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Impact of Chlamydia and Gonorrhea in Georgia: An Urban / Rural Comparison (2000-2004)

Impact of Chlamydia & Gonorrhea in Georgia: An Urban/Rural Comparison (2000-2004)

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ABSTRACT

Background: In 2005, 33,562 cases of chlamydia and 15,860 cases of gonorrhea were reported in the State of Georgia, respectively corresponding to 3.4% and 4.7% of all cases reported nationally (CDC, 2005). Disparities of infection with respect to race and gender are evident for both diseases. The objective of this study was to determine the magnitude of chlamydia and gonorrhea in rural Georgia compared to urban areas of the state. Methods: County level data necessary for analysis were acquired using the Georgia Division of Public Health's Online Analytical Statistical Information System database (GDHR, 2007). Rates of infection by gender and race (black vs. white) were aggregated over a five year period (2000 – 2004) and indirectly adjusted using Georgia as the standard. Rates for rural counties, defined as populations less than 35,000, were statistically compared to urban rates using a test of proportions ($\alpha = 0.05$). Additionally, rate ratios and 95% confidence intervals were calculated to further quantify risk. Results: Although variation exists, data suggest infection of both diseases in Georgia is an urban problem, disproportionately impacting black residents. For chlamydia, adjusted rates for white males (21.0/100,000) and black males (313.9/100,000) were significantly higher in urban counties. Quantified risk as indicated by rate ratios [RR] and 95% confidence intervals [95%CI] suggest an 18% increase of risk among white males (RR = 1.18; 95%CI = 1.07, 1.30) and 33% increase of risk among black males (RR = 1.33; 95%CI = 1.27, 1.38). Among females, rates in rural areas of the state were higher for whites (121.9/100,000) and blacks (1,045.5/100,000). However, these differences were not significant. For gonorrhea, rates in urban areas were significantly higher among white males (15.5/100,000), black males (519.6/100,000), and black females (414.2/100,000) as compared to rural populations. Additionally, elevated risk of gonorrhea among these groups ranged from a 10% increase among black females (RR = 1.10; 95%CI = 1.07, 1.14) in urban areas to a 65% increase among white males (RR = 1.64; 95%CI = 1.43, 1.85) in urban areas. Conclusions: The State of Georgia continues to report two of the most common sexually transmitted infections at an alarming rate. The disproportionate impact of minorities is evident, although further assessment of the variation between urban and rural areas is warranted to more fully explain risk of infection.

INTRODUCTION

The public health community has witnessed an alarming increase in the number sexually transmitted disease (STD) infections in United States over the past few decades. According to recent statistics released by the Centers of Disease Control and Prevention (CDC), an estimated 19 million new STD infections occur each year in this country. According to Weinstock, et al. (2004), approximately fifty percent of all new STD infections occur among individuals 15 to 24 years of age. Moreover, the estimated direct medical cost associated with STD infection is $15.5 billion in one year (Chesson, Blandford, Gift, Tao, & Irwin 2004).

Chlamydia, a bacterial infection caused by C*hlamydia trachomatis*, is the most prevalent STD infection reported in the United States and this disease is widely spread among sexually active women. Chlamydia infections are usually asymptomatic and, if left untreated, this disease can cause pelvic inflammatory disease (PID). In general terms, PID is an infection affecting the uterus, fallopian tubes, and other reproductive organs often resulting in ectopic pregnancy (CDC, 2004). Since 1986, the number of reported cases of chlamydia has increased steadily in the United States. In 2005, 976,445 new cases of this infection were reported thereby representing an infection rate of 332.5/100,000 population. In fact, the number of cases detected in 2005 increased by over 37.0% as compared to year 2000 data (CDC, STD Surveillance 2004 Report).

Gonorrhea, a bacterial infection caused by *Neisseria gonorrhoea*, is the second most reported STD in the United States. Like chlamydia, gonorrhea is also considered a major cause of PID, and this bacterial infection has been designated as a primary contributing factor for the spread of Human Immunodeficiency Virus (HIV), especially in the South. According to the CDC, gonorrhea infection is mostly prevalent among adolescents and young adults (CDC, Tracking of Hidden Epidemics, 2000). In 2005, the infection rate in the United States from gonorrhea was reported to be 115.6/100,000 (CDC, STD Surveillance 2005 Report). Additionally, the data suggest that this disease disproportionately impacts African Americans.

The literature suggests that reported infection rates for both chlamydia and gonorrhea are substantially higher in the southern region of United States as compared to other parts of the country (Farley, 2006). There is also strong evidence to support racial and gender differences in infection of these bacterial diseases. Moreover, the role of geography in risk of infection, particularly with respect to urban and rural comparison, is apparent (Milhausen, Crosby, Yarber, DiClemente, Wingood, & Ding, 2003).

Given the evidence indicating elevated infection rates in the southern United States, as well as the apparent disproportionate impact of these diseases on minorities, researchers in the Center for Rural Health & Research at Georgia Southern University sought to more clearly define STD trends in the state. The specific objective of this research was to conduct a county-based ecological investigation of chlamydia and gonorrhea infection in Georgia. Moreover, the aim of this research was to examine urban and rural differences in disease trends while controlling for race and gender.

METHODS

County-level data necessary for this analysis were acquired using the Georgia Division of Public Health's Online Analytical Statistical Information System (OASIS) database (GDHR, 2007). Publicly available through the Internet, OASIS is a data repository that provides the user with access to standardized health and population data. Cause-specific mortality, morbidity, and hospital discharge data are available through OASIS. Additionally, population and birth data, including maternal and child health indicators, are available to the user. Data acquired through OASIS may also be segmented by age, gender, race, ethnicity, and geography.

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The intent of this study was to investigate urban and rural differences in STD infection (chlamydia and gonorrhea) in Georgia. Urban and rural distinctions were based on a county-level definition used by the State Office of Rural Health (Georgia Department of Community Health, 2007). According to this definition, counties with populations of 35,000 people or more are considered urban while those counties with less than 35,000 people are considered rural. Morbidity rates were further stratified with respect to age, gender and race. For all urban and rural counties, age-gender-race specific morbidity rates were calculated and aggregated over a five-year interval (2000 – 2004). With respect to race, morbidity rates for only black and white residents were considered given these two cohorts comprise 95.9% of the state's population (Census Bureau, 2007). Using Georgia as the standard, urban and rural rates were then age-adjusted using an indirect method (Page, Cole, & Timmreck, 1995).

Age-adjusted rates for urban and rural counties were compared ($\alpha = 0.05$) using a Test of Proportions (Cohen, 1988). Rate ratios and 95% confidence intervals were calculated to further quantify risk (Rosner, 2000). Only urban and rural differences were investigated and no attempt was made to investigate significant differences within or between particular races or genders.

RESULTS

Although variation exists, data suggest infection of chlamydia and gonorrhea is an urban problem, disproportionately impacting black residents. Table 1 illustrates the infection rates of chlamydia by race and gender in urban and rural counties in Georgia. According to these data, urban populations exhibit a significantly greater infection rate (248.1/100,000) compared to rural populations (229.7/100,000). Overall, an 8% increase in total risk (RR = 1.08; 95%CI = 1.06, 1.10) of infection was observed for people living in urban areas. Regardless of urban/rural classification, it is evident that chlamydia infection disproportionately impacts black residents in Georgia. Among black females, infection rates are actually higher in rural counties (1,045.5/100,000) compared to urban counties (959.1/100,000). Although considerably reduced, a similar trend was observed for white females in rural counties (121.9/100,000) as compared to urban counties (111.5/100,000). However, differences in rates for either group are not statistically significant. According to risk estimates, a 9% decrease in risk among urban white females (RR = 0.91; 95%CI = 0.88, 0.95) and an 8% decrease in risk among urban black females (RR = 0.92; 95%CI = 0.90, 0.94) was noted. This trend is reversed when examining rates among black males. Adjusted rates among urban black males (313.9/100,000) are significantly higher compared to rural black males (236.3/100,000). Among blacks, urban residents have a 33% increase in risk (RR = 1.33; 95%CI = 1.27, 1.38) as compared to blacks in rural counties. A similar trend in geographic location and prevalence of infection is noted among whites in Georgia. Infection rates are significantly higher among urban white males (21.0/100,000) as compared to their rural counterparts (17.8/100,000). According to risk estimates, urban white males have an 18% increase in overall risk (RR = 1.18; 95%CI = 1.07, 1.30) of gonorrhea infection.

Table 2 illustrates an urban/rural comparison of infection rates of gonorrhea by race and gender. When considering the total population without regard to race and gender, urban infection rates (157.2/100,000) are significantly higher than rural infection rates (115.4/100,000). Rate ratios indicate that urban residents are 36% more likely than rural residents to be infected with gonorrhea (RR = 1.36; 95%CI = 1.33, 1.39). Similar to the trend noted for chlamydia, black males and females are disproportionately impacted by gonorrhea. Based on this analysis, infection rates among black females (414.2/100,000) and black males (519.6/100,000) are significantly higher in urban areas. Risk estimates suggest a 10% increase in risk for black females (RR = 1.10; 95%CI = 1.07, 1.14) and a 44% increase in risk for black males (RR = 1.44; 95%CI = 1.39, 1.49). Overall, infection rates among white residents are considerably reduced relative to black residents. Among white males, the infection rate

Table 1: Infection Rates of Chlamydia by Race and Gender in Urban and Rural Georgia

Demographic Group	Area of Comparison	Number of Cases†	Population†	Unadjusted Rate/100,000	Adjusted Rate/100,000	Risk Ratio (95% CI)
White Male	Urban	2,419	11,339,104	21.3	21.0*	1.18 (1.07, 1.30)
	Rural	493	2,931,544	16.8	17.8	
White Female	Urban	12,666	11,278,244	112.3	111.5	0.91 (0.88, 0.95)
	Rural	3,505	2,961,157	118.4	121.9	
Black Male	Urban	15,030	4,791,871	313.7	313.9*	1.33 (1.27, 1.38)
	Rural	2,494	1,051,863	237.1	236.3	
Black Female	Urban	51,806	5,367,790	965.1	959.1	0.92 (0.90, 0.94)
	Rural	11,524	1,136,297	1,014.2	1,045.5	
Total	Urban	81,921	32,777,009	249.9	248.1*	1.08 (1.06, 1.10)
	Rural	18,016	8,080,861	223.0	229.7	

† Aggregated over 5 years (2000 – 2004)
* Significant at $\alpha = 0.05$

(15.5/100,000) in urban areas is significantly elevated compared to the rural areas. Estimated rate ratios suggest that white males in urban areas have a 64% increase in risk (RR = 1.64; 95%CI = 1.43, 1.85) of gonorrhea as compared to rural populations. Among white females, this trend is reversed with a slight increase being observed among rural populations (28.2/100,000; RR = 0.91; 95%CI = 0.84, 0.98). However, no significant difference in adjusted rates was detected.

DISCUSSION

Throughout the United States, the public health sector continues to invest enormous resources to combat the impact of STD infections. The CDC estimates that 19 million new STD cases occur each year in this country, primarily impacting people 15 to 24 years of age (Winestock, Berman, & Cates, 2004). Although many STD infections respond effectively to physician prescribed treatment, undiagnosed cases may result in significant long-term health consequences in the individual including sterility, infertility and adverse pregnancy events.

According to the CDC, chlamydia is the most commonly reported infectious disease in the United States (CDC, STD Surveillance 2005 Report). The rate of reported cases of chlamydia in 2004 was 316.5/100,000 (CDC, STD Surveillance 2004 Report). Estimates suggest that nearly 3 million new cases of chlamydia occur in this country, but most infections go undiagnosed. From an epidemiological perspective, the sheer magnitude of undiagnosed cases is staggering and presents a unique challenge to public health professionals in this country. From 2004 to 2005, the CDC reported a 5.1% increase in rates of infection. This increase may be attributed, in part, to more effective screening tests and enhanced public awareness of potential risk (CDC, STD Surveillance 2005 Report). However, public health professionals cannot rule out an actual increase in infections among the general public. The literature suggests that chlamydia infection

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Table 2: Infection Rates of Gonorrhea by Race and Gender in Urban and Rural Georgia

Demographic Group	*Area of Comparison*	*Number of Cases†*	*Population†*	*Unadjusted Rate/100,000*	*Adjusted Rate/100,000*	*Risk Ratio (95% CI)*
White Male	Urban	1,781	11,339,104	15.7	15.5*	1.64
	Rural	259	2,931,544	8.8	9.4	(1.43, 1.85)
White Female	Urban	2,926	11,278,244	25.9	25.7	0.91
	Rural	806	2,961,157	27.2	28.2	(0.84, 0.98)
Black Male	Urban	24,960	4,791,871	520.8	519.6*	1.44
	Rural	3,754	1,051,863	356.9	361.0	(1.39, 1.49)
Black Female	Urban	22,397	5,367,790	407.7	414.2*	1.10
	Rural	4,117	1,136,297	417.3	375.5	(1.07, 1.14)
Total	Urban	52,064	32,777,009	158.8	157.2*	1.36
	Rural	8,936	8,080,861	110.6	115.4	(1.33, 1.39)

† Aggregated over 5 years (2000 – 2004)
* Significant at $\alpha = 0.05$

rates were similar among populations in the Midwest (353.7/100,000), West (343.6/100,000), and South (338.1/100,000) (CDC, STD Surveillance 2005 Report). In Georgia, a similar trend in the rate (416.9/100,000) of chlamydia was reported (CDC, STD Surveillance 2005 Report).

Risk of chlamydia is associated with gender and a significant increase in prevalence of infection among women is noted (CDC, STD Surveillance 2005 Report). Moreover, undiagnosed cases in women pose more significant long-term health risks relative to men. In 2004, the rate of chlamydia was three times higher in women (485.0/100, 1000) as compared to men (147.1/100,000) (CDC, STD Surveillance 2004 Report). In this study, a similar, but elevated, trend was noted with respect to gender. Among whites, regardless of urban or rural residence, the female rate was six times higher as compared to males. Among black residents, data from the present study indicate the rate of infection among females to be approximately 3.5 times higher than the male infection rate. When adjusting for place of residence as presented in this study, similar gender associated trends in rates of chlamydia were noted. Although variation was evident, data from this study also suggests at least an 8% increase in risk associated with urban populations in Georgia. Infection rates of urban black males (313.9/100,000) were significantly higher compared to rural black males (236.3/100,000). Significance of infection rates was also noted among urban white males (21.0/100,000) as compared to rural white males (17.8/100,000). Statistical differences for chlamydia were not detected among females. Overall, chlamydia rates in urban counties (248.1/100,000) were significantly higher as compared to rural counties (229.7/100,000) in Georgia. Further investigations by race indicated the rate of chlamydia infection was at least eight times higher in blacks (1247.0/100,000) as compared to whites (152.1/100,000) (CDC, STD Surveillance 2005

Report). Using data acquired specifically for the purposes of this study, the infection rate for black residents, regardless of urban or rural status, was over 9 times greater than white residents.

According to the CDC, gonorrhea is the second most commonly reported infectious disease in the United States (CDC, STD Surveillance 2005 Report). As reported for chlamydia, rates of infection for gonorrhea are thought to be grossly underestimated (Winestock, Berman, & Cates, 2000). At present, morbidity rates in the South (143.9/100,000) are the highest in the country (CDC, Trends in Reportable STDs in U.S., 2005). However, data suggest a 17.6% decline in recent years. Rates of gonorrhea infection in the Midwest (139.1/100,000) and Northeast (74.7/100,000) also indicate declines of 2.4% and 23.1%, respectively. Infection rates in the West (81.5/100,000) have actually increased by 35.4% in recent years. Moreover, data suggest the infection rate for African Americans (626.4/100,000) is nearly eighteen times higher as compared to Whites (35.2/100,000 in 2005) (CDC, Trends in Reportable STDs in U.S., 2005). According to data presented in this study, considerable disparity in infection rates of gonorrhea is noted with regard to race. Regardless of place of residence, risk of infection among black residents is approximately 21 times higher as compared to whites.

In 2005, the rate of gonorrhea in Georgia was 179.6/100,000 (CDC, STD Surveillance 2005 Report). Although risk differs by race or ethnicity, the association of gender is less apparent. National data suggest the rate of gonorrhea among women (119.1/100,000) was slightly higher as compared to men (111.5/100,000) (CDC, STD Surveillance 2005 Report). In this study, very little difference was detected with regard to gender. In fact, males had a slightly higher unadjusted rate than females, thereby contradicting reports from the literature. Additionally, data from this study indicate that gonorrhea infection is more prevalent in urban counties in the state. Infection rates in urban counties (157.2/100,000) were significantly higher as compared to rural counties (115.4/100,000). Quantified risk measures indicate that urban areas experienced a 36% increase in risk of gonorrhea infection. With respect to race and gender, the prevalence of gonorrhea was significant among urban black males (519.6/100,000) and females (414.2/100,000) as compared to rural black males (361.0/100,000) and females (375.5/100,000). Similarly, infection rates among urban white males (15.5/100,000) were significantly elevated compared to rural white males (9.4/100,000).

Limitations to the Study

Conclusions drawn from this study relied solely on the use of a secondary data source acquired from Georgia's Division of Public Health. The primary disadvantage to using any secondary data source, for this study or similar studies, is the potential for errors associated with data quality. Any researcher using secondary sources is at the mercy of those that collected. Additionally, the researcher is unable to control or account for poor data quality associated with data cleaning or data entry.

This particular study relied on the use of adjusted rates to control for age differences in race and gender. A significant limitation of adjusted rates is that they are calculated using a statistical transformation process designed to equalize differences in population proportions. Consequently, adjusted rates are fictional and do not necessarily represent the true state of morbidity for chlamydia and gonorrhea in Georgia. Moreover, this study used Georgia as the standard to calculate the adjusted rates because the intent was to estimate trends only in the state. However, the use of this standard prohibits a direct comparison of infection rates to areas outside of Georgia.

Lastly, this study is limited because it was unable to assess other social and economic factors contributing to risk. Age, gender, race, and geographic residence (urban vs rural) were the only factors considered in this analysis. Therefore, this research was unable to account for many factors known to be associated with risk of STD infection, including socio-economic status,

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education, or religiosity. Readers should be cautioned to consider the possibility of an ecological fallacy when interpreting the results of this study.

Further Implications

The State of Georgia continues to report two of the most common sexually transmitted infections at an alarming rate. The disproportionate impact of minorities is evident, although further assessment of the variation between urban and rural areas is warranted, as found in this study. Targeted interventions to modify sexual behaviors should rely on individual and community-level approaches to reduce the risk of infection in Georgia. Further, these targeted interventions should utilize a theoretical framework and should be tailored to ensure cultural competence. To achieve the objective of promoting population-level risk behavior reduction, individual and community-level interventions must attempt to bring about changes in safer sex knowledge, attitudes, intentions, and peer norms among members of the entire target population.

According to the CDC, the prevention and control of STD transmission is based on the following five major concepts: a) education and counseling of persons at risk on ways to adopt safer sexual behavior; b) identification of asymptomatically infected persons and of symptomatic persons unlikely to seek diagnostic and treatment services; c) effective diagnosis and treatment of infected persons; d) evaluation, treatment, and counseling of sex partners of persons who are infected with an STD; and e) pre-exposure vaccination of persons at risk for vaccine-preventable STD infection (CDC: Sexually Transmitted Diseases Treatment Guidelines, 2002).

Physicians and other health-care providers play a critical role in preventing and treating STD infection. Prevention messages should be tailored to the patient, with consideration given to the patient's specific risk factors for a given STD. Moreover, messages should include a description of specific actions that the patient can take to avoid acquiring or transmitting an STD (e.g., abstinence from sexual activity if STD-related symptoms develop). If risk factors are identified, providers should encourage patients to adopt safer sexual behaviors. Counseling skills (e.g., respect, compassion, and a nonjudgmental attitude) are essential to the effective delivery of prevention messages. Techniques that can be effective in facilitating rapport with the patient include using open-ended questions, using understandable language, and reassuring the patient that treatment will be provided regardless of circumstances unique to individual patients (including ability to pay, citizenship or immigration status, language spoken, or lifestyle).

Interactive counseling approaches directed at a patient's personal risk, the situations in which risk occurs, and use of goal-setting strategies are effective in STD prevention (CDC MMWR, 2001). In addition to prevention counseling, certain videos and large group presentations that provide explicit information about how to use condoms correctly have been effective in reducing the occurrence of additional STD infection among persons at high risk, including clinic patients and adolescents. Results from randomized controlled trials demonstrate that compared with traditional approaches to providing information, certain brief risk reduction counseling approaches can reduce the occurrence of new sexually transmitted infections by 25% to 40% among STD clinic patients (Kamb, Fishbein, Douglas, et al, 1998).

Interactive counseling strategies can be effectively used by most health-care providers, regardless of educational background or demographic profile. High-quality counseling is best ensured when clinicians are provided basic training in prevention counseling methods and skills building approaches, periodic supervisor observation of counseling with immediate feedback to counselors, periodic counselor and/or patient satisfaction evaluations, and regularly scheduled meetings of counselors and supervisors to discuss difficult situations. Prevention counseling is believed to be more effective if provided in a non-judgmental manner appropriate to the patient's culture, language, sex, sexual orientation, age, and developmental level. Although study limitations are evident, findings from this research can be used initially target at-risk populations at the county level. Moreover, this research may serve as a catalyst for local public health professionals to more diligently seek out vulnerable populations for more intense prevention and health promotion efforts.

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