer et al., 2004; Parrish & Kent, 2008).

Tilson and colleagues found that among surveyed adolescents, the primary healthcare related barriers to sexually transmitted disease testing were the following: physician lack of knowledge and available resources, cost of services, long travel time, and long weight time (Tilson et al., 2008). The authors echoed the recommendation of others by suggesting the use of electronic and social media campaigns regarding sexually transmitted diseases, school based

comprehensive sexuality education programming, and regional grants to support the employment of more primary care physicians and transportation (Tilson et al., 2008).

Socioeconomic Status

Socioeconomic disparities contribute significantly to patterns of morbidity in the United States (Adler, Boyce, & Chesney, 1994; Anderson & Armstead, 1995; Springer, Samuel, & Bolan, 2010). Studies have found various measures of socioeconomic status, such as income, poverty, and unemployment, to be associated with poorer health outcomes, limited access to health care, and reduced health seeking behaviors (Datta et al., 2007; Hurling, Subramanian, Barnighausen, & Kawachi, 2014; Krieger, Waterman, Chen, Soobader, & Subramanian, 2003; Springer, Samuel, & Bolden, 2010). Often, studies examine socioeconomic status by assessing economic stability and educational attainment simultaneously.

Annang, Walsemann, Maitra, and Kerr (2010) conducted a study to describe the association between education and sexually transmitted disease diagnosis among a nationally representative sample of Black and White females using secondary data extracted from the National Longitudinal Study of Adolescent Health (Add Health). Educational status was assessed by identifying the highest level of educational attainment. Options for education status were less than high school diploma; high school diploma; enrolled in/graduated from college. The data was collected at specific periods between 1995 and 2002. The authors found that Black females had significantly higher rates of diagnosis compared to White females. The rates of self-reported infection among Black respondents did not vary significantly by educational status; however, the rate of self-reported infection did decline among White women as the level of education increased (Annang et al., 2010).

Crichton and colleagues examined the prevalence of chlamydia and its associations with socio-economic position using the Avon Longitudinal Study of Parents and Children. Risk of infection was strongly associated with social disadvantage across the life course (Crichton et al., 2014). After adjusting for other measures of disadvantage, such as disposable household income, neighborhood disadvantage, and special education status, the authors found that the strongest risk factors for chlamydia infection were lower maternal educational attainment and lower participant educational attainment (Crichton et al., 2014). The findings support the need to examine the role of educational attainment as a predictor of chlamydia, as higher levels of educational attainment are associated with greater occupational wages, which often includes higher wages and health benefits, as well as access to diagnostic and treatment services and contraceptives (Anang et al., 2010; Crichton et al., 2014).

Beydoun, Dail, Tamim, Ugwu, & Beydoun (2010) conducted a cross-sectional, secondary analysis of 5,611 sexually active adults between the ages of 20 and 39 years of age to examine sex, gender, age, race, and other select socio-demographic risk indicators of chlamydia. In addition to the findings reported in a previous section, the study found that the highest overall chlamydia prevalence rates were among those who reported having less than a high school education or a household income of less than $20,000 (Beydoun et al., 2010). The authors, also, found a negative relationship between level of education and the prevalence of chlamydia. The chlamydia prevalence rate among those with less than a high school education was 4.2%, while the prevalence rates for those with a high school diploma or its equivalency and those with greater than a high school diploma were 3.9% and 1.7% respectively. It is important to note that these results could not be generalized to both genders and other age groups (Beydoun et al., 2010). Also, Datta and colleagues found individuals with a household income of at least $20,000

were 1.8 times more likely to be infected with chlamydia when compared to those who earned more (Datta, 2007).

Harling and colleagues (2013) conducted a quantitative analysis of national data from a cohort of adolescents surveyed included in Waves I-III of the Add Health Survey to determine the pattern of socioeconomic gradients in sexually transmitted diseases, particularly chlamydia. The Add Health Survey included a sample of 80 high school students enrolled in the United States of America. The sampled schools were representative of United States schools with respect to region, urbanicity, school size, school type, and ethnicity. Wave I was administered in 1994-95 and surveyed a sample of all students enrolled in grades 7-12. Wave II was administered in 1996 and surveyed the same individuals included in the Wave I survey, and Wave III was administered in 2001-02 (Harling et al., 2013).

The authors found that chlamydia was the most common sexually transmitted disease, with 6.7% of respondents reporting contraction. The cumulative risk of chlamydia diagnosis decreased as family income increased. Respondents whose family income fell within the poorest quintile had a risk of 14.7%, while respondents from the wealthiest quintile had a risk of 5.2%. Bivariate regression analysis conducted during the study confirmed that White persons were at significantly lower risk of STI diagnosis than all other Black and Hispanic persons, and all income quintiles at significantly higher risk compared with the richest quintile (Harling et al., 2013).

Research has found that macro-level economic factors are associated with sexual behaviors and outcomes. Poverty and economic inequality have been found to be associated with high rates of sexual activity and lower rates of contraception use among populations (Datta et al., 2007; Fenton et al., 2001; Salisburg et al., 2005; Santelli, Lowry, Brener, & Robin, 2000;

Springer, Samuel, & Bolan, 2010). Springer and colleagues (2010) hypothesized that young adults who live in impoverished neighborhoods have a higher risk pool of sexual partners to choose from compared to peers from more advantaged communities, thus the probability of subsequent contact with an infected sexual partner is significantly higher. Also, with lower socioeconomic status have less access to treatment and screenings for infectious diseases, which may increase the spread of disease (Beydoun, 2010; Harling et al., 2013; Springer et al., 2010).

Social and Community Context

In public health research, social capital is often operationalized as a population-level attribute that measures social relations and connections among people, social organizations, and communities (Holtgrave & Crosby, 2003; Kawachi & Berkman, 2000; Seman, Sternbern, Zaidi, & Aral, 2007; Thoits, 2011; Umberson, 2010; Vallejos 2017). Although there exist limited studies that examine the association between social capital and chlamydia, these studies have found that social capital is inversely related to sexually transmitted diseases (Holtgrave & Crosby, 2003; Holtgrave & Crosby, 2005; Holtgrave & Crosby, 2013). Kawachi and Berkman (2000) hypothesized that higher social capital is associated with better sexual health outcomes, due to (1) the existence of social and health norms that support healthy behaviors; (2) stronger social networks that encourage residents to take more responsibility for each other; (3) availability of pivotal resources, such as, access to health care services; (4) and, the fostering of democratic political participation and thereby leading to the development of policies that protect all citizens.

Holtgrave and Crosby (2003) conducted a state level, correlations analysis to assess the relationship among various measures of poverty, social capital, and infection and a host of sexually transmitted diseases such as chlamydia, gonorrhea, and AIDS (Holtgrave & Crosby,

2003). The social capital variable was a combination of 14 variables that captured some domain of the following concepts, as indexed by Putnam in *Comprehensive Social Capital Index*: community and organizational life, involvement in public affairs, volunteerism, information sociability, and social trust. They found that social capital, poverty, and income inequality were significant predictors of chlamydia infections (Holtgrave & Crosby, 2003; Putnam, 2001). The results of this study suggest that social capital is highly predictive of numerous sexually transmitted diseases. The authors suggested the potential need for structural interventions designed to increase social capital in vulnerable communities (Holtgrave & Crosby, 2003).

Also, family structure has been found to indirectly influence health outcomes. Studies have found that within the family, the parent-parent and parent-child relationships impact the level of support, supervision, and behaviors youth can model, as well as messages about healthy sexual behaviors and sexual health outcomes (Bettinger, Celentano, & Curriero, 2004). Also, the percentage of female headed households has been consistently found to be a predictor of sexually transmitted diseases in county-level studies (Kilmarx et al., 1997; Robertson, Thomas, St. Lawrence, & Pack, 2005; Thomas & Gaffield, 2003). The results support the recommendation that interventions to increase parental involvement in promoting positive sexual behaviors may aid in sexually transmitted disease prevention.

Thomas, Torrone, and Browning (2010) hypothesized that high rates of incarceration impact sexually transmitted diseases contraction and transmission by undermining social cohesion and control. High rates of incarceration undermine social cohesion by removing large numbers of people from the community (Thomas et al., 2010). Further, it has been suggested that the incarceration of important family members, such as parents or grandparents, can negatively influence social cohesion and control within the family and lead to risky sexual behaviors that

may result in unintended pregnancies and sexually transmitted diseases. Also, in institutionalized settings where there are high rates of sexually transmitted disease among inmates, the release of an infected inmate may facilitate the transmission of the disease in the community. The authors used homicide rates as a proxy for incarceration, and a change from the 25th percentile to the 75th percentile in 1995 homicide rates yielded a gonorrhea rate increase of 164.6 cases per 100,000 of the population, which is greater than the neighborhood median (Thomas et al., 2010). Overall, these findings indicate that factors extending beyond individual behaviors may contribute to community sexually transmitted disease rates, and public health programs that strengthen the social capital of areas that face high sexually transmitted diseases rates may prove beneficial in lowering rates. Browning found that the age of onset sexual activity was greater in areas with more collective efficacy or combined social cohesion and control.

Neighborhood & Built Environment

The characteristics of the neighborhood setting in which an individual or population lives, works, and grows provide have the potential to influence risky sexual and health behaviors, and may inform the development and expansion of accessible and effective community-based prevention and treatment services (Dembo, Belenko, Childs, Wareham, & Schmeidler, 2009; Gomeet al. 2015). Yen and Kaplan (1998) were among the first to empirically establish linkages between neighborhood and built environment and overall health and mortality (Yen & Kaplan, 1998). Since then, researchers have recognized the important influences neighborhood and built environment exert on health outcomes. For instance, studies have found that individuals residing in poorer neighborhoods generally have higher exposures to crime, pollution. Also, these individuals are more likely to attend underperforming schools, have fewer job opportunities, and lack access to healthcare services (Holtgrave, 2003; Roux, 2001; Thomas et al., 2010).

Also, Biello, Pettigrew, & Niccolai (2012) conducted a study to determine whether neighborhood-level socioeconomic measures provided a comparable assessment of the burden of multiple chlamydia diagnosis among young women with current chlamydia infections. Neighborhood characteristics of employment were gauged by identifying the percentage of the neighborhood's population residing below the poverty level. There were four categories with the most disadvantaged being the category with 20% or more of the residents below the poverty level, while the most advantaged category included those with less than 5% of residents living below the poverty level. Those living in the highest poverty neighborhoods were three times more likely than those living in the lowest poverty neighborhood to have multiple chlamydia diagnosis. The results were statistically significant.

Urbanicity

While sexually transmitted diseases have traditionally been more prevalent in urban communities, emerging research suggests that the spread of sexually transmitted diseases is increasingly affecting rural areas. This shift has the potential to present public health challenges to rural communities, as these locations, when compared to urban areas tend to have less access to public health resources and less community and healthcare experience with preventing sexually transmitted diseases (Reichel, 2019).

Pinto, Dorn, Chinchilli, and Du (2018) conducted a quantitative comparison of chlamydia and gonorrhea rates among adolescent and young adult residing in rural and urban communities in Pennsylvania from 2004-2014. The authors extracted secondary data from two electronic repositories, the Pennsylvania Department of Health National Electronic Database Surveillance System and National Center for Education Statistics lunch data sets. The study found that rural communities had much higher rates of chlamydia, when compared to their urban counterparts

when income and gender were controlled. The authors hypothesized that the higher rates of chlamydia and gonorrhea among rural youth may be related to the following: (1) infections are typically asymptomatic; (2) rural communities typically lack access to comprehensive sex education; (3) and, rural youth may fear negative community perceptions, due to lack of anonymity, as healthcare providers maybe members of a close-knit community.

Kozhilmannial and colleagues (2015) conducted a quantitative analysis of the county-level correlates of pregnancy and chlamydia among adolescents in 66 rural and urban counties located in Minnesota. The study found that chlamydia rates were greater among the rural counties, when compared to urban counties. The study also found that community characteristics such as poverty, unemployment, and single parent household rates were correlated with chlamydia; however, the rates were not statistically significant (Kozhilmannial et al., 2015).

Only one reviewed article empirically examined chlamydia in Georgia's rural and urban counties. Raychowdhury, Tedders, and Jones (2008) examined county-level data extracted five years of data from the Georgia Division of Public Health's Online Analytical Statistical Information System (OASIS) database, a data repository that provides access to standardized health and population data for all counties in Georgia. Per guidelines established by the State Office of Rural Health, the authors' defined rural counties as those with a population less than 35,000, and urban counties were those with a population of 35,000 or more people (Raychowdhury et al., 2008). The study found that, although variations existed among gender and racial groups, chlamydia was far more pronounced among rural Georgia counties (Raychowdhury et al., 2008). Rural counties were found to have an adjusted chlamydia rate of 1,045.5 cases per 100,000 of the population, compared to the 248.1 cases per 100,000 of the population found in urban counties (Raychowdhury et al., 2008). The study conducted by

Raychowdhury and colleagues was not without limitations, as the authors was unable to assess socio-environmental factors that may contribute to the distribution of chlamydia among rural and urban counties, such as educational attainment and family structure (Raychowdhury et al., 2008).

Disparities exist in health service delivery between rural and urban areas may explain the difference in chlamydia distribution. Healthcare delivery services have decreased in the United States since the 1970s, due to declining population trends, and rural hospitals and clinics began closing in the 1980s (Ibery, 1998). Rural residents are more likely to be unemployed than urban residents and are less likely to see a physician. Sullivan and colleagues found that rural residents tend to use fewer preventative screenings than urban citizens, mostly due to a lack of health care services (Sullivan et al., 2011). Further, healthcare professionals are unevenly distributed among rural and urban populations. For instance, the patient-to-primary care physician ratio in rural areas is 39.8 physicians per 100,000 of the population compared to 53.3 physician per 100,000 of the population in urban areas (Sullivan et al., 2011). The lack of providers can lead to great transportation difficulties and escalating traveling costs experienced by rural Americans, which may negatively impact residents' abilities to seek preventative services or testing for sexually transmitted diseases (Arcury, Pressier, Gesler, & Powers, 2006; Nelson & Gingerich, 2010) Also, Hartley, Quan and Lurie (1994) have found that disparities in health outcomes among rural and urban populations may be associated with socioeconomic differences, as rural residents tend to be more vulnerable to financial challenges (Hartley, Quan, & Lurie, 1994) On average, the per capita income in rural areas was found to be $9,242 lower than the average per capita income in the United States, and rural Americans were found to be more likely to live below the federal poverty line (Rural Health Information Hub, 2016).

Gaps in the Literature

While the literature has sought to expand the understanding of sexually transmitted infections from being reflective of biological, genetic, and individual behaviors to being associated with and partially determined by social and environmental determinants, significant gaps in the relevant literature remain regarding four primary areas (Browne, Wechsberg, White, Middlesteadt, Raidford, Carry, & Herbst, 2014; Dean & Fenton, 2008; Hogben & Leichliter, 2008). First, while chlamydia disproportionately impacts the southern part of the United States, few studies are set in southern states, particularly Georgia. Second, research linking proxy measures of social determinants of health and sexually transmitted diseases has shown great progress; however, few studies have studied multiple influences or examined a broad range of social influence simultaneously. Third, while chlamydia is the most prevalent sexually transmitted disease in the United States, few theoretical models have been used to guide the examination of intrapersonal risks and social determinants of risk within the context of chlamydia. Fourth, most reviewed articles utilized data collected between 10 and 20 years ago; therefore, more recent data is needed to examine current linkages and develop more appropriate interventions.

Summary

The purpose of this study is to examine the association between multiple social determinants and chlamydia infections among Georgia counties. Chapter Two provided an epidemiological view of chlamydia trachomatis and previous federal and state prevention policies. Also, Chapter Two presented the Social Ecological Model of Public Health as a mechanism by which to understand the influence social, environmental, and individual factors may exert on behavior and outcomes, as well as specific applications in public health. Chapter Two conceptualized central components of the Social Ecological Model by applying the theory

through a conceptual framework developed by the CDC, the Healthy People 2030 Social Determinants of Health. Lastly, Chapter Two reviewed relevant literature that documents the interrelationship and associations between the individual, social, and environmental risk factors and population sexual health outcomes and identify gaps in the literature. Chapter Three will review a description of the research methodology and research design.

Chapter 3: Methodology

Introduction

The purpose of this study was to examine the associations between social determinants of health and chlamydia infections among Georgia counties. Chapter three provides a detailed description of the research methodology and procedures used in the study. This chapter describes the sample and discusses issues of confidentiality, as well as the minimal risks to human participants. Next, this chapter presents specific discussions of measurement and variables. Lastly, this chapter explains the data analysis techniques.

Research Design

This dissertation study employed a correlational research design. Correlational research is a type of non-experimental research in which the researcher measures at least two variables and assesses the statistical relationship between them (Price et al., 2017). Correlational research is most appropriate when a researcher does not intend to examine or prove a causal relationship, but rather is interested in statistically describing the strength and direction of the relationship between variables (Price et al., 2017). If there is a relationship between the variables, the researcher may use scores on the independent variables to predict estimates on the dependent variable (Price et al., 2017). Another reason a researcher would choose to use a correlational approach rather than an experimental design is that the statistical relationship of interest may be causal, but the researcher cannot manipulate the independent variable because it is impossible, impractical, or unethical. Little or no effort is typically made to control for extraneous variables (Andrade, 2018; Price et. al, 2017; Westfall & Henning, 2013).

Next, the study was ecological in nature, as the unit of analysis was Georgia counties. Ecological studies are those with at least one variable measured at the group level (Babbie, 2016;

Price et al., 2017). In this study, aggregate measures, such as means or proportions, for each independent variable and the dependent variable were summaries of observations derived from individuals in each county. While previous scholars often used cross-sectional analysis to examine the association between social determinants and sexually transmitted diseases among individuals, those results could not be extrapolated beyond individuals to entire geographic locations, counties, or communities (Miller et al., 2004; Navarro, 2002; Toomey et al., 1993). All data for the dependent and independent variables were county-level measurements extracted from the 159 counties in Georgia.

Validity and Reliability

Internal Validity

Internal validity refers to the extent to which an observed cause-and-effect relationship cannot be explained by extraneous variables (Price et al., 2017; Lau, 2017; Rubin & Babbie, 2005). To make inferences regarding causality, the researcher must satisfy the following three factors: (1) illustrating that the cause preceded the effect; (2) the cause was related to the effect; (3) and there is no other plausible alternative explanation for the effect. While correlational studies are easier to conduct, when compared to randomized experiments, correlational studies are not effective in ensuring high levels of internal validity (Price et al., 2017; Lau, 2017; Rubin & Babbie, 2005). Correlational studies lack control for threats of maturation, history, testing, instrumentation, selection bias, attrition, and statistical regression (Lau, 2017; Rubin & Babbie, 2005). Due to the correlational nature of the research study and use of secondary data, the researcher is not able to control for the threats of internal validity; however, this study does not seek to establish a causal relationship.

External Validity

External validity refers to the extent to which the results of a study may be generalized to other settings, situations, or time periods (Andrade, 2018). A strength of correlational research is that it is typically higher in external validity than experimental research; however, the results of this study may not be generalized to other settings, situation, or time periods.

In ecological studies, the aggregation of data results in the loss or concealment of certain details of individual data, as aggregate level data may not adequately capture specific individual data (Hseih, 2008; Price et al., 2017; Lau, 2017; Rubin & Babbie, 2005; Tu & Ko, 2008). The researcher made no assertions about an individual resident of each county, but rather conducted group level analysis of county-level data. To determine whether the results generated by group-level analyses are true for individual residents, individual-level data must be collected, which the study does not do (Hsieh, 2008).

Reliability

Reliability refers to the consistency of the measurement results over time (Price et al., 2017; Lau, 2017; Rubin & Babbie, 2005). GeorgiaData is an updated version of the Georgia Statistical System introduced by the University of Georgia's Carl Vinson Institute of Government to provide interactive access to up-to-date surveillance data from 2000-2019 regarding agriculture, courts and crime, economic, education, health, labor, population, public assistance, and vital statistics. GeorgiaData reports as 1-year estimates, 2-year estimates, 5-year estimates, and 10-year estimates, depending on the data's original source and reporting. Earlier editions are archived through GeorgiaData. Each data element contains footnotes regarding extraction techniques, as well as electronic hyperlinks to the data's original source. The data extracted for use in this study fulfilled the reliability criteria.

Research Questions

The purpose of this study was to assess the association between social determinants of health and chlamydia infections among Georgia counties. This study tested determinants within the Healthy People 2030 Social Determinants of Health Conceptual Framework. These determinants also represented various levels of the Social Ecological Model of Public Health. The research questions are listed below.

1. Is there a bivariate association between each social determinant of health and chlamydia prevalence among Georgia counites?
2. If an association exists, (a) what is the strength and direction of the association, and (b) when considering other social determinants of health, does the association remain?
3. Which social determinants of health exerts the most relative influence on chlamydia among Georgia counties?

Setting

Georgia

Georgia, nestled in the southern portion of the United States and bordered by Florida, Tennessee, North Carolina, and Alabama, and boasts a land area of approximately 59,000 square acres. According to the United States Census, the state's total population in 2018 approached 10.4 million, making it the ninth most populous state in the United States and the third most populous state in the south after Texas and Florida (Census, 2018). Georgia has 159 counties, more than any state apart from Texas. Georgia counties are not monolithic, but may vary significantly in terms of demographic, economic, educational, and health-related characteristics which studies have been found to influence sexual health dependents (Usery, 2003).

Population of Interest

A population refers to the entire group about which a researcher is attempting to examine and draw conclusions (Banerjee & Chaudhury, 2010). Depending on the research design and

research questions, the population may reflect groups of people, geographic locations, or set of organizations, among others. This study sought to assess the association between social determinants of health and chlamydia infections among Georgia counties. The population of interest included the 159 counties in Georgia. Once a population was identified, decisions regarding whether to take a census or select a sample were considered.

Typically, researchers prefer to draw conclusions about populations from collecting and analyzing data extracted from samples (Banerjee and Chaudhury, 2010). In most instances, a collecting data from the entire population is not practical due to size of the units in the population, time, and cost constraints. This study collected and analyzed data from each of the 159 counties in Georgia, as the constraints previously listed exerted minimal challenges in this dissertation study. Data for each county were easily extracted from GeorgiaData. Further, the population of interest for this study was well defined. For the variables included in this study, there were no missing data points for any of the counties. Also, the count of counties included in the study was relatively small, compared to previous scholars, such as Beydoun and colleagues (2010), who sought to examine larger quantities of individuals or counties in multiple states (Beydoun et al., 2010).

A census is a study of every unit in a population. Taking a census and collecting data from each of the 159 counties in Georgia poses key advantages. A population census is advantageous when considering the minimization of sampling error. Sampling error refers to the difference between the test statistic generated from a data collected from a sample and what would have been found if a census of the entire population was taken. Sampling error occurs when the sample extract for the purposes of analyses is not representative of the entire population. Georgia's counties are not monolithic, but rather vary significantly in terms of

demographic, economic, educational, and health-related characteristics, which studies have found to influence sexual and population health outcomes (Usery, 2003). While a proportionate stratified sampling, may have reduced this sampling bias, the time and resources needed to implement this sampling method would greatly exceed those required by extracting data for each county. Collecting data from each county and county-equivalent eliminated sampling error issues and provided true measures of the correlations between social determinants of health and chlamydia infections among Georgia counties.

Lastly, while statistical inference, such as hypothesis testing and interpretations of *p values*, draws conclusions about a desired population from on a sample extracted from the population, the study included all 159 counties in Georgia and did not include a sample of counties. The study will make no effort to interpret any *p values* associated with any test statistics, as there is no need to make inferences or generalizations from a sample about the counties, considering all 159 counties were included in the study.

Secondary Data Source

The study was ecological in nature, as the dependent variable and each independent variable were measured at the group level. Secondary analysis was completed using county-level data extracted from GeorgiaData, Georgia's electronic data repository, for each independent and dependent variable. Secondary analysis draws upon data collected by other research, often for other purposes (Gray, 2014; Welch & Comer, 2001).

In 2015, the University of Georgia launched GeorgiaData as an enhancement to the Georgia County Guide and replacement for the Georgia Statistics System. GeorgiaData consolidates the work of several units at the University of Georgia such as, the Carl Vinson Institute of Government, Cooperative Extension, and the Center for Agribusiness and Economic

Development. GeorgiaData provides county and state-level crime, economic, education, labor, land use, population, and vital statistics from a variety of public sources, such as the CDC, Georgia Department of Health's Online Analytical Statistical Information System (OASIS), and the U.S. Census. Data may be reported by year, decade, or a compilation of multiple years. Data are updated annually.

While GeorgiaData contained a wealth of secondary data, it is not without limitation. While several scholars have examined the relationship between MSM and sexually transmitted diseases, GeorgiaData contained no measures of MSM. Additionally, GeorgiaData did not contain multiple years of data for several measures such as civic participation, quality of housing, and crime and violence. Further, the researcher was unable to exert complete control over the data collection process, accuracy of data, or representativeness of the collected data

Confidentiality

The county-level data used for the study were extracted from GeorgiaData, a publicly accessible data repository. No indirect or direct identifiers of individual information were disclosed in the county level data. No participant consent forms were required.

Minimizing Risk of Harm to Human Participants

The study exerted no harm upon the individual, as the researcher conducted a secondary analysis using pre-existing county-level data extracted from a publicly accessible data repository, GeorgiaData. No data contained individual level measurements. No personal identifiable information was included. As a result, the researcher did not contact any individuals nor have access to any personal identifiable information on those residing in the counties.

Operationalization of Key Variables

Operationalizing variables refers to defining a variable in terms of precisely how it is to be characterized for data analysis. Operationalizing variables involves transforming abstract constructs that cannot be directly observed and transforming those into something that can be directly observed and measured. This subsection will operationalize the concepts introduced in the Social Ecological Model of Public Health, Healthy People 2030 Social Determinant of Health Conceptual Framework, and the dependent variable, as well as how each variable was measured. See Table 4.

Table 4

Operationalized Variables

Variable	Measurement	Original Source
Demographics		
Female, gender	percent of population reported as female	U.S. Census
Youth	percent of population reported as14-29 years old	U.S. Census
Black, race	percent of population reported as African American, Black	U.S. Census
Economic Stability		
Below Poverty Level	percent of population reportedly living at or below the federally established poverty threshold, per the OMB's Statistical Policy Directive 14	American Community Survey
Unemployed	unemployment rate (number of unemployed persons as a percentage of the labor force)	Georgia Department of Labor
Education		
Less than High School Ed	percent of population over 25 years of age with less than a high school diploma or its equivalency	U.S. Census
Social and Community Contexts		
Single Parent Household	percent of households headed by a single parent	U.S. Census
Percent Voting	percent of county's registered voters that cast a vote in the 2018 gubernational election	Georgia Secretary of State
Health and Healthcare		
Uninsured	percent of county's population under 65 years of age who are underinsured	U.S. Census
Physician Rate	county's physician rate (number of physicans per 100,000 of county's population)	Georgia Board for Physician Workforce
Neighborhood and Built Environment		
Total Crime	county's Total Index Crime Rate	Georgia Bureau of Investigation
Rurality	percent of county's population residing in a rural area	U.S. Census
Dependent Variable		
Chlamydia	chlamydia rate (number of newly reported cases of chlamydia infections, per 100,000 of county's population)	OASIS

Dependent Variable

Chlamydia. The dependent variable changes as a function of change in the independent variable. In the study, *chlamydia* was the dependent variable. County-level chlamydia infections was measured as a rate or the number of newly reported confirmed cases of chlamydia infection per 100,000 of each county's population. Per Georgia state law (O.C.G.A. 31-12-2), all Georgia physicians, laboratories, and other health care providers are required to report patients diagnosed with sexually transmitted diseases such as chlamydia, gonorrhea, and syphilis to the Georgia

Department of Public Health. While data for the *chlamydia* variable were extracted from GeorgiaData, Georgia Department of Public Health's OASIS serves as the original source.

Independent Variables

Social determinants of health variables were included in the bivariate Pearson Correlation to gauge association with the dependent variable. These variables were included in a multiple linear regression model to estimate the combined effects on the dependent variable. The independent variables represented the five domains of the Healthy People 2030 Social Determinants of Health Conceptual Framework, as well as levels of the Social Ecological Model of Public Health. Additional county-level demographic characteristics, such as measures of age, race, and gender, will be included in the analyses as independent variables. In a highlight of the secondary data collection used for this study, while data for all variables were extracted from GeorgiaData, an online data repository, original sources of the data ranged from state health agencies to national agencies.

Demographics

While each variable was extracted from GeorgiaData, the primary source of the demographic data is the U.S. Census Bureau. Each year the U.S. Census Bureau produces and publishes estimates for the resident population of the United States, states, municipalities, and territories. Estimated resident population data for each year since the most recent decennial census by using measures of population, which includes the population base, births, deaths, and migration counts. Additional information, such as geography, age, sex, race, and Hispanic origin, was collected, as well. These population estimates were used for federal funding allocations and controls for major surveys, including the American Community Survey and to aid in community development.

Sex. The variable *female, gender* was measured as the percent of each county's total population reported as female from 2010-2018. While the data for *Female* were extracted from GeorgiaData, the U.S. Census, *Annual Estimates of the Resident Population for Selected Age Groups by Sex for the United States, States, Counties, and Puerto Rico Commonwealth and Municipios, April 1, 2010 to July 1, 2018* serves as the original source of data for *sex*. The U.S. Census refers to sex as the biological sex of an individual at birth (Census, 2019). There were two options, male and female.

Age. The variable *Youth* was measured as the percent of each county's total 2010-2018 population reported as being between 14 and 29 years old. While the data for *Youth* were extracted from GeorgiaData, the U.S. Census, *Annual Estimates of the Resident Population for Selected Age Groups by Sex for the United States, States, Counties, and Puerto Rico Commonwealth and Municipios, April 1, 2010 to July 1, 2018* served as the original source of data for *age*. Each year the U.S. Census Bureau produces and publishes estimates for the resident population of the United States.

Race. GeorgiaData contained county-level data for reported percent of racial identification including the following: African American, Black (alone), White (alone), Race Other than White or Black Reporting One Race Alone (American Indian, Asian, Pacific Islander), Two or More Races Combined. The racial classification variables include county level percent of each racial classification over the period 2010-2018. In the study, the variable *Black, race* was measured as the proportion of residents reported as African American, Black. While the data for *Black, race* were extracted from GeorgiaData, the U.S. Census, *PEPSR6H. Annual Estimates of the Resident Population by Sex, Race, and Hispanic Origins for the United States, 2010-2018* served as the original source of data.

Economic Stability

The Healthy People 2030 Social Determinants of Health Conceptual Framework included multiple measures of economic stability. In the study, county-level economic stability will be measured using the following proxy measures: *Below Poverty Level* and *Unemployment*. First, in this study the variable, *Below Poverty Level*, was measured by the proportion of each county's population reportedly living at or below the federally established poverty threshold, per the Office of Management and Budget's (OMB) Statistical Policy Directive 14. While the data for *poverty* were extracted from GeorgiaData, the U.S. Census Bureau, *2014-2018 American Community Survey 5-Yr. Estimates, "Poverty Status in the Last 12 Months"* serves as the original source. Second, in the study the variable, *Unemployment*, measured each county's unemployment rate for 2009-2019. Unemployment rate was calculated as the number of unemployed people as a percentage of the labor force for each county. While data for the *Unemployment* are extracted from GeorgiaData, the Georgia Department of Labor's *Yearly Civilian Labor Estimates and Yearly Unemployment Insurance Claims* serves as the original source.

Education

The Healthy People 2030 Social Determinants of Health Conceptual Framework includes multiple measures of education. In this study, the variable *Less than High School Ed*, was measured as the proportion of each county's residents over 25 years of age with less than a high school diploma or its equivalency, 2014-2018. To generate the variable, first, the researcher combined the raw number of each county's population over 25 years of age with the number reportedly completing less than 9th Grade from 2014-2018, labeled *Completing Less than 9th Grade, Number,* and the raw count of the respective county's population over 25 years of age

who reportedly completed Grades 9-12 without obtaining a diploma or its equivalency, which is labeled *Completing Grades 9-12 No Diploma, Number.* The new variable, *Less than High School Ed, Completing Grades 9-12 No Diploma, Number*, by the *Person Aged 25 Years and Older, Number*, included those residents who reported obtaining less than a high school diploma or its equivalency. Second, the researcher divided the data in each county's respective *Completing Grades 9-12 No Diploma, Number,* by the *Person Aged 25 Years and Older, Number,* variable data. The resulting variable, *Less than High School Ed,* was the proportion of residents over the age of 25 with less than a high school diploma, 2014-2018.

Social and Community Contexts

The Healthy People 2030 Social Determinants of Health Conceptual Framework included multiple measures of social and community contexts. In the study, economic stability was measured using *Single Parent Household* and *Percent Voting*. First, the variable, *Single Parent Household*, was measured by the proportion of each county's households headed by a single-parent, 2014-2018. This included a combination of female and male-headed, single-parent households. While the data for *Single Parent Household* were extracted from GeorgiaData, the U.S. Census Bureau, *U.S. Census Bureau, 2014-2018 American Community Survey 5-Yr. Estimates. "Households and Families," Table S1101* served as the original source. Second, the variable, *Percent Voting*, was measured by the proportion of each county's registered voters that casted a vote in the 2018 gubernational election. While the data for *Percent Voting* were extracted from GeorgiaData, the Georgia Secretary of State, Election served as the original source.

Health and Healthcare

The Healthy People 2030 Social Determinants of Health Conceptual Framework includes multiple measures of health and healthcare. County-level health and healthcare was measured using the following proxy measures: *Uninsured* and *Physician Rate*. First, in the variable, *Uninsured*, was measured by the percent of each county's population under 65 years of age who are uninsured from 2014-2018. While the data for *Uninsured* were extracted from GeorgiaData, the U.S. Census Bureau, Small Area Health Insurance Estimates (SAHIE) Program's Model-based Small Area Health Insurance Estimates (SAHIE) for Counties and States served as the original source. Second, the variable, *Physician Rate*, will be measured by each county's physician rate for 2014-2018. The physician rate is the number of total physicians per 100,000 of the population. The rate includes primary, secondary, and tertiary physicians (e.g., family practice, internal medicine, obstetrics and gynecology, general surgery, emergency medicine). While the data for *Physician Rate* were extracted from GeorgiaData, the Georgia Board for Physician Workforce, "Georgia Physician Workforce Primary Care/Core Specialties Based on the 2017-2018 Licensure Renewal Data and New Licensees," served as the original source.

Neighborhood and Built Environment

The Healthy People 2030 Social Determinants of Health Conceptual Framework includes multiple measures of neighborhood and built environment. County-level neighborhood and built environment was measured using the following proxy measures: *Total Crime* and *Rurality*. First, the variable, *Total Crime,* was measured by each county's Total Index Crime Rate for 2017. The rate was the number of Part 1 offenses reported to by local law enforcement per 100,000 of each county's population. Part 1 offenses includes the following eight offenses: murder and non-negligent manslaughter, forcible rape, robbery, aggravated assault, burglary, larceny-theft, motor vehicle theft, and arson (GBI, 2020). While the data for *Total Crime* were extracted from

GeorgiaData, the Georgia Bureau of Investigation, Crime Information Center served as the original source. Second, the variable, *Rurality,* was measured by the proportion of each county's population residing in a rural area in 2010. In the 2010 Census, an urban area was defined as a settled core of census tracks or blocks that meet the minimum population density requirement of at least 2,500 residents. Rural areas are those census tracks or blocks with less than 2,500 residents. While the data for *Rurality* were extracted from GeorgiaData, the *U.S. Census Bureau, Percent Urban and Rural by State and County, 2010* served as the original source.

Data Analysis

The researcher entered, cleaned, and analyzed all data using Statistical Package for the Social Sciences (SPSS) v27. The study generated the following descriptive statistics: mean, median, standard deviation, minimum and maximum values to explain the data, identify outliers, data inconsistencies, and missing information. The descriptive statistics were utilized to guide the treatment of missing data and distribution of key variables data.

Next, the skewness and kurtosis were examined to measure asymmetry and the distribution of each continuous variable. A general guideline for skewness is that if the number is greater than +1 or less than -1, the distribution is substantially skewed to the left and right, respectively. If the skewness of a variable is greater than two, then the variable is considered asymmetrical about its mean (Westfall, 2014; Westfall & Henning, 2013). Kurtosis is a statistical measure used to describe the degree to which values of the data cluster in the tails or the peak of a frequency distribution (Westfall, 2014). A kurtosis greater than or equal to 3 is an indication that a variable's distribution is distinctly different than a normal distribution in its likelihood to produce outliers (Westfall & Henning, 2013). Bivariate Pearson Correlation tests and multiple linear regression were conducted to answer the research questions.

Research Questions 1 and 2(a)

Research Question 1 states: *"Is there a bivariate association between each social determinant of health and chlamydia among Georgia counties?*" Research Question 2(a) states*: "If an association exists, what is the strength and direction of the association?"* To answer Research Question 1 and Research Question 2(a), the researcher conducted a bivariate Pearson Correlation test. The bivariate Pearson Correlation test has been used by previous scholars to examine the marginal association among pairs of continuous variables (Gray, 2014). The bivariate Pearson Correlation test produced a correlation coefficient, ρ, that assesses the strength and direction of the linear relationship between each of the continuous independent variables and the dependent variable. Values ρ range from -1 to 1. The closer the ρ is to either -1 or 1, the greater the observed association between the social determinant of health variable and chlamydia among Georgia counties. A positive ρ signified that there is a positive relationship between the social determinant of health and chlamydia infection, while a negative ρ signifies that the association is negative. A ρ of close to 0 signified that there was no observed linear dependency between the social determinant of health and chlamydia infections among Georgia counties.

Research Questions 2(b) and 3

Research Question 2b states, "*If an association exists, when considering other social determinants of health, does the association remain?"* Research Question 3 states, "*Which social determinant of health exerts the most relative influence on chlamydia among Georgia counties?*" To answer Research Question 2(b) and Research Question 3, a multiple linear regression was conducted, as multiple linear regression is the most appropriate analysis technique to assess the predictive relationship between multiple continuous independent variables and a single continuous dependent variable. The resulting unstandardized coefficients signified how much the

dependent variable, chlamydia, varied with each one unit change in a social determinant of health variable when all other independent variables are held constant. A negative unstandardized coefficient indicated a negative directional relationship, while a positive unstandardized coefficient indicated a positive directional relationship. The standardized coefficient indicated the relative strength of each social determinant of health variable on the dependent variable. The standardized coefficient indicates how much the dependent variable increases, in standard deviations, when the dependent variable is increased by one standard deviation assuming other variables in the model are held constant. The higher the absolute value of the standardized coefficient, the stronger its effect. Standardized coefficients are calculated by subtracting the mean from the independent variable and dividing by its standard deviation.

Limitations

As previously discussed, this study aimed to investigate the association between social determinants of health and chlamydia among Georgia counties. The results of this study cannot be used to make any inferences regarding causation, as association does not imply causation. A statistical relationship between two variables does not mean that the social determinants of health caused chlamydia infections among Georgia counties. The observed relationship could be due solely to chance or some mystery variable.

Next, this study relied on secondary data analysis. Because data will be extracted from GeorgiaData, an electronic data repository, the researcher was unable to exert complete control over the data collection process, accuracy of data, or representativeness of the collected data. Further, because persons infected with chlamydia are largely asymptomatic, the reported county-level rates of chlamydia could widely likely underrepresent the actual number of new cases (Batteiger, 2017; CDC, 2018; Malhotra et al., 2013; Pinto et al., 2018; Tilson et al., 2004).

Additionally, the variables in the study were limited to the data contained in GeorgiaData. While previous scholars have sought to establish links between MSM and chlamydia, GeorgiaData lacks any specific county-level data regarding MSM (Abrara et al., 2016; Batteiger, 2017; Chow et al., 2016; Hoff et al., 2012; Jin et. al, 2010; Oster et. al, 2013; Rank & Yeruva, 2014; Woestenberg et al., 2020). While, the Healthy People 2030 Social Determinants of Health Conceptual Framework contained a proxy measure related to school policies that support health promotion and Tilson and colleagues investigated the relationship between adolescent participation in comprehensive sexuality curriculum and sexually transmitted diseases, GeorgiaData contained no measures related to the provision of comprehensive sexuality education programs in local school districts or any such public policies (Tilson et al., 2004). While the results of this study may be used to describe the association between social determinants of health and chlamydia among Georgia counties, the results of this study cannot be generalized to counties in all southern states or extrapolated to all counties in the United States. Lastly, the results of this study cannot be generalized to all sexually transmitted diseases and individual residents.

VCU IRB

Prior to data collection, the researcher submitted the study to the Virginia Commonwealth University Institutional Review Board (IRB) under the Exempt Review, as established by VCU and Department of Health and Human Services federal regulation (45 CFR 46). To qualify for an exemption, a study must fall entirely within at least one of the six categories for exemption and cannot place subjects at a greater than normal risk. This dissertation study met the requirements for "Category 4 – Secondary Data or Specimen Research That Does Not Require Consent". No consent was required, as the study contained no private

data and makes no attempt to identify individuals. All data were secondary and publicly accessible using Georgia's online data repository, GeorgiaData.

Summary

The purpose of this study was to examine the association between social determinants of health and chlamydia in Georgia. Chapter three provided a detailed description of the research methodology and procedures that will be used in the study. This chapter also described the population and discussed issues of confidentiality, as well as the minimal risks to human participants. Next, this chapter presented discussions of measurement and variables. Lastly, Chapter three explained the data analysis techniques and discussed limitation of the study. Chapter Four provides an in-depth discussion of the results from the bivariate and multivariate linear regression analyses.

Chapter 4: Results

Introduction

The purpose of this study was to examine the association between social determinants of health and chlamydia infections among Georgia counties. Results were based on the following research questions: 1) Is there a bivariate association between each social determinant of health and chlamydia among Georgia counties? 2) If an association exists, (a) what is the strength and direction of the association, and (b) when considering other social determinants of health, does the association remain? 3) Which social determinant of health exerts the most relative influence on chlamydia among Georgia counties? Chapter Four will detail the results of the analyses.

Univariate Analysis

The purpose of this study was to examine the association between social determinants of health and chlamydia infections in Georgia. As previously reported, data for all 159 counties in Georgia were collected and analyzed in the study. The descriptive statistics below in Table 5 summarize the central tendency and variance of the data included in the study.

Table 5

*Key Study Variables: Social Determinants of Health of Georgia's C*ounties *(n = 159)*

Variables	Mean	Median	SD	Skewness	Kurtosis	Minimum	Maximum
Chlamydia Rate[1]	471.25	445.65	214.49	0.55	-0.14	87.60	1105.30
Youth	19.36	18.98	2.93	1.59	5.43	13.30	34.30
Black, race	28.00	28.40	17.45	0.29	-0.56	0.80	72.10
Female, gender	50.80	51.18	2.13	-2.02	6.85	40.26	56.87
Below Poverty Level	20.35	20.80	6.72	0.13	0.19	5.60	41.10
Unemployment	4.39	4.20	0.88	0.77	0.42	3.00	7.70
Less than High School Ed	18.00	17.95	5.69	0.14	-0.22	5.20	32.43
Single Parent Household	9.90	9.74	2.92	0.35	-0.03	3.87	19.05
Percent Voting	62.76	63.03	4.85	0.09	0.27	49.49	76.05
Physician Rate[2]	112.92	82.30	101.02	1.27	1.08	0.00	460.62
Uninsured[3]	16.92	16.90	2.69	0.32	0.81	10.20	25.10
Rurality	60.70	65.06	28.32	-0.37	-0.69	0.25	100.00
Total Crime[4]	2347.16	2227.61	1198.51	0.66	0.46	0.00	6103.77

**Denotes the dependent variable.*

Demographics

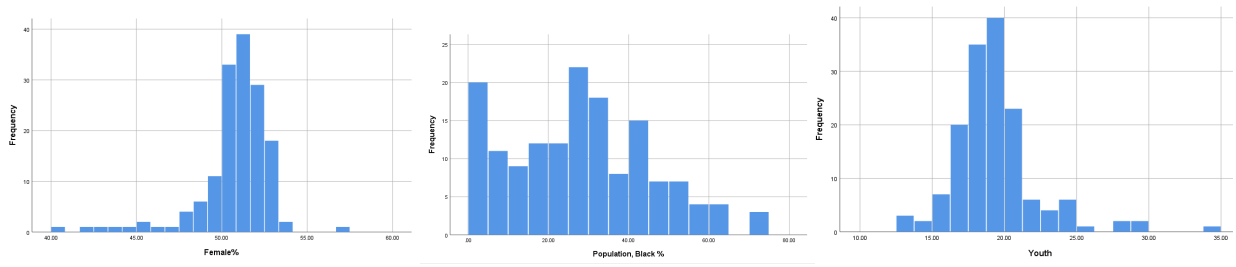
Figure 9 illustrates the distribution of the data for each demographic variable. First, the mean proportion of residents aged 15 to 29 years among the Georgia counties included in the study was 19.4%. Values ranged from 13.3 to 34.3 with higher values indicating a greater proportion of residents aged 15 to 29 years in the counties. As illustrated in Figure 9 and the

[1] The variable Chlamydia Rate was measured as a rate (the number of newly reported cases of chlamydia per 100,000 of each county's population), as reported to the Georgia Department of Health.
[2] The variable, Physician Rate, was measured as rate (the number of physicians per 100,000 of each county's population).
[3] The variable, Uninsured, was measured as a rate (number of uninsured or underinsured residents per 100,000 of each county's population).
[4] The variable, Total Crime, was measured as a rate (the number of Part 1 offenses reported to by local law enforcement per 100,000 of each county's population). Part 1 offenses includes the following eight serious offenses, as reported the Georgia Bureau of Investigation: murder and non-negligent manslaughter, forcible rape, robbery, aggravated assault, burglary, larceny-theft, motor vehicle theft, and arson.

corresponding skewness value of -2.02, the distribution of the dataset was skewed to the right. Second, the mean proportion of residents identified as African American, Black for the Georgia counties included in the study was 28.0%. Values ranged from 0.80 to 72.1, with greater values indicating a greater proportion of the county's population identified as African American, Black. As indicated by a kurtosis value of -0.56, the dataset for this variable was flatter and had thinner tails and lower and broader central peak, which compared to a normal distribution. Also, the skewness value of 0.29 indicated that the distribution was approximately symmetric Third, the mean percent of residents self-identifying as female was 50.8% among Georgia counties. Values for female, gender ranged from 40.26 to 56.87, with higher values indicating a greater percentage of the county's population identified as female. As indicated by a kurtosis value of 5.34, the dataset for this variable had heavier tails than a normal distribution, and the skewness value of 1.59 indicates that the distribution was slightly skewed to the left.

Figure 9

Histogram of Demographic Variables



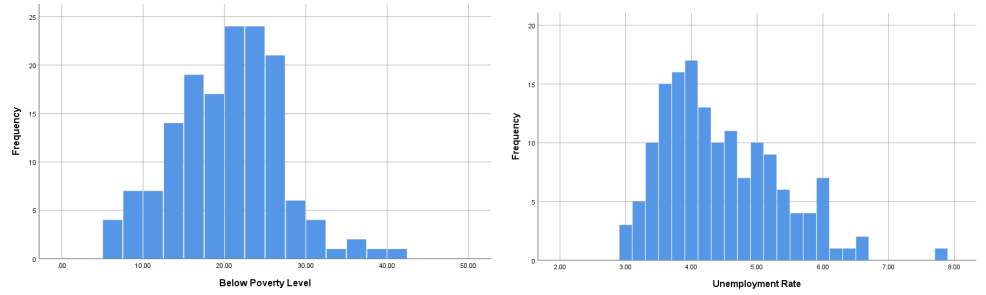
Economic Stability

The economic stability context was assessed using the following variables: poverty and unemployment. First, the mean proportion of residents living at or below the federally established poverty threshold among Georgia's counties was 20.35%. Figure 10 illustrates the distribution of the data for each measure of the Economic Stability context. Values ranged from

5.60 to 41.10, with the greater values representing a greater proportion of residents living at or below the poverty threshold. As indicated by a kurtosis value of 0.19, the dataset for this variable was flat and had thin tails, and the skewness value of 0.13 indicated that the distribution was approximately symmetric. Second, the mean rate of unemployed residents among Georgia counties was 4.39. Values for the dataset ranged from 3.00 to 7.70 with greater values representing a greater proportion of unemployed residents. As indicated by a kurtosis value of 0.42, the data for this variable had a shorter and thinner tail, with a lower and broader central peak than a normal distribution. Also, as indicated by a skewness value of 0.77, the distribution was lightly skewed to the right.

Figure 10

Histogram of Economic Stability Variables



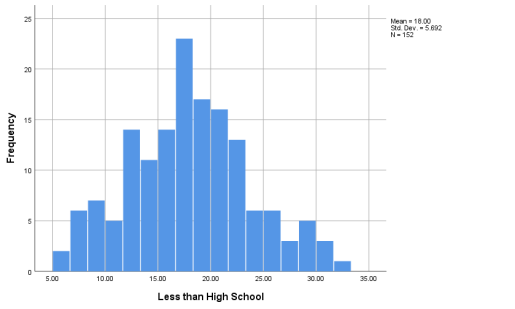
Education

The education context was assessed using the following variable: less than high school ed. As seen in Table 5, the mean residents over the age of 25 years of age with less than a high school diploma or its equivalency was 18.00%. Values ranged from 5.20 to 32.43, with greater values representing a greater proportion of the county's residents over 25 with less than a high school diploma. Figure 11 illustrates the distribution of the data for the variable. As indicated by a skewness value of 0.14, the dataset had a symmetrical distribution. As indicated by the kurtosis

value of -0.22, the dataset for this variable was flatter and had thinner tails, as well as a lower and broader central peak, which compared to a normal distribution.

Figure 11

Histogram of Education Variables



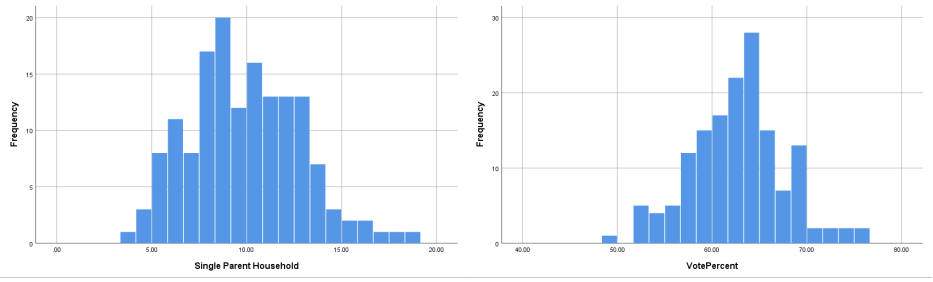
Social and Community Contexts

Social and community contexts were assessed using the following variables: single parent household and percent voting. As seen in Table 5, mean proportion of households headed by a single parent was 9.90% for Georgia counties. Values ranged from 3.87 to 19.05 with greater values representing a greater proportion of single parent headed households. The skewness value of 0.35 indicated the dataset is moderately skewed to the right, while the kurtosis value of -0.03 indicates the distribution of the data had tails that were shorter and thinner than those found in a normal distribution. Also, the central peak was lower and broader than that found on a normal distribution. See Figure 12. The mean proportion of registered voters that participated in the 2018 gubernational election was 62.76% among Georgia counties. Values ranged from 49.49 to 76.05 with greater values indicated a higher rate of voter participation. Also, the dataset's distribution appeared to be approximately symmetric, as indicated by a skewness value of 0.09. Like the single parent household variable, the kurtosis value of 0.27 indicates the distribution of

the voter proportion data had tails that are shorter and thinner than those found in a normal distribution. Also, the central peak is lower and broader than that found on a normal distribution.

Figure 12

Histogram of Social and Community Context Variables

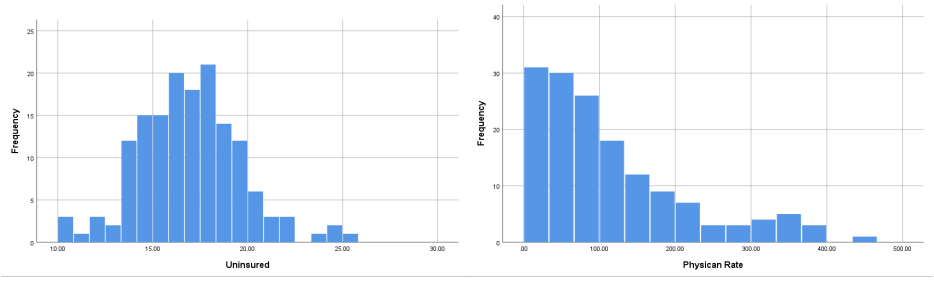


Health and Healthcare

The health and healthcare context was assessed using the following variables: uninsured and physician rate. As seen in Table 5, among Georgia counties, the mean proportion under 65 years and uninsured was 16.92%. Values ranged from 10.20 to 25.10 with higher values representing greater proportion of uninsured residents among the counties. The dataset's distribution appeared moderately skewed to the right as indicated by a skewness value of 0.32. The kurtosis value of 0.81 indicated the distribution of the data had tails that were shorter and thinner than those found in a normal distribution, as well as central peak that was lower and broader than that found in a normal distribution. The mean physician rate was 112.92 cases per 100,000 of the population. Values ranged from 0.00 to 6103.77 cases per 100,000 of the population among Georgia counties. The dataset's distribution appeared highly skewed to the right as indicated by a skewness value of 1.27. The kurtosis value of 1.08 indicated the distribution of the data had tails that were shorter and thinner than those found in a normal distribution, as well as central peak that was lower and broader than that found in a normal distribution.

Figure 13

Histogram of Health and Healthcare Variables

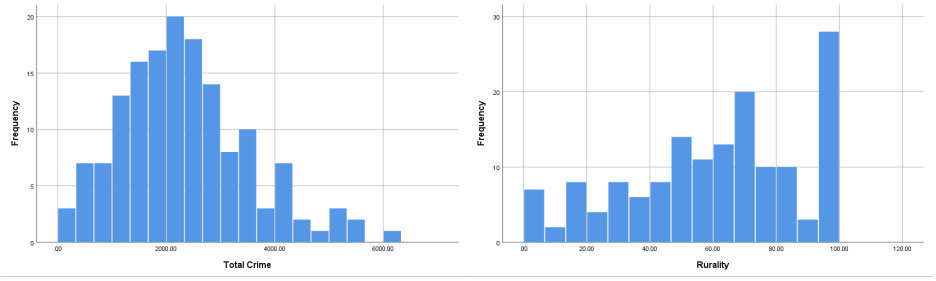


Neighborhood and Built Environment

Neighborhood and Built Environment was assessed using the following variables: crime and violence and rurality. As seen in Table 5, the mean total crime rate was 2347.16 per 100,000 of the population for Georgia counties. Values ranged from 0.00 to 6103.77 cases per 100,000 of the population among Georgia counties. The dataset's distribution appeared moderately skewed to the right as indicated by a skewness value of 0.66. The kurtosis value of 0.46 indicated the distribution of the data had tails that were shorter and thinner than those found in a normal distribution, as well as central peak that was lower and broader than that found in a normal distribution. See Figure 14 for a graphical illustration of the data's distribution. The mean proportion of residents residing in rural areas was 60.70% among Georgia counties included in the study. Values ranged from 0.25 to 100.00, with greater values representing a higher proportion of residents residing in a rural area among Georgia counties. Also, the dataset's distribution appeared to be approximately symmetric, as indicated by a skewness value of -0.37. Like the total crime rate, the kurtosis value of 0.46 indicates the distribution of the data had tails that are shorter and thinner than those found in a normal distribution. Also, the central peak is lower and broader than that found on a normal distribution.

Figure 14

Histogram of Neighborhood and Built Variables



Bivariate Tests

This section will describe the results of the bivariate tests conducted assess the association between chlamydia and each social determinant of health variable. Research Question 1 states: *"Is there a bivariate association between each social determinant of health and chlamydia among Georgia counties?*" Research Question 2(a) states*: "If an association exists, what is the strength and direction of the association?"* To answer Research Question 1 and Research Question 2(a), the researcher conducted a bivariate Pearson Correlation test. The Pearson Correlation test is the most appropriate analysis to assess the relationship between two continuous variables. Results of the bivariate testing provided indications of associations between social determinants of health and chlamydia.

The researcher was to create a scatterplot of the variables to check for linearity, as the Pearson Correlation coefficient cannot be calculated if the relationship between the two continuous variables is not linear. Once it was determined that was reasonable to assume the two variables had a linear relationship, the Pearson Correlation test was conducted. As shown in Figures 15-20, it was reasonable to assume that the relationship between chlamydia and each social determinant of health variable was linear. Thus, the assumption of linearity was satisfied.

Figure 15

Simple Scatterplot with Line of Fit, Demographic Variables, by Chlamydia

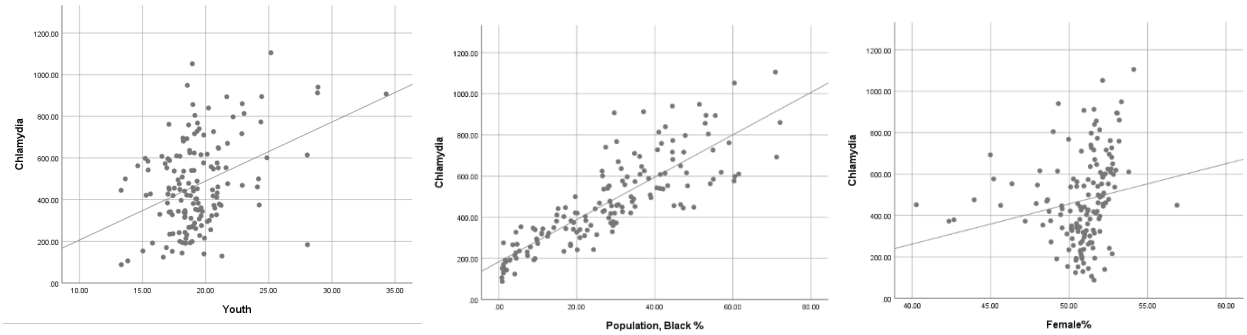


Figure 16

Simple Scatterplot with Line of Fit, Economic Stability Variables, by Chlamydia

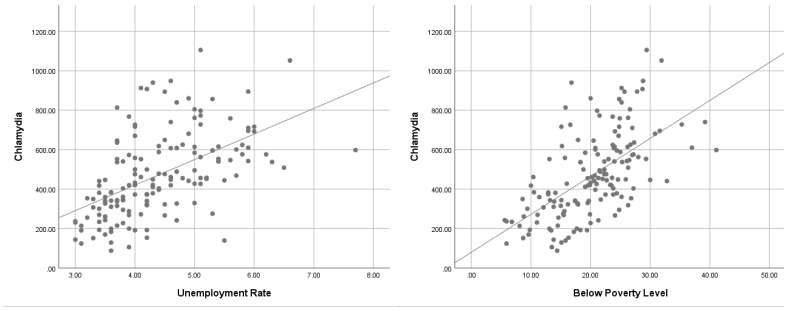


Figure 17

Simple Scatterplot with Line of Fit, Education Variable, by Chlamydia

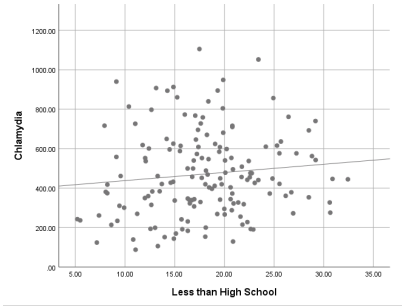


Figure 18

Simple Scatterplot with Line of Fit, Social and Community Context Variables, by Chlamydia

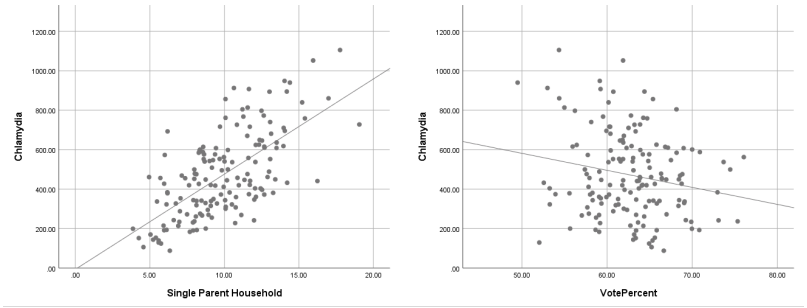


Figure 19

Simple Scatterplot with Line of Fit, Health and Healthcare Variables, by Chlamydia

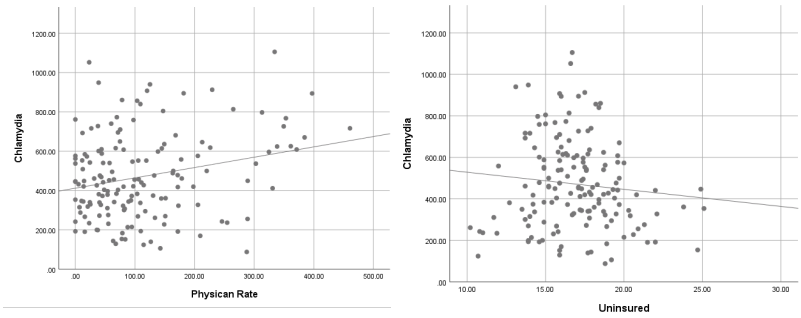
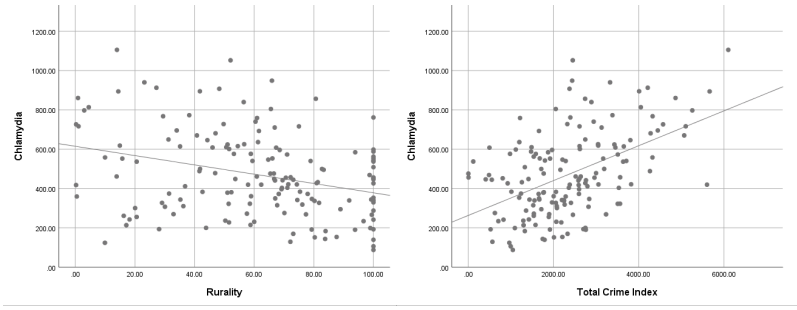


Figure 20

Simple Scatterplot with Line of Fit, Neighborhood and Built Environment Variables, by Chlamydia



The Pearson Correlation test produced a population association coefficient, ρ, which indicated (1) whether a linear relationship exists between each continuous social determinant of

health variable and the continuous dependent variable; (2) the strength of the linear relationship, which indicated how close the relationship is to being a perfectly straight line; (3) the direction of a linear relationship. Pearson Correlation coefficient, ρ, range from -1 to +1. Regarding the direction, a negative ρ signified a negative linear relationship between the social determinant of health variable and chlamydia. As the social determinant of health variable decreased, the dependent variable tended to decrease. A ρ of 0 signified that no relationship exists between the variables. A positive ρ signified a positive linear relationship between the variables. As the social determinant of health variable increased, the chlamydia tended to increase. Regarding strength of the relationship between the social determinant variable and chlamydia infections, a ρ between .1 and .3 indicate a weak association, while an *r* of .3 to .5 indicated a moderate association. A ρ greater than .5 indicated a strong association. Pearson Correlation statistics (ρ) of the bivariate tests gauging the association between each social determinant of health variable and chlamydia by can be found in Table 6.

Table 6

Bivariate Pearson Correlation Test Results

Variable	ρ	*P*
Youth	0.40	0.00
Black, race	0.81	0.00
Female, gender	0.08	0.15
Below poverty level	0.58	0.00
Unemployment	0.48	0.00
Less than high school	0.28	0.18
Single parent household	0.64	0.00
Percent Voting	-0.25	0.00
Uninsured	0.33	0.00
Physician rate	-0.12	0.07
Rurality	-0.34	0.00
Total Crime	0.47	0.00

Note: This study included no sample of counties, but rather data were collected for all Georgia counties (n = 159). Interpretations of *p* are not necessary.

Demographics

Pearson Correlation tests assessed the bivariate association between chlamydia and the following demographic variables: gender, female, race, and youth. First, it was found that there was a moderate positive association between the proportion of a county's population between the ages of 15 and 29 years old and chlamydia rate ($\rho = 0.40$). Second, a strong positive association between the proportion of a county's population self-identifying as Black, African American and the chlamydia was found among Georgia counties (ρ=*-0*.81). Third, a bivariate Pearson Correlation test produced a very weak association between the proportion of a county's population self-identifying as female and chlamydia among Georgia counties ($\rho = 0.08$).

Economic Stability

Pearson Correlation tests were conducted to assess the bivariate associations between chlamydia and the following measures of the economic stability context: below poverty level and unemployment. First, a bivariate Pearson Correlation test found that there was a strong, positive association between the proportion of residents at or below the poverty level and chlamydia among Georgia's counties ($\rho = 0.58$). Next, the bivariate Pearson Correlation found a strong a moderate, but positive association between the unemployment rate and chlamydia among Georgia's counties ($\rho = 0.48$).

Education

A Pearson Correlation test was conducted to assess the bivariate association between chlamydia and the education measure. The Pearson Correlation test found a weak, but positive association between the proportion of residents over the age of 25 years with less than a high school diploma or its equivalency and chlamydia ($\rho = 0.28$)

Health and Healthcare

Pearson Correlation tests were conducted to assess the bivariate associations between chlamydia and the following health and healthcare variables: physician rate and uninsured. First, the Pearson Correlation test indicated a moderate, but weak, but negative association between the number of physicians per 100,000 of the population and chlamydia among Georgia counties ($\rho = -0.12$). Second, the bivariate test indicated a moderate positive association between the proportion of the population under the age of 65 without some form of health insurance coverage and chlamydia among Georgia counties ($\rho = 0.33$).

Social and Community Contexts

Pearson Correlation tests assessed the bivariate associations between chlamydia and the following social and community contexts variables: single parent households and percent voting.

It was found that there was a strong positive association between the proportion of single parent headed households and chlamydia among Georgia counties (ρ = 0.64). It was found that there was a weak, but negative association between the proportion of registered voters participating in the 2018 gubernational race and chlamydia among Georgia counties (ρ = -0.25).

Neighborhood and Built Environment

Pearson Correlation tests were conducted to assess the bivariate associations between chlamydia and the following neighborhood and built environment variables: rurality and total crime. First, a moderate, but negative association was found to exist between the proportion of residents residing in a rural area and chlamydia among Georgia counties (ρ = -0.34). Next, a moderate, but positive association was found to exist between the total crime index rate and chlamydia among Georgia counties (ρ = .47).

When interpreting the results of the bivariate tests, it is important to acknowledge the challenges presented due to level of measurement, linearity, and causation. A Pearson Correlation coefficient cannot be used to address non-linear relationships or those relationships among categorical variables. Also, it is important to note that the results of the bivariate test cannot be used to support any inferences regarding causation, as the observed correlations do not equal causation. Lastly, it is important to note that the results only apply to the 159 Georgia counties. The results may not be extrapolated to other counties, states, or time periods. While the test statistics and p-value are provided in Table 6, no effort was made to enlist a test of significance or interpret the resulting test statistics and p-values, as the study included all 159 counties in the analyses.

Multiple Linear Regression

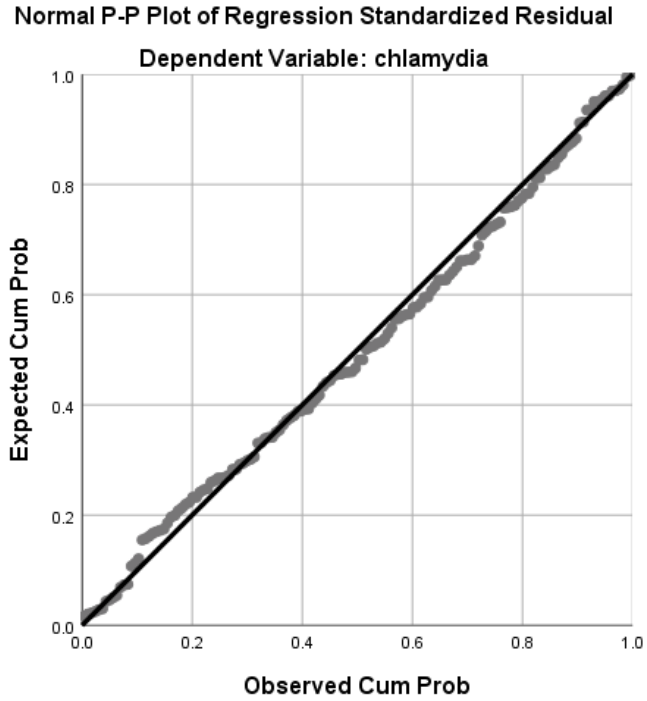
After the bivariate associations were reviewed, female, gender had a negligible association with chlamydia infections (ρ = .08). This variable was excluded from the multivariate linear regression analysis. Eleven bivariate correlates emerged and the corresponding variables were included in the multivariate linear regression: *youth* (proportion of population 15-29 years of age), *Black, race* (proportion self-identified as Black, African American), *below poverty level* (proportion at or below poverty threshold), *unemployment* (unemployment rate), *uninsured (*proportion of population under 65 and uninsured), *physician rate* (physician rate), *single parent households* (proportion of single-parent households), *proportion voting* (proportion of registered voters voting in gubernational race in 2018), *rurality* (proportion of population residing in a rural area), *total crime* (total crime index rate).

Prior to interpreting the results of the multivariate linear regression analysis, the researcher verified that the variables satisfied the assumptions of multiple regression, including linear relationship, identification of outliers, normal distribution of residuals, independence of residuals, homoscedasticity, and multicollinearity. First, the relationship between the independent variables and the dependent variable, *chlamydia*, must be linear. The researcher confirmed a linear relationship by viewing scatter plots of each independent variable and the dependent variable, as noted in the previous section on bivariate analyses. Second, special attention was allocated to checking for outliers, as linear regression is sensitive to the effects of outliers. (Lund & Lund, 2020; Piedmont, 2014; Westfall, 2013).

Third, as shown in Figure 21, the residuals of the regression line were normally distributed.

Figure 21

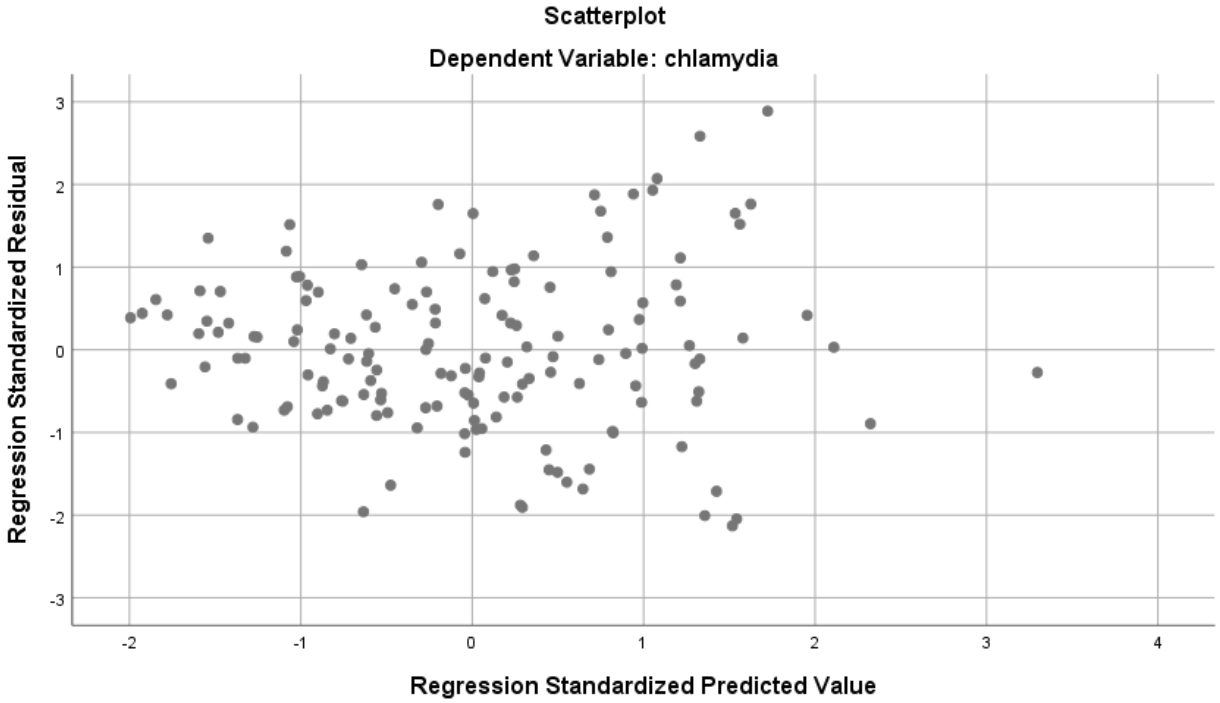
P-P Plot: Residuals of the Regression Line



Fourth, the researcher verified that the residuals of the regression line are independent. Fifth, the researcher checked for homoscedasticity to ensure the residuals did not vary systematically with the predicted values by plotting the results against the values predicted by the regression model. As shown in Figure 22, the scatterplot of the residuals did not have an obvious pattern, and the data were homoscedastic.

Figure 22

Scatterplot of the Residuals



Additionally, the linear regression assumed there was minimal multicollinearity (Lund & Lund, 2020). Multicollinearity occurs when there are high correlations between two or more independent variables. To assess multicollinearity, the Variance Inflation Factors (VIF) were reviewed (Lund & Lund, 2020). The VIF is equal to the ratio of the overall model variance to the variance of a model that does not include only that single independent variable (Lund & Lund, 2020; Westfall, 2013). If the VIF is greater than five but less than or equal to 10, multicollinearity may be a factor, and if the VIF is greater than 10, multicollinearity among the variables exists. If there is high multicollinearity among variables, the variables may be combined or excluded from analysis (Lund & Lund, 2020). In the study, VIF values ranged from 1.483 (*age*) to 3.262 (*poverty*). Multicollinearity was not an issue.

Unstandardized coefficients indicate how much the dependent variable varies with each independent variable when all other independent variables are held constant. The unstandardized beta coefficient, *B* or slope of the regression, is the degree of change in the dependent variable for every one-unit of change in the independent variable (Lund & Lund, 2020). In the study, the *B* for each social determinant of health variable was the degree of change in chlamydia caused by a one-unit change in the social determinant of health variable (Lund & Lund, 2020; Piedmont, 2014; Westfall, 2013). The standardized coefficients, β or beta weights, were used to rank the influence of the social determinant of health variables. When ranked, the most influential variables had the higher absolute value and exerted the most relative influence over changes in the chlamydia rate. Table 6 contains the unstandardized coefficient (*B*) and standardized coefficients (β) for the multiple linear regression.

Table 7

Coefficients for Multiple Linear Regression

Variable	Unstandardized Coefficient *B*	SE	Standardized Coefficient β	*t*	VIF	*p*
Constant	-208.90	160.76		-1.3		
Youth	14.95	2.78	0.20	5.38	1.48	0.00
Black, race	7.22	0.63	0.59	11.49	2.68	0.00
Below poverty level	6.52	1.8	0.21	3.62	3.26	0.00
Less than high school	1.04	2.00	0.03	0.52	2.97	0.60
Unemployment	-1.64	11.48	-0.01	-0.14	2.27	0.89
Physician rate	-5.35	3.10	-0.07	-1.73	1.55	0.09
Uninsured	0.19	0.09	0.09	2.24	1.71	0.03
Single parent household	10.08	3.30	0.14	3.05	2.08	0.00
Percent voting	-1.07	1.73	-0.02	-0.62	1.57	0.54
Rurality	0.62	0.42	0.08	1.48	3.12	0.14
Total crime	0.03	0.01	0.15	3.37	1.94	0.00

Note: This study included no sample, but rather data were collected for all counties in Georgia (n = 159). Interpretations of *p* are not necessary.

Demographics

It was found that each percentage point increase in the proportion of a county's population between 15 and 29 years of age is associated with a nearly 15 cases per 100,000 increase in the chlamydia rate among Georgia counties, when adjusting for other social determinant of health variables. Next, a one percentage point increase in the proportion of a county's population identified as African American, Black is associated with slightly more than 7 per 100,000 more cases of chlamydia infections when adjusting for other social determinants of health.

Economic Stability

It was found that each percentage point increase in the proportion of residents below the poverty threshold was associated with a 6.52 cases per 100,000 increase in the rate of chlamydia infections when adjusting for other social determinants of health. Next, it was found that each percentage point increase in the proportion of residents unemployed was associated with a 1.64 cases per 100,000 decrease in the rate of chlamydia infections when adjusting form other social determinants of health.

Education

It was found that a one percentage point increase in the proportion of residents above 25 years of age and without at least a high school diploma or its equivalency was associated with a 1.04 cases per 100,000 increase in the rate of chlamydia infections when adjusting for other social determinants of health.

Social and Community Contexts

Each percentage point increase in the percent of a county's registered voters participating in the gubernational race was associated with 1.07 per 1000,000 less cases of chlamydia infections when adjusting for other social determinants of health. Also, it was found that each percentage point increase in the proportion of households classified as single parent headed was associated with a 10.08 per 100,000 increase in cases of chlamydia infections.

Health and Healthcare

It was found that each one-unit increase in the number of physicians per 100,000 was associated with a 5.53 per 100,000 decrease in chlamydia cases when adjusting for other social determinants of health. Also, each percentage point increase in the proportion of residents under 65 and uninsured was associated with a 0.19 cases per 100,000 increase in chlamydia infections when adjusting for other social determinants of health.

Neighborhood and Built Environment

A one case per 100,000 increase in a county's total crime index was associated with a less than one case per 100,000 increase in chlamydia infections when adjusted for other social determinants of health. Each percentage point increase in the proportion of a county's population residing in a rural area was found to be associated with a nearly one case per 100,000 increase in chlamydia infections when adjusting for other social determinants of health.

Standardized coefficients are the partial coefficients that indicate the relative strength of the relationship between an independent variable and the dependent variable while controlling for the presence of all other independent variables (Lund & Lund, 2020; Piedmont, 2014, Westfall, 2013). While standardized coefficients may be positive or negative, their absolute values typically range from 0 to 1 (Piedmont, 2014). When the absolute value of each independent variable is ordered from least to greatest, the independent variable with an absolute value closest to 1 exerts the greatest relative influence on the dependent variable (Lund & Lund, 2020; Piedmont, 2014, Westfall, 2013). In the study, the social determinants of health with the largest absolute standardized coefficient value exerts the most influence on the chlamydia rate among Georgia counties. As shown in Table 7, the order of the social determinants of health, in terms of significance includes, *Black, race* (β = .59), *youth* (β = .20), *below poverty level* (β = .21), *total crime* (β = .15), *single parent household* (β = .14), *physician rate* (β = .09), *rurality* (β = .08), *uninsured* (β = -.07), *less than high school* (β = .03) *percent voting* (β = -.02) and *unemployed* (β = -.01). Among the predictor variables included in the study, the three most influential social determinants of health were the proportion of residents self-identified as Black, African American, proportion between 15 and 29 years of age, and proportion below the poverty level.

Another benefit of generating a multiple linear regression lies in the Model Summary output. The R-Square value of the regression represents the fraction of the variation in the dependent variable, *chlamydia*, explained by the social determinants of health included in the final regression. Based on an r-squared value of .868, the social determinants of health included the multiple linear regression model, explain 86.8% of the variance in the chlamydia infections.

Lastly, linear regression may be used to produce an equation that can predict a dependent variable using one or more independent variables in the form of the equation below.

$$y = 14.95x_{youth} + 7.22x_{Black,race} + 6.52x_{below\ poverty\ level} + 1.04x_{less\ than\ hgih\ school} - 1.64x_{unemployment} - 5.35x_{physican\ rat} + 0.19x_{uninsured} + 10.08x_{parent\ household} - 1.07x_{vote} + 0.62x_{rurality} + .03x_{total\ crime} - 208.9$$

This equation may be used by policymakers and practitioners in Georgia to identify levels of each independent variable needed to obtain a target estimated chlamydia rate among Georgia counties.

Lastly, while statistical inference, such as hypothesis testing and interpretations of *p values*, draws conclusions about a desired population from on a sample extracted from the population, this study included all 159 counties in Georgia and did not include a sample of counties. There is no need to make inferences or generalizations from a sample about the counties, considering all 159 counties were included in the study.

Summary

The purpose this study was to examine the association between social determinants of health and chlamydia in Georgia. The study's multivariate analysis found the following social determinants were positive predictors of chlamydia: proportion of residents identifying as Black, African American, proportion of residents between 15 and 29 years of age, proportion of residents proportion of residents below the poverty threshold, proportion of residents with less

than a high school diploma or equivalency, physician rate, proportion of single parent households, proportion of residents residing in rural area, and total crime index. Additionally, the study found the following social determinants were negative predictors of chlamydia: proportion unemployed, proportion under 65 years of age and uninsured, and proportion of registered voters participating in the gubernational election. The three most influential social determinants were proportion identifying as Black, African American, between 15 and 29 years of age, and below the poverty level.

Chapter 5: Discussion

Introduction

The purpose of this correlational research study was to examine the associations between multiple social determinants of health and chlamydia infections among Georgia counties using secondary data extracted from the online data repository, GeorgiaData. The study had an ecological focus, as the researcher extracted and analyzed group level data for all 159 counties in Georgia to answer the following research questions:

1) Is there a bivariate association between each social determinant of health and chlamydia among Georgia counties?
2) If an association exists, (a) what is the strength and direction of the association, and (b) when considering other social determinants of health, does the association remain?
3) Which social determinant of health exerts the most relative influence on chlamydia among Georgia counties?

In the analyses, positive associations were found between chlamydia and each of the following social determinants of health: proportion Black, African American, proportion between 15 and 29 years of age, proportion below the poverty threshold, proportion with less than a high school diploma or equivalency, physician rate, proportion of single parent households, proportion residing in rural area, and total crime rate. Negative associations were found between chlamydia infections and each of the following social determinants of health: unemployment rate, proportion under 65 years of age and uninsured, and percent voting.

This chapter contains five objectives. First, chapter five situates the findings of the study within the context of the Healthy People 2030 Social Determinants of Health Conceptual

Framework. Using the Healthy People 2030 Social Determinants of Health Conceptual Framework as a guide, special attention will be paid to the ways the social determinants analyzed in the study may impact health seeking behaviors and exposure to risk factors related to chlamydia infections among Georgia counties. Second, the chapter will compare the findings of this dissertation study with those found in the relevant literature. Specific attention will be focused on identifying similarities, as well as possible explanations for observed differences. Third, the chapter will situate the results of the study within the levels of the Social Ecological Model of Public Health. Specific attention will be paid to examining the theory's usefulness in centering chlamydia infection and promoting prevention interventions that simultaneously address multiple levels of influence. Fourth, this chapter will discuss the study's implications for future policy, practice, and research. Lastly, this chapter will present a discussion of this study's limitations.

Summary of Findings Within the Context of Healthy People 2030

This study moved the discourse beyond the individual and into the realm of the environment. Individual sexual behaviors such as condom use, substance use, and early onset sexual activity are associated with risks of chlamydia infections, as well as other sexually transmitted infections. Nevertheless, studies have found that these behaviors do not exist in a vacuum and cannot wholly account for infections, but rather, social determinants of health have been shown to be key factors in shaping the dynamics of sexually transmitted infections and prevention by impacting access and exposure to resources in homes, neighborhoods, and schools (CDC, 2018; Hogben & Leichliter, 2008). These determinants impact not only the choices populations make regarding sexually transmitted infections, such as participating in diagnostic testing, expedited partner therapy, and condom use, but the opportunities to make those choices.

The findings of this study underscore the importance of understanding and examining the association between social determinants and chlamydia infections among Georgia counties.

Healthy People 2030 Social Determinants of Health Conceptual Framework was used as the guiding framework for operationalizing the social determinant of health variables and better understanding the mechanisms by which these determinants have been found to impact population and sexual health related outcomes. This section will review the results of the bivariate and multivariate associations within the context of the social determinant of health domains; provide a comparison of the observed associations to those discussed in the relevant literature; and possible justifications for the observed associations between the determinants and chlamydia infections among Georgia counties.

Demographics

The bivariate analysis found a positive, but quite negligent association ($\rho = 0.08$) between proportion of residents identifying as female and chlamydia infections among Georgia's counties. The positive association was aligned with the findings of previous scholars (CDC, 2018; Sales et al., 2012). Berman & Hein, 1999; Milbank, 2002; Nguyet et al., 1994). The results of this study highlight assertions that gender may influence population health outcomes and sexually transmitted infections, as Beydoun and colleagues found that that female respondents had a higher chlamydia infection rate than males (Beydoun, 2010). Further, higher rates of chlamydia infection among Georgia counties with higher proportions to female residents may be indicative of females having higher biological risks for sexually transmitted infection. The CDC noted that the lining of the vagina is thinner and more delicate than the skin on a penis, making it easier for bacteria and viruses to penetrate (CDC, 2019). Further, studies have found that women are less likely to experience symptoms of chlamydia (Beydoun et al., 2010; Milbank, 2002;

Nguyet et al., 1994; Navarro et al., 2020). Next, this study found that the proportion of residents between 15 and 29 years of age was positively correlated ($\rho = 0.40$) with chlamydia infections. As the proportion of residents between 15 and 29 years of age increases, chlamydia infections generally increase among Georgia counties. Higher rates of chlamydia infection among Georgia counties with higher proportions of young residents may be indicative of youth populations being less able to appropriately utilize contraceptives, communicate effectively about sexuality, and acknowledge the risks associated with sexual behavior (Navarro et al., 2002; Sales et al., 2012). Further, the results of this study may underscore the relevance of studies that found that younger persons were more sexually impulsive and eager to engage in sexual relationships with multiple partners, both of which have been found to be risk factors for chlamydia infection (Sales et al., 2012; Santelli et al., 1998). The observed positive correlations observed in the study may also highlight the possible impact of utilization of preventative and diagnostic services and biological vulnerabilities among youth. Studies have found that adolescents and young adults who are covered by their parent's health insurance may be more reluctant to disclose their sexual behaviors to medical professionals and have a decreased likelihood of receiving diagnostic screenings and treatment for chlamydia infections (Dembo et al., 2010; Keller, 2020). Also, higher rates of chlamydia may be reflective of the susceptivity young females have to infections, due to the cellular composition of their cervixes.

Next, the study found that the proportion of residents self-identifying as African American, Black and was positively correlated ($\rho = 0.81$) with chlamydia infections. As the proportion of African American, Black residents increase, chlamydia infections generally increase among Georgia counties. When considering the other social determinants of health, the association remained. The observed correlations were similar to the results found by other

scholars, who found that areas with higher proportions of racial minority populations were linked to higher rates of mortality, HIV, chlamydia, and gonorrhea (Brester, 1994; Dembo et al., 2010; Driscoll et al., 2005).

Higher rates of chlamydia among counties with higher proportions of African Americans may be indicative of the economic disadvantage, inequalities in education, lack of access to preventative healthcare and insurance, employment instability, and housing instability more likely to be experienced by racial minorities (Adimora et al., 2014; CDC, 2018; Dembo et al., 2010; Sullivan et al., 2014). The results of the study underscore the possible impact of institutional racism and stigmatization experienced by African Americans on creating barriers to preventative sexual health and treatment services (Morris et al., 2014). Further, it has been found that African American men are particularly more likely to report higher levels of stigma related to discussing infections with health providers and partners (Adimora et al., 2014; CDC, 2018; Dembo et al., 2010; Sullivan et al., 2014). Studies have found that African Americans are less likely than White residents to visit a health care provider at least annually and are less likely to have a primary care physician (Morris et al., 2014, Sullivan et al., 2014). The results of this study also underscore the relevance of Pflieger and colleagues, who found that the network of sexual partners in African American communities is particularly limited by the smaller male to female ratios (Pflieger, Cook, Niccolai, & Connell, 2013). As the pool of available sexual partners becomes more restricted, residents become more closely connected to one another, and are more likely to engage in sexual intercourse (Pflieger et al., 2013). This may increase the risk of exposure to chlamydia infections among African American communities (Pflieger et al., 2013).

Economic Stability

Economic stability allows populations to access essential resources, including financial opportunities, quality housing and food, preventative health services, and medical treatment. The study found that the proportion of residents at or below the poverty threshold was positively correlated with chlamydia infections ($\rho = 0.58$) among Georgia counties. As the percent of impoverished residents increases, chlamydia infections generally increase. When considering other social determinants of health, the association remained. The observed correlations between poverty and chlamydia infections were similar to the results found by previous scholars (Annang et al., 2010; Datta et al., 2007; Hurling et al., 2014; Krieger et al., 2003; Santelli et al., 2000; Springer et al., 2010). The results of this study highlight assertions that poverty can have profound effects on population health outcomes and chlamydia infections, as Gonzalez and colleagues found that factors such as poverty and heightened economic inequality made it more difficult for people to stay sexually healthy (Gonzalez, 2008). Further, the higher rates of chlamydia infection among Georgia counties with higher poverty may be indicative of later initial diagnosis of chlamydia infections, delays in treatment, or gaps in the quality of medical care residents receive, as it has been found that populations residing in high poverty jurisdictions are less likely to have access to adequate preventative medical services (Harling et al., 2014). Additionally, the results of this study underscore the relevance of Springer and colleagues (2018), who found that populations residing in impoverished neighborhoods have a higher risk pool of sexual partners from which to choose. Those residents from Georgia counties with higher poverty rates have an increased probability of sexual contact with an infected sexual partner. This may be further exacerbated the low rates of contraception use found among poorer populations, due to a lack of financial resources (Fenton et al., 2001; Salisburg et al., 2005; Santelli, 2000). Impoverished communities in Georgia may also have limited access to

information that could potentially reduce infections, such as neighborhood campaigns to educate residents on preventative measures and the importance of diagnostic services, as well as partner notification resources. Okingbo and colleagues stated, "because higher socioeconomic status often correlates with better knowledge of health and public affairs, and greater access to public facilities, people who are at the lower end of the social scales often get trapped in vicious circles of ignorance, poverty, and inaction" (Okingbo et al., 2002).

Next, the study found that the proportion of adults under the age of 65 years and unemployed had a moderately positive association ($\rho = 0.48$) with chlamydia infections among Georgia counties. When considering other social determinants of health, the association between unemployment and chlamydia infections was negative. The results of the multivariate analyses were not aligned with previous studies, as these studies found a positive association between measures of unemployment and poorer health outcomes such as chlamydia infections, even in the presence of other social determinants of health (Barry et al., 2000; Corcoran et al., 2000; Fenton et al., 2001; Haring et al., 2013; Salisburg et al., 2005; Santelli, 2000).

Differences in results may be attributed to variances in the data collection methods and measurement of variables. The reviewed articles were longitudinal and examined data collected from individuals dispersed throughout the United States, while this study was ecological and focused on counties within one state (Annang et al., 2010; Barry et al., 2000). In the reviewed studies, measures of unemployment, underemployment, and employment were collected using self-reports of individuals or reports from their children, while this study collected aggregate proportions of unemployment, measured at the county-level using a secondary data source (Barry et al., 2000; Corcoran et al., 2000; Fenton et al., 2001; Haring et al., 2013; Salisburg et al., 2005; Santelli, 2000). Further, this study's measure of unemployment considered residents under

65 years of age, while the reviewed articles collected employment measures for high school youth, college students, and those between 20 and 39 years of age (Annang et al., 2010; Beydoun et al., 2010). The disparities require future exploration into the use of consistent measures.

Education

Educational attainment allows populations access to upward mobility, which afford them greater financial resources and opportunities to access quality healthcare, as well as safer living and work environments and the information need to make informed decisions about their health. The proportion of adults with less than a high school diploma was found to have a positive association (ρ =0.28*)* with chlamydia infections among Georgia counties. As the proportion of adults with less than a high school diploma increases, chlamydia infections general increase among Georgia counties. When adjusting for other social determinants of health, the direction of the association did not change. The results were similar to those found by previous scholars in the sense that less educational attainment was associated with poorer health outcomes, and more specifically chlamydia infections (Alder, Boyce, & Chesney, 1994; Anderson & Armstead, 1995; Hurling et al., 2014; Krieger et al., 2003; Springer et al., 2010).

There are several pathways by which educational attainment may be linked with chlamydia infections in Georgia. Educational attainment is not singularly about information learned in the classroom, but it unlocks doors to exposure to chlamydia and well-being. Bartley and Plewis found that jurisdictions with less educated populations were more likely to experience higher rates of unemployment, which has been found to be associated with worse health and higher morality due to poor nutrition and preventive measures and dangerous living conditions (Bartley & Plewis, 2002). Subsequently, those census tracks and jurisdictions with lower proportions of residents obtaining at least a high school diploma are more likely to be

plagued by less investment in infrastructure, transportation, and healthcare services (Bartley & Plewis, 2002). Additionally, the results of this dissertation study underscore the notion that lower educational attainment can lead to barriers in health seeking behaviors, as less educated individuals have reduced access to informed decision making for themselves and their families and preventative resources. For instance, Anang and colleagues (2010) found that lower levels of educational attainment were associated with lower occupational wages and knowledge of health seeking behaviors, as well as access to diagnostic testing, treatment, and contraceptives.

Lower education may also negatively impact chlamydia infections among Georgia counties by influencing social and physiological factors such as less perceived personal control over sexual behaviors among residents, which has been linked with worsening health seeking behaviors, social support, and physical and mental health among populations (Shankar et al., 2013). The findings from this study coupled with the relevant literature underscore the importance of increasing the proportion of residents graduating from high school. McGill stated, "Education is one of the single most important modifiable social determinants of health" (McGill, 2016).

Health and Healthcare

Access to health and healthcare resources allows populations access to regular sources of care of diagnostic, preventative and treatment services that promote population well-being. This study found a positive association ($\rho = 0.33$) between chlamydia infections and the proportion of residents under 65 years of age and uninsured among Georgia counties. When adjusting for the effects of other social determinants of health, the direction of the association remained the same. As the proportion of residents under 65 years of age and uninsured increases, chlamydia infections generally increase, which is aligned with the findings of previous scholars (CDC,

2018, Denison et al., 2017; Kavilanz, 2011; Mugavero et al., 2011; Tilson et al., 2004). Kavilanz, as well as Mugavero and colleagues found that uninsured populations generally experience poorer health outcomes, when compared to those residing in areas with higher rates of insured populations (Kavilanz, 2011; Mugavero, Norton, & Saag; 2011).

Higher rates of uninsured residents may be associated with higher chlamydia infections in Georgia due to the role a lack of health insurance plays on access to medical and health services. Studies found that uninsured persons are less likely to receive preventative medical services and have access to a primary health care provider (Ayanian, Weissman, Schneider, Ginsburg, & Zaslavsky, 2000; Denson et al., 2017; Majerol, Newkirk, & Garfield, 2015). Because most chlamydia infections are asymptomatic, access to routine diagnostic testing is vital to preventing increased infections and disparities. Call and colleagues stated, "Inadequate health coverage is one of the largest barriers to health care access, and the unequal distribution of coverage contributes to health disparities" (Call et al., 2014). The observed association between the proportion of uninsured residents and chlamydia infections may be indicative of the financial barriers experienced when attempting to obtain preventative, treatment, and diagnostic reproductive health services that are presented by a lack of insurance. Studies found that uninsured adults were 4-5 times more likely than those who had private coverage and nearly 3 times more likely than those who had Medicaid to report difficulty in obtaining medical care and prescription access (NCHS, 2015; Kielb et al., 2017).

Next, this study found a negative association ($\rho = -0.12$) between chlamydia infections and the number of physicians per 100,000 residents among Georgia counties. When considering other social determinants of health, the negative association remained. As the number of physicians per 100,000 residents increased, chlamydia infections generally decreased among

Georgia counties. The observed associations between chlamydia infections and physician rate among Georgia counties were similar to those found by other scholars (Denison et al., 2017; Haley et al., 2018; Kavilanz, 2011; Starfield, Shui, & Macinko, 2005; Tilson et al., 2004). The results of this study indicate that the supply of physicians may have profound effects on population health and chlamydia infections, as Starfield and colleagues found that areas with higher ratios of primary care physicians to population had better health outcomes including lower rates of all causes of mortality and in increase in lifespan (Starfield et al., 2005).

Further, lower rates of chlamydia infection among counties with higher physician rates may be indicative of the fact that primary care physicians offer a source of early detection and treatment of diseases before they become widespread. Studies have found that patients with a usual source of primary care are more likely to receive the recommended preventive services such as flu shots, blood pressure screenings, and diagnostic testing for sexually transmitted infections (Freidberg, Hussey, & Schneider, 2010; Xu, 2002). Access to diagnostic testing is particularly important as most chlamydia infections are asymptomatic. For instance, evidence suggests that early screening is one of the most beneficial interventions for the prevention or early detection of chlamydia, as well as gonorrhea, syphilis, and hepatitis B outbreaks (Starfield, Shui, & Macinko, 2005). The results of this study coupled with the results of the relevant literature underscore the importance of removing barriers to accessing health and healthcare services by increasing access to health insurance and the supply of physicians.

Social and Community Contexts

Social and community contexts are the connections between members of a population such as family, friends, colleagues, and community members. These connections have major impacts on feelings of support, neighborhood safety, discrimination, and access to health seeking

opportunities. This study assessed the association between chlamydia infections and the following measures of social and community contexts: family structure and social cohesion. The study found that the proportion of single parent headed household was positively correlated (ρ =0.64*)* with chlamydia infections among Georgia counties. As the percent of single parent headed households increased, the chlamydia infections generally increased. When considering other social determinants of health, the association remained. The observed associations between single parent households and chlamydia infections were similar to those reported by previous scholars (Bettinger et al., 2004; Kilmarx et al., 1997; Robertson et al., 2005). The results of this study highlight assertions that the households in which populations live have profound effect on population health outcomes, as previous scholars found that children in single-parent households were less likely than those living with two parents to have a regular source of medical care or see a physician and have higher rates of morbidity. The results of this study underscore the potential impact of the parent-child dynamic in single-parent households on chlamydia infections. Studies have found that within the family, the parent-parent and parent-child relationships impact the level of support, supervision, and behaviors youth can model, as well as messages about healthy sexual behaviors and sexual health outcomes (Bettinger et al., 2004; Kilmarx et al., 1997; Robertson et al., 2005).

Further, the higher rates of chlamydia among Georgia counties higher proportions of single-parent households underscores the notion that household stability may impact sexual behaviors. Studies found that youth living in single-parent households were more likely to engage in unprotected sex and early sexual initiation than peers living in two-parent households (Mmari, Kalamar, Brahmbhatt, & Venables, 2016; Wu & Thompson, 2001). Higher rates of chlamydia infection among Georgia counties with higher proportions of single-parent households

may be indictive of the effects of financial burdens. Studies found that children living in single-parent households were less likely to have a parent who works full-time and access to health insurance, which have been linked to access to preventative and treatment health services (Mmari et al., 2016; Robertson et al., 2005; Wu & Thompson, 2001).

Next, this study found that the proportion of registered votes participating in the gubernational election had a negative association ($\rho = -0.25$) with chlamydia infections among Georgia counties. When considering the other social determinants of health, the association remained. As voting participation increases, chlamydia infections generally decrease among Georgia counties, which aligned with reviewed literature (Holtgrave & Crosby, 2003). Studies found that in addition to providing an avenue for systemic change, civic engagement, such as voting, has been shown to be associated with better mental and physical health, healthy behaviors, and well-being (Buck-McFadyen, 2018; Dubowitz et al., 2020; Holtgrave & Crosby, 2003; Ojeda & Pacheco, 2019; Schur, Shields, Kruse, & Schriner, 2002). The results of the study underscore the relevance of Dubowitz and colleagues, who found that areas with higher voter participation were characterized by residents who were willing to ensure that policymakers and practitioners work to change and implement policies that promote healthy communities and populations, such as supporting comprehensive sexuality education programming and other community sexual health interventions. Further, lower chlamydia infections among Georgia counties with higher rates of voter participation may be indicative of the influence of social connectedness and group solidarity, as studies have found that social connectedness can improve physical health, lead to less risky health behaviors, and improve resources to improve health (Brown, Raza, Pinto, 2020; Islam, 2006). The results of this study underscore the role of social

support and social cohesion on chlamydia infections, as studies have found them to provide buffers from risk factors that may damage health (CDC, 2018).

Neighborhood and Built Environment

Neighborhood and built environment impact a population's access to safe living conditions, exposure to violence, and health services. This study accessed the association between chlamydia infections and the following measures of neighborhood and built environment: geographic location and crime. The study found that the proportion of residents living in a rural area was found to have a negative association with chlamydia infection, which was not aligned with the relevant literature. A possible cause of the difference may be the units of analysis and the mechanism by which rural was defined and measured. In this study, rurality was defined by the proportion of each county's residents residing in a rural area. The previous literature measured rurality by assessing whether the county or census tract was rural, or the respondents resided in a rural location, not aggregate level rurality (Ibey, 1998; Nelson & Gingerich, 2010; Pinto et al., 2018; Raychowdhury et al., 2008). Usually, the variables were dichotomous, while this study contained a continuous variable (Ibey, 1998; Nelson & Gingerich, 2010; Pinto et al., 2018; Raychowdhury et al., 2008).

Nevertheless, when considering other social determinants of health, the association was positive. Based on the results of the multivariate analysis, as the proportion of residents living in a rural area increased, chlamydia infections generally increased, which was consistent with previous studies (Arcury et al., 2006; Kozhilmannial et al., 2015; Ibey, 1998; Nelson & Gingerich, 2010; Pinto et al., 2018; Raychowdhury et al., 2008). The observed association highlights assertions that residing in rural areas may have profound effects on population health

outcomes and chlamydia infection, as Sullivan and colleagues found that rural residents tend to have fewer preventative screenings, less health insurance, and greater rates of morbidity.

Higher rates of chlamydia infections among counties with higher proportions of residents residing in rural areas may be indicative of the limitation in health services found in rural areas. Most chlamydia infections are asymptomatic, which underscores the importance of early diagnostic and detection services in reducing the spread of infections. Also, studies have found that rural areas are less likely than urban and metropolitan ones to have contraceptives readily available in retail stores (Arcury et al., 2006; Hartley et al., 1994; Kelly, 2011; Nelson & Gingerich, 2010; Sullivan et al., 2011). Next, the results of the study may be influenced by stigma associated with sexually transmitted infections and sexual health among rural populations, as Pinto and colleagues found that rural residents are more likely to stigmatize sexual health, which places them at a greater risk of infections (Pinto et al., 2018). The results of this study also suggest that higher rates of chlamydia infections among counties with higher proportions of residents residing in rural areas may be indicative of the economic challenges facing rural areas in Georgia, rural residents are more likely to have inadequate access to transportation, stable working conditions, and health insurance (Arcury et al., 2006; Hartley et al., 1994; Kelly, 2011; Sullivan et al., 2011). Further, it has been found that rural health systems experience challenges recruiting and retaining quality primary care professionals, which directly impacts access to critical diagnostic services to identify infections (Arcury et al., 2006; Hartley et al., 1994; Kelly, 2011; Nelson & Gingerich, 2010; Sullivan et al., 2011).

Next, this study found that the number of crime incidents per 100,000 residents had a positive association ($\rho = 0.47$) with chlamydia infections. When considering the other social determinants of health, the association remained. As the crime incidents per 100,000 increased,

chlamydia infections generally increased among Georgia counties. The results were similar to those found by previous scholars (Cohen et al., 2000; Dembo et al., 2009; Gomm et al., 2015). The results of the study highlight the assertions that crime and incarceration contribute to sexually transmitted infection by disrupting sexual networks and destabilizing communities (Chesson, Owusu-Edusei, Leichliter, & Aral, 2013). Studies have found that increased crime erodes community cohesion and perceptions of social control which creates a local environment conducive to higher rates of risky sexual behaviors and infections due (Marota, 2005). Cohen and colleagues found that violent crime rates were associated with physical deterioration in the neighborhood, which has been shown to be correlated with gonorrhea and chlamydia (Cohen et al., 2000). Further, higher chlamydia rates among counties with higher crime, may be indicative of hinderances related to the development and accessibility of healthcare services and fostering of mutual trust and respect for residents that support health seeking behaviors. Also, the association between crime and chlamydia infections in Georgia may be due to residents in areas with higher crime rates being more likely to attend underperforming schools, have access to less stable employment opportunities, and lack of access to health services (Holtgrave, 2003; Roux, 2001; Thomas et al., 2010).

The final question guiding this research study was as listed: "Which social determinant of health exerts the most relative influence on chlamydia among Georgia counties?" The results of the study found that the three most influential social determinants of health contributing to chlamydia infections among Georgia counties were the proportion of residents identifying as Black, African American, proportion of residents between 15 and 29 years of age, and the proportion of residents at or below the poverty threshold.

Implications for Policy, Practice and Research

This section situates the observed associations between social determinants of health and chlamydia infections within the context of the Social Ecological Model of Public Health, then provide implications for policy and practice based on the levels in which the determinants lie. Because scholars have found that relationships exist among the determinants at various levels, special efforts will be made to identify policies and interventions that are cross-cutting and may simultaneously impact multiple levels of the Social Ecological Model of Public Health (CDC, 2018; Golden et al., 2015; Krieger, 2008; McLeroy et al., 1988; Stokols, 1994). The last component of this section will review the implications for research.

Intrapersonal

Interventions to address chlamydia infections that target the social determinants of health that lie within the intrapersonal level of the Social Ecological Model of Public Health address health seeking behaviors and exposure to risks caused by the knowledge, skills, and personal traits of populations. Successful interventions aim to increase knowledge about the contraction, diagnostic, treatment, and prevention of chlamydia infections, while considering the unique inhibiting and promoting factors associated with the targeted determinants (CDC, 2018; Stokols, 1994).

First, this study found that the proportion of residents between 15 and 29 years of age was positively associated with chlamydia infections. Studies have found that comprehensive sexuality education programs hold promise in increasing knowledge and skills regarding the ability to utilize contraceptives, communicate effectively about sexuality with peers and partners, and risk factors associated with sexual behaviors among youth populations, (CDC, 2018; Kelly, 2010; Pittman & Gahungu, 2006). For instance, in a study that compared the effectiveness of

comprehensive sexuality education and abstinence only education programs, Pittman and Gahungu found that the youth receiving comprehensive sexuality education programs had a lower prevalence of sexually transmitted infections, greater knowledge of prevention methods, and less participation in risky sexual behaviors when compared to those receiving abstinence only education programs (Pittman & Gahungu, 2006).

Georgia Code Annotated §§ 20-2-143 requires local school districts to provide sex education and AIDS prevention; however, the statute does not mandate the inclusion of comprehensive sexuality education program. The statute only mandates that the guidelines provided by localities emphasize abstinence from sexual activity until marriage. Local school districts can implement components of comprehensive sexuality education programming to encourage the dissemination of information regarding sexual health seeking behaviors such as contraceptives, screening opportunities for sexually transmitted infections, and healthy sexual and non-sexual relationships, recognizing sexual violence, and consent. Kelly found that most effective comprehensive sexual health education programs were those that were medically accurate, age appropriate, and rooted in theories that demonstrated effectiveness (Kelly, 2010).

While the state of Georgia does require licensure for academic instructors, the state of Georgia does not require sexuality education programs and curriculum to be delivered by licensed instructors (CDC, 2020; SEIUS, 2019). Subsequently, local school districts may develop and sustain collaborations with regional technical colleges and continuing education programs to train and recruit Comprehensive Sexual Health Education instructors. These collaborations with educational organizations are cross-cutting and underscore the regulations and community norms furthered by this intervention, as represented by the institutional level of the Social Ecological Model of Public Health.

Local boards of education may seek funding from the U.S. Department of Health and Human Services to partially fund Comprehensive Sexual Health Education training programs. In 2018, Georgia localities received $3 million in funding from the program. The National Institute for Child Health and Human Development Agency also provides complete funding for all program related expenses for local school districts that are willing to serve as experimental pilots for the Comprehensive Sexual Health Education Program (CDC, 2010).

Second, this study found that the proportion of residents identifying as African American, Black was positively associated with chlamydia infections. Interventions that target African American populations should address the role racial disparities and racism have on health seeking behaviors and attitudes (Stokols, 1996; McLeroy et al., 1988). According to Borrow and colleagues, the availability of diagnostic tests, effective medications, and screening tools, as well as structural challenges may restrict full access to these resources by racial minorities (Barrow et al., 2008). Screening interventions for bacterial sexually transmitted disease pose a key strategy for addressing and changing behaviors related to chlamydia in the African American community, as most infected persons are asymptomatic which may lead to delays in treatment and further infections.

Local governments can develop partnerships with local healthcare organizations to ensure emergency department are equipped with the appropriate preventative, diagnostic, and treatment resources and knowledgeable staff may increase access to diagnostic and treatment services, as studies have found that lower-income racial minorities are more likely to visit the emergency room for primary care services (Hamilton & Morris, 2015; Mehta et al., 2003). Further, studies have found that racial minorities and poorer residents are more likely to work in lower wage jobs during non-traditional hours (Ibery, 1998; Kozhilmannial et al., 2015; Mehta et al, 2003; Miller

et al., 2004; Springer et al., 2010). Partnerships among local governments and local employers, transit services, and social service agencies may reduce barriers to accessing affordable care and treatment, as well as the ability of residents to take time off from work to seek diagnostic and treatment services, as needed (CDC, 2018).

In addition to interventions to increase screening efforts among African American communities, interventions to expand expedited partner services may pose benefits. African American men are less likely to seek medical services for sexually transmitted infections, particularity if they are asymptomatic, even if they have been notified of an infected sexual partner (Barrow et al., 2003). Hook and Handsfield (2008) found that most sampled partner screening interventions targeted women, making women the intermediary to men's care, which may complicate notifications for chlamydia among men. Local governments may collaborate with local public health officials, healthcare providers, and social organizations to develop informational campaigns for expedited partner therapy that are non-judgmental, engage the target audience, and are approachable (Lederer et al., 2021).

Studies have found that the success of screening and expeditated partner therapy interventions that target the African American community are contingent upon being delivered by a culturally competent public health and medical workforce (Adimora et al., 2014; CDC, 2019; Kotchick et al., 2001; Sullivan, 2014). Brach and Fraserirector found that racial minorities are more likely to feel comfortable discussing sensitive sexual information, experience greater satisfaction with service, and better outcomes when the provider is of a similar race or ethnic background (Brach & Fraserirector, 2016). Local governments in Georgia can seek develop new and strengthen existing partnerships with minority-based organizations, such as professional organizations and community advancement groups, to develop, implement, and evaluate

effective promotional campaigns for preventative, diagnostic, and treatment services. Additionally, regional partnerships may provide a useful avenue for recruiting minority public health, social service, and medical interns for local hospitals, social service departments, and public health centers (Truong, Paradies, & Priest, 2014).

Third, while the proportion of residents identifying as female was found to have a quite negligible association with chlamydia infection, the relevant literature underscores the importance of continuing to develop interventions that address barriers to awareness, knowledge, and skills encountered by women. Further, Shover and colleagues have found that current awareness campaigns regarding chlamydia and other sexually transmitted infections largely neglects gender role socialization and the ability of women to protect their sexual health (Shover et al., 2018). Scholars have found that females are more susceptible to contracting chlamydia than males, due to increased biological risks and socialization (CDC, 2018; Sales et al., 2012, Santelli et al., 1998). Local governments can develop targeted marketing campaigns that encourage females to seek diagnostic testing, communicate with partners regarding contraception, and seek treatment for chlamydia infections (Shover et al., 2018). Local health educators and governmental agencies could design chlamydia prevention campaigns that consider the unequal distribution of power in intimate relationships, as well.

Interpersonal

Interventions to address chlamydia infections that target the social determinants of health that lie within the intrapersonal level of the Social Ecological Model of Public Health address the health seeking behaviors and exposure to risks caused by the informal and formal relationships and social networks, such as family structure and social networks. In this study, the proportion of

single parent households represented the interpersonal level of the Social Ecological Model of Public Health and was found to have a positive association with chlamydia infections.

Studies found that the parent-parent and child-parent relationships impact the levels of support, supervision, and behaviors youth make related risky sexual behaviors, access to diagnostic, treatment, and preventative services, and knowledge of chlamydia infections (Bettinger et al., 2004; Crosby et al., 2000; DiClemente et al., 2001; Stanton et al., 2002). To address the intrapersonal level, local governments and school districts in Georgia can implement strategies to increase parental involvement by hosting informational sessions and workshops that educate parents on communication techniques, as well as sexually transmitted infections. Further, health organizations may create transportation programs that encourage single parents to accompany their children to health screening appointments (Bettinger et al., 2004).

Next, studies have found that single parents may experience difficulty when attempting to access health care services due to childcare, which may delay diagnostic testing and treatment for chlamydia (Bettinger et al., 2004; Crosby et al., 2000; DiClemente et al., 2001; Stanton et al., 2002). The planning, financing, and implementation of on-site childcare resources at healthcare facilities may reduce barriers experienced by single parents attempting to receive diagnostic, treatment, and preventative health services (Bettinger et al., 2004; Robertson et al., 2005; Thomas & Gaffield, 2003).

Institutional

Interventions to address chlamydia infections that target the social determinants of health that lie within the intrapersonal level of the Social Ecological Model of Public Health target the rules, regulations, and structures of organizations that constrain or promote health seeking behaviors and risk factors related to chlamydia infections (Stokols, 1998). In this study, the

following determinants represented the institutional level of the Social Ecological Model of Public Health: proportion of residents who are unemployed and the proportion of residents over 25 years of age with less than a high school diploma.

First, policies and interventions that target unemployed residents provide opportunities for localities, educational agencies, and the employment sector to promote health seeking behaviors and mitigate risk by increasing employment and human capital development. Localities may partner with local businesses to advertise employment opportunities and host job fairs. Developing training programs to increase access to higher paying jobs has also been shown to increase access to diagnostic and treatment services, as well as the use of contraceptives (Annang et al., 2010; Crichton et a., 2014). A primary benefit of stable employment is access to job benefits such as health insurance and paid sick leave, which reduces barriers related to the affordability of healthcare and contraceptives (Annang et al., 2010; Datta et al., 2007; Springer et al., 2010). To address additional barriers, local health departments and social service organizations can collaborate to provide affordable or no-cost health care resources for unemployed residents, as permitted by the Comprehensive STD Prevention Systems grant. Further, some counties may benefit from proximity to post-secondary institutions that offer comprehensive, high quality sexually transmitted infection related services (CDC, 2019).

Second, policies and interventions to target the proportion of residents with less than a high school diploma offer opportunities for schools, healthcare organizations, and social agencies to promote health seeking behaviors and mitigate risks by increasing educational attainment and subsequently access to higher income, economic stability, and employment related insurance. Organizations should partner to develop programming that encourage high school completion, such as after school programming and tutoring services for marginalized and

at-risk populations. Studies have found that increasing graduation rates among high-risk communities generally decreases the risk of premature death and detrimental health outcomes (CDC, 2018; Hummer & Lariscy, 2011). Further, policies should also identify and target disparities among various groups based on geographic location, race, and gender, which signifies the importance of developing multi-level interventions and polices. For instance, the success of interventions to promote graduation would involve addressing gender and racial disparities in educational organizations. Also, strengthening parental involvement in the promotion of educational attainment would involve considering the formal and informal relationships represented by the interpersonal level of the Social Ecological Model of Public Health.

Community

Interventions to address chlamydia infections that target the social determinants of health that lie within the intrapersonal level of the Social Ecological Model of Public Health target the networks between community organizations and the ways these networks impede or promote health seeking behaviors related to chlamydia infections. In this study, the following determinants represented the institutional level of the Social Ecological Model of Public Health: proportion of residents living at or below the poverty threshold, physicians per 100,000, and the proportion of residents under 65 who are uninsured, proportion of residents residing in a rural area, cases of crime per 100,000, proportion of registered voters voting. Interventions and policies that target the community level of the Social Ecological Model of Public Health require community organizations such as local commissions, elected bodies, healthcare organizations, and private corporations, to pool resources and ideas together to address chlamydia infections.

First, the proportion of residents residing in poverty was found to be positively correlated with chlamydia infections. Besides improving the health capital of residents, local community

organizations can partner to provide health care services to impoverished residents using community health centers or health hubs. Free or reduced-cost services provided by community health centers offer preventive health services such as cancer screenings and screenings for sexually transmitted infections more accessible for impoverished individuals (Haley et al., 2004). The effects poverty also impacts the health social networks and attitudes within the intrapersonal level of the Social Ecological Model of Public Health, as well as the disadvantages and barriers experienced by determinants within the interpersonal level, such as gender and race.

The proportion of voters participating in the most recent gubernational election was found to have a negative relationship with chlamydia infections, underscoring the benefits of increased social cohesion on infections. Interventions targeting social cohesion offer benefits related to empowering communities, increasing trust among social and sexual networks, and developing shared values related to sexually transmitted infections, access to health care resources, and prevention efforts. Scholars have identified benefits of drop-in centers, peer education services, stakeholder advocacy meetings and policy workshops, and the formation of chlamydia prevention efforts led by members of the community (Holtgrave & Crosby, 2003; Kawachi & Berkman, 2000; Kerrigan et al., 2006; Seman et al., 2007; Thoits, 2011; Vallejos, 2017).

Interventions that target the distribution and physician rate offer ample opportunities for localities in Georgia. Special efforts are needed to address high travel times for medical services related to sexually health. Bauer and colleagues recommended community centers and medical organizations collaborate to provide prevention, diagnostic, and treatment services in non-traditional settings, such as schools and churches (Bauer et al., 2004). Further, the attraction of diverse public health and healthcare workforces not only poses benefits for the sexual health

outcomes of racial and ethnic minority communities, but the entire state, particularly those areas that are underserved by healthcare professionals (Denison et al., 2017).

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To attract physicians in traditionally underserved and impoverished areas, the state of Georgia offers a loan forgiveness program; however, the demand for physicians far exceeds those willing to apply for the program. Additionally, local policymakers and practitioners have offered local incentives to attract and retain a diverse pool of physicians. For instance, counties in southwest Georgia have collaborated to implement *Pathway to Med School*, which encourages in-state medical students to remain in the state after completing residency. Research universities and colleges are only a component of the solution, policymakers can also ensure public K-12 science and technology programs are adequately funded in underserved communities, with a special emphasis on minority communities. Localities are also recommended to increase financial support for pipeline training programs at community and technical colleges, as well as diversity initiative at health professional schools.

Studies have shown that increasing access to affordable services has positive impacts of diagnostic testing and treatment for chlamydia (Haley et al., 2018; Olonilua et a., 2008). Studies

have found that uninsured individuals are more likely to seek primary care services in the emergency room; therefore, better integration of service delivery related to sexually transmitted infection in emergency rooms may pose benefits. Policies and interventions to target the proportion of residents who are impoverished or uninsured should align incentives to reward providers and health care organizations for providing diagnostic, treatment, and preventative care (Chin, 2008). Legislators are recommended to reform policies to ensure providers are rewarded through speedy reimbursements and access to subsidies for serving a disproportionate share of marginalized and high-risk patients (Chin, 2008).

Lastly, the cases of crime per 100,000 was found to be positively associated with chlamydia infections, underscoring the importance of neighborhood instability on chlamydia infections. Social service, educational, and community-based organizations may develop youth programming and resources, minimize poverty, and improve educational outcomes to reduce chlamydia infections (Thomas et al., 2009). Studies have found that these interventions increase social capital, improve parent-child relationships, and limit violence while creating environments where residents model health seeking behaviors out of respect for their neighbors (Dembo et al., 2009; Thomas et al., 2009). Lastly, the proportion of residents residing in rural areas was negatively correlated with chlamydia infections, which was not aligned with the relevant literature. Nevertheless, the finding underscores the importance of continuing to study the effects of geographic location on chlamydia infections.

Public Policy

While this study did not contain measures of public policy, the importance of this level must not go unnoticed. The results of this study underscore the importance of local, state, and federal policies in the regulation and promotion of health seeking behaviors and practices for the early

detection, treatment, and prevention of chlamydia infections. Public policies, such as those governing the provision of funding for preventative health care, educational attainment, workforce development, or the administration of county-wide sexuality education interventions in K-12, can have a cascading impact on the other layers by either supporting or hindering access to health seeking behaviors and risk factors such as economic stability, affordability of health services, and diagnostic testing. The results of this study also underscore the role of financing in setting local priorities for the proposed interventions.

Research

This dissertation study contributed to the relevant literature by applying the Social Ecological Model of Public Health and Healthy People 2030 Social Determinants of Health Conceptual Framework to the examinations of the associations between social determinants and chlamydia among Georgia counties. This study included an analysis of a southern state within the context of chlamydia infections, which filled a void observed in the relevant literature. Further, the study collected and analyzed county-level data, which may aid local policymakers and practitioners in developing, implementing, and evaluating community level interventions. This study also examined multiple social determinants of health in one study. Further, the study contributed to the relevant literature by examining recent data, which allows policymakers and practitioners to make decisions based on more relevant data.

Future research is encouraged to establish clear and consistent measurements of gender and rurality. Next, future is encouraged to explore the pathways by which the social determinants of health included in this study impact community level health seeking behaviors, as well as the interactions among various levels of the Social Ecological Model of Public Health. Lastly, future

research is encouraged to evaluate the effectiveness and efficiency of the targeted policies and interventions presented in this chapter.

Limitations

The previous section discussed this study's implications for the fields of policy, practice, and research; however, limitations and areas requiring further analysis exist. This study relied on secondary data. Because data was extracted from GeorgiaData, an electronic data repository managed by the University of Georgia, the researcher was unable to exert complete control over the data collection process, accuracy of data, or representativeness of the collected data. Further, because persons infected with chlamydia are largely asymptomatic, the reported county-level rates of chlamydia could widely underrepresent the actual rate of new chlamydia infections (Batteiger, 2017; CDC, 2018; Malhotra et al., 2013; Pinto et al., 2018; Tilson et al., 2004). Also, this dissertation study was correlational, which signifies that the results cannot establish causation and any the interpretation of results should be limited to the counties and time period included in the study.

Next, while GeorgiaData contained county-level total index crime rates, which includes the number of cases of murder and non-negligent manslaughter, forcible rape, robbery, aggravated assault, burglary, larceny-theft, motor vehicle theft and arson, per 100,000 of the population, GeorgiaData did not include data regarding intimate partner violence (IPV) or sexual assault. The CDC estimates that nearly 1 in 4 women and 1 in 10 men will have experienced IPV during their lifetime, thus it is important to understand how IPV impact relates to other social determinants of health and chlamydia, as well how IPV and assault create barriers to healthy sexual behaviors and the ways policymakers and practitioners can address these barriers (CDC, 2018).

Previous studies have examined the association between sexual assault and intimate partner violence (IPV) and sexually transmitted infections. For instance, Hess and colleagues conducted a study of the association between IPV victimization and perpetuation and prevalent sexually transmitted infections among a sample of 3,548 young women (Hess, Javanbakht, Brown, Weiss, Hsu, & Gorbach, 2013). The authors found that survivors of IPV were 2.1 times more likely to have a prevalent sexually transmitted infection when compared to those with no history of IPV (Hess et al., 2013). Similar results were found in a study of 774 prenatal patients in North Carolina. Martin and colleagues found that after controlling for confounding variables, women who reported physical and sexual abuse were significantly more likely to have experienced a sexually transmitted infection, when compared to women with no experiences of abuse (Martin, Matza, Kupper, Thomas, Daly, & Cloutier, 1999). Breiding, Black, and Ryan (2008) found that women and men with histories of IPV victimization were more likely to report participation in behaviors that have been found to increase the risk of contracting sexually transmitted infections, including intravenous drug use, anal intercourse without condom, and having multiple sexual partners, when compared to those with no histories of IPV victimization. Based on these previous studies, a variable of interest in future research would be county-level rates of sexual assault or measures of IPV. The field of research would benefit from specifically examining the correlations between IPV and sexual assaults and chlamydia or other sexually transmitted infections, as a means of providing the foundation for practical community interventions for survivors.

Next, while previous chapters discussed policies governing the administration of sexuality education programs and recommended the implementation of a comprehensive approach, the study did not examine the existing association between the provision of sexuality

education programming in schools and chlamydia among Georgia counties. The results of this study found that as the proportion of youth increased among Georgia counties, the rate of chlamydia cases generally did, too. Strong evidence suggests that comprehensive approaches to sexuality education programming that include information regarding contraception and safe-sex practices are related to delaying the age of sexual activity, unintended pregnancies, and sexually transmitted infections (CDC, 2019; CDC, 2020; Kirby, 2008; Santelli, 2008). Therefore, it is important to understand whether the delivery of these programs in K-12 is correlated with sexually transmitted infections in Georgia prior to developing county-wide adjustments to local school boards and instruction.

Additionally, while previous scholars have sought to establish links between MSM and chlamydia, GeorgiaData lacks any specific county-level data regarding MSM or sexual behaviors (Abrara et al., 2016; Batteiger, 2017; Chow et al., 2016; Hoff et al., 2012; Jin et. al, 2010; Oster et. al, 2013; Rank & Yeruva, 2014; Woestenberg et al., 2020). Also, the results of this study cannot be generalized to counties in all southern states or extrapolated to all counties in the United States. Lastly, the results of this study cannot be generalized to all sexually transmitted diseases or individual residents given its ecological design.

Conclusion

Chlamydia is a growing public health concern in southern states, particularly in Georgia; however, there has been limited inquiry into social determinants contributing to chlamydia rates in Georgia (Raychowdhury, Tedders, & Jones, 2008). While social determinants do not directly cause chlamydia infections, these determinants do influence infections by creating environments that promote or hinder access to health seeking behaviors, as well as exposure to risk factors (Baral, Logie, Grosso, Wirtz, & Beyrer, 2013; CDC, 2019; ODPHP, 2019; Kozhimannil et al.,

2015; Krieger, 1994; Salazar et al., 2010; Thomas et al., 1999). This study used the Social Ecological Model of Public Health as the guiding theoretical framework to understand how levels of determinants are associated with chlamydia infections and to develop interventions that address those environmental factors, as opposed to individual behaviors. The Healthy People 2030 Social Determinants of Health Conceptual Framework was used to operationalize the determinants contained within each layer of the Social Ecological Model and identify the directional association between these determinants and chlamydia infections among Georgia counties.

The study's multivariate analysis found the following county-level determinants were positively correlated with chlamydia infections among Georgia counties: proportion of residents identifying as Black, African American, proportion of residents between 15 and 29 years of age, proportion of residents below the poverty threshold, proportion of residents with less than a high school diploma or equivalency, physician rate, proportion of single parent households, proportion residing in rural area, and crime rate. Additionally, the study found that the following county-level determinants were negatively associated with chlamydia infections among Georgia counties: unemployment rate, proportion of residents under 65 years of age and uninsured, and civic participation. The three most influential social determinants were the proportion of residents identifying as Black, African American, proportion of residents between 15 and 29 years of age, and the proportion of residents below the poverty threshold.

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