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Examination of the ecological correlation between rates of pregnancy termination and spatial proximity to family planning services in Georgia, 2006

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Examination of the ecological correlation between rates of pregnancy termination and spatial proximity to family planning services in Georgia, 2006

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An abstract of

A thesis submitted to the Faculty of the
Rollins School of Public Health of Emory University

in partial fulfillment of the requirements for the degree of
Master of Public Health
in Epidemiology

2011

ABSTRACT

Examination of the ecological correlation between rates of pregnancy termination and spatial proximity to family planning services in Georgia, 2006

By Vita Lam Mayes

The overall U.S. abortion rate has reached a plateau after a multi-year decline; however, the rate of abortion occurring in Georgia is back on the rise, with the highest incidence being among young, low-income, minority women. Publicly-funded family planning services, such as Title X clinics, offer contraceptive availability and services particularly to vulnerable populations with a goal of decreasing the rate of unintended pregnancies and, in turn, effectively reducing the abortion rate. As an indirect measure of program impact, this study examines the geographic distribution of Title X family planning clinics in Georgia and its association with the abortion rate. We hypothesize an inverse relationship exists between the rate of pregnancy termination for a geographic area and the spatial accessibility to the nearest Title X family planning clinic in the given area.

The 2006 Georgia ITOP (Induced Termination of Pregnancy) file was utilized with written permission from the state of Georgia Department of Public Health. The rate of abortion occurring on a zip code level was calculated and compared to the spatial proximity of the centroid of each zip code to the nearest Title X family planning services across Georgia.

Abortion rates were highest among non-Hispanic Blacks, 20-24 year olds, predominantly poor regions, and metropolitan areas. When adjusting for all factors (distance, age, ethnicity/race, neighborhood poverty, and rural/urban coding), the effect of distance from clinic to centroid of zip code showed a consistent linear pattern between distance and abortion rate, with closest proximity having the highest rates of abortion and farthest distance having lowest rates of abortion.

Although this association was opposite our hypothesized direction, we do not conclude that spatial proximity plays a causal role in increased abortion rates. Perhaps geographic access is not a barrier to women receiving family planning services in Georgia, or spatial proximity and access are not as connected as we thought and other factors may be confounding the observed spatial correlation. Increased efforts to reduce abortion rates should extend beyond increasing the number of family planning clinics, and also include greater patient outreach and education, particularly to young, minority, low-income women.

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ACKNOWLEDGEMENTS

This thesis exists thanks to the help, support, and contributions of several people. I would like to acknowledge my thesis advisors, Michael Kramer and Carol Hogue, and my field advisor, Anne Dunlop. I thank them all for being so patient and supportive through this writing process, and I cannot thank them enough for the time, effort, and assistance they contributed to make this happen, individually and collectively. Their help and guidance has been invaluable throughout this process and this thesis could not have been completed without them, and I sincerely appreciate and thank them.

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CHAPTER I: BACKGROUND AND LITERATURE REVIEW

Introduction

By the age of 45, approximately 50% of U.S. women will have had an unintended pregnancy - a proportion that distinguishes the United States as having one of the highest overall rates among developed countries [1, 2]. Forty percent of these unintended pregnancies (or approximately 22% of all pregnancies) will end in induced abortion. It is estimated that 10% of U.S. women will have had an abortion by age 20, 25% by age 30, and 30% by age 45 [1].

From 1973 through 2005, more than 45 million legal abortions took place in the United States alone [1]. Controlling unintended pregnancy is a public health necessity, because women with unintended pregnancies who choose to continue the pregnancy are at increased risk of receiving inadequate or delayed prenatal care and are more likely to engage in harmful behaviors prenatally such as smoking and drinking [3]. In turn, they are more prone to experience pregnancy complications and poorer pregnancy outcomes including low birth weight, preterm delivery, infant mortality, and maternal morbidity and mortality. Children that result from these pregnancies are more likely to experience developmental delays, learning disabilities, and have lower quality maternal-child relationships [4]. These risks are further magnified for adolescent mothers whose children born from unintended pregnancies more often experience neglect, behavioral problems, and poverty. These unintended pregnancies and poor outcomes are oftentimes repeated in a cycle due to the low accessibility and attainability of health services and contraception in vulnerable populations, particularly among minority and low socioeconomic status (SES) women [4, 5].

Over the past several decades, contraceptive usage has become increasingly prevalent in the United States. This is principally due to women’s desire to limit family size and avoid unintended

pregnancies, combined with the increasing availability and accessibility of a variety of contraceptive methods. Despite an increasing prevalence in contraceptive use, the incidence of unintended pregnancy and subsequent abortions remains unacceptably high [6].

Public health efforts to combat this problem have been attempted. Government policies for abstinence promotion and abstinence-only sex education, in theory, had a worthwhile goal of preventing unintended pregnancies and sexually transmitted infections (STI). However, some studies have shown that when put to the test, these programs did not positively or negatively impact teen pregnancy or STI risk [7-10]. One longitudinal study showed that although some teenagers did delay the initiation of sexual intercourse, they were less likely to use contraception or seek STI screenings once they initiated sexual activity [11]. Accordingly, alternative efforts were set forth, and competing evidence showed that comprehensive sex and HIV education programs achieve a greater reduction in the rate of unintended pregnancies by delaying sexual initiation, increasing contraceptive use, and decreasing teen pregnancy [10]. Thus, abstinence-only-promoted education may not be as efficient as originally planned and may possibly hinder the promotion of other preventive behaviors that are much more likely to be effective.

Preliminary studies that support this stage of the research

Bongaarts and Westoff [6] found that the total abortion rate is inversely related to the prevalence of contraception use, the effectiveness of contraceptive methods, and lower fertility preferences. Alongside these findings, their research suggests that the total abortion rate is directly related to the rate of unintended pregnancy. This led to the belief that by increasing the prevalence of contraceptive use and the availability and accessibility of effective methods via family planning services, an inevitable decline would be seen in pregnancies, unintended pregnancies, and induced abortion. Furthermore, it is projected that once highly effective contraceptive method use

rises to 80% among women of reproductive age, the potential demand for abortion, and its incidence, will fall [12].

Previous studies suggest that the availability of publicly funded family planning services for women produces public health benefits - especially in terms of providing public assistance for those in financial difficulties and increasing the availability of options to prevent unintended pregnancies [13]. Studies have shown that when contraceptives are not used or fail, a woman's likelihood of having an abortion to avoid an unintended birth increases [12]. This non-use of a method of birth control is greatest for those who are young, poor, Black, Hispanic, or less educated. Therefore, increasing availability of contraceptive services to women of this group would be of greatest benefit to reduce abortion rates [13].

Studies have also been done to examine whether accessibility to contraceptive use affects rates of unintended pregnancies. Investigations in several other countries showed that areas with increased availability and accessibility to family planning services were associated with increased contraceptive use and controlled fertility. In contrast, areas that lacked family planning services had higher rates of unintended pregnancies and abortions [12]. However, another study recently done by Goodman et al [14] had different results. In their study in Alabama, Ohio, Oklahoma, and Washington State, they defined accessibility to contraceptive services as the time it took to drive to the closest family planning clinic and looked at the relationship of accessibility with the risk of unintended pregnancies. They used State Pregnancy Risk Assessment Monitoring System (PRAMS) and natality files to track unintended and teenage births, respectively. Their results did not demonstrate a statistically significant trend between longer travel time and higher risk of unintended pregnancies, leading to the notion that perhaps differential geographic access does not

explain the continuing high occurrence of unintended pregnancies. However, they made note that their study was not nationally representative and requires comparable analyses in other states.

Significance and justification for current study

Despite popular belief, a majority of abortions in the United States do not occur among teens. Current statistics show that only 2 in 10 abortions occur among teens, with most of those occurring in the older age bracket (age 18-19). Women in their 20s account for more than half of all abortions. However, age is not the only correlate influencing abortion rates. Race and ethnicity are also important related factors. Black and Hispanic women are disproportionately likely to have an abortion because of the increased rate of unintended pregnancy among these groups (69% and 54% respectively) [1, 15]. Another significant factor that comes into play is income. From 1987 to 1994, patterns of abortion rates were comparable among lower- and higher-income women, but rates have drastically diverged since then [16]. Over the past decade, the overall unintended pregnancy rate has stayed relatively constant; however, category-specific rates have changed: the rate of unintended pregnancy among poor women actually increased 29% while decreasing by 20% among higher-income women [1]. Evidence has shown that lower SES women are more likely to have earlier initiation of sexual intercourse and subsequent adolescent pregnancy [4]. In 2008, women who had incomes below 100% of the federal poverty level obtained more than 40% of all abortions, further illustrating that lower SES women are at an increased risk of unintended pregnancy and abortion outcomes [1, 4, 15]. It is conjectured that the differences in access and availability of contraceptives drive the observed differences in unintended pregnancy rates (and subsequent abortion rates) by socioeconomic status. These statistics give further evidence for the increased need to direct resources, availability of contraceptive use, sex education, and funding towards the populations with this unmet need: young, poor, Black or Hispanic women.

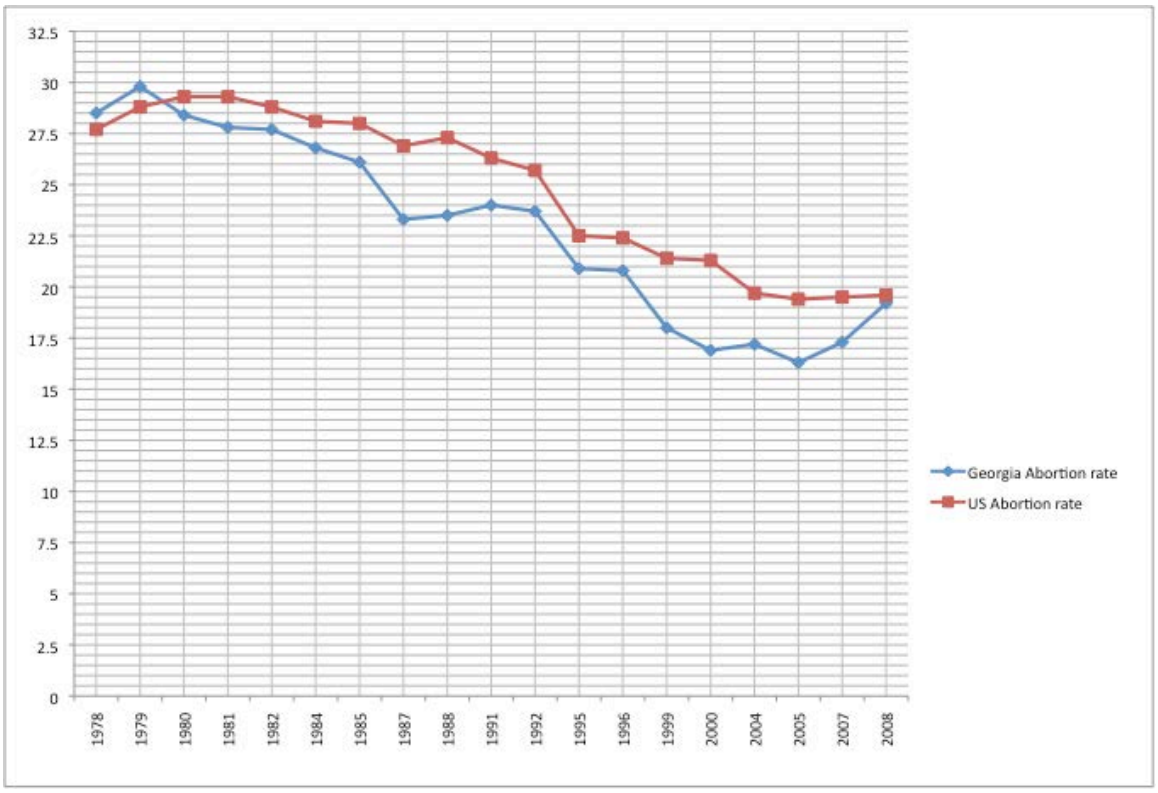
The Guttmacher Institute, a non-profit organization that works for the advancement of sexual and reproductive health and rights [1], estimates that the typical American woman spends approximately three quarters of her reproductive years avoiding pregnancy. However, not all women are successful at preventing unintended pregnancy. Fifty-four percent of women who have abortions had used contraception during the month they became pregnant. Thus, the majority of pregnancies ending in abortions are due to inconsistent or improper use of contraceptives. And even if contraception was consistently used, there is no contraceptive method that is 100% effective and a residual need for abortion would always exist [6, 12]. However, evidence shows that if condoms were also used alongside other highly effective contraceptive measures, an estimated 80% of unplanned pregnancies and abortions could be prevented [17].

Still, a substantial proportion of pregnancies ending in abortion (46%) are to women who had not used a contraceptive method during the month they became pregnant. An additional 8% of women who have abortions never used any form of birth control in their lifetime, with the greatest non-use being among young, less-educated, low-income, Black or Hispanic women [2, 18]. Many minority and low income women either simply did not think that they would get pregnant or were apprehensive about the use of contraception; further, among women using contraception, minority and low income groups tend to have higher rates of contraception failure or discontinuation compared to white and higher SES women [4, 19, 20]. This suggests the importance of minimizing the need for abortion by reducing unintended pregnancies through the provision of more education in schools and public settings that dispel certain misbeliefs and fears women may have and that inform them about the pros and cons of various contraceptive methods, the consequences of unprotected intercourse and unintended pregnancy, the proper use of the most effective contraceptive strategies, and the accessibility of inexpensive and confidential services [6, 13].

Georgia statistics

Currently, abortions in Georgia represent 3.3% of all abortions in the United States [19]. In 2008, the Guttmacher Institute estimated that a total of 39,820 women obtained abortions in Georgia, generating a rate of 19.2 abortions per 1000 women of reproductive age (15-44). This is an18% increase from 2005 when the rate was 16.3 per 1000 women (Figure 1.1) [19, 21, 22]. This "state of occurrence" rate is based on the total number of abortions that occurred in Georgia, including women coming from other states, particularly neighboring states. When calculating the abortion rate of women who reported residence in Georgia, the rate (per 1000 women aged 15-44) was actually at a low compared to 1978 data when it was at its highest at 28.2 (Figure 1.2). This decline is comparable to national abortion rates of 27.7 in 1978 and 19.4 in 2005 [23]. This discrepancy in abortion rates may imply that Georgia has become an abortion destination site for women from neighboring states in the last few years. Although rates declined on the whole by "state of residence," the rates between lower- and higher-income women have continued to become increasingly disparate, with abortions becoming increasingly concentrated among poor women [15].

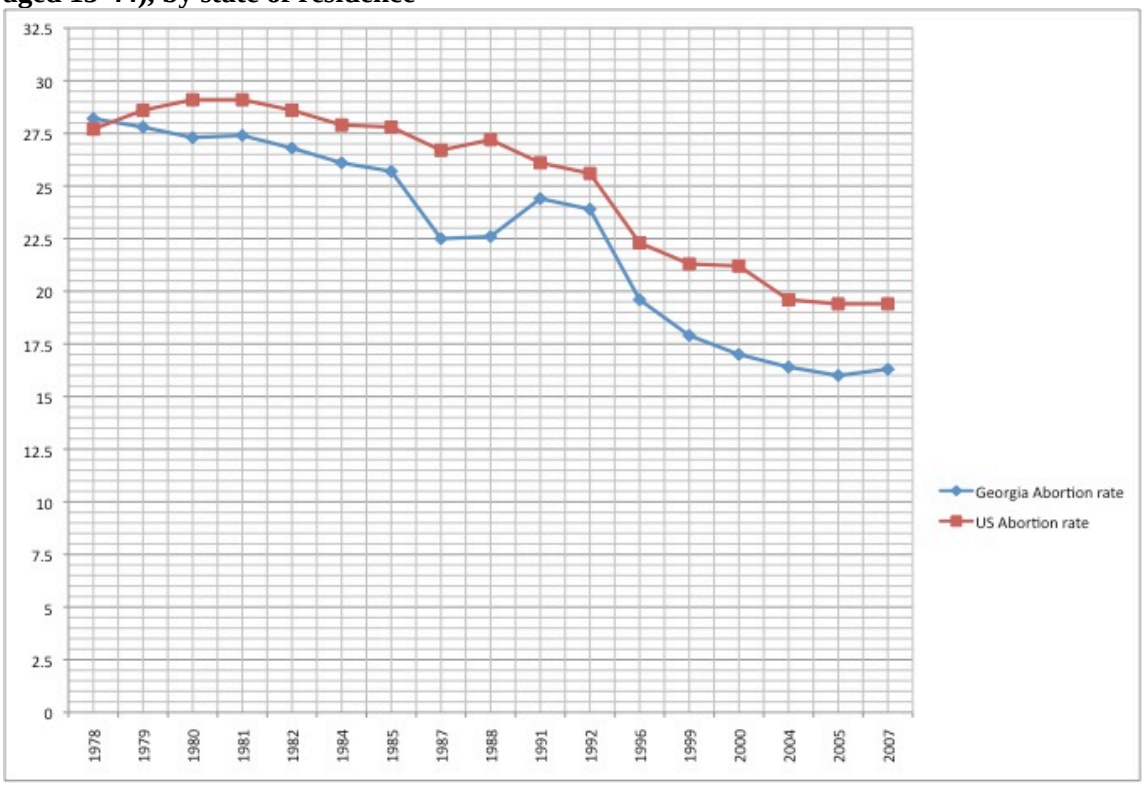
Figure 1.1. US and Georgia Abortion Rates (The number of abortions per 1000 women aged 15-44), by state of occurrence



Adapted from http://www.guttmacher.org

Source: (For 1973-2008) Abortion Incidence and Access to Services in the United States, 2008, Jones RK and Kooistra K, 2011.

Figure 1.2. US and Georgia Abortion Rates (The number of abortions per 1000 women, aged 15-44), by state of residence



Adapted from http://www.guttmacher.org

Sources:
(For 1978-2004) Trends in the Characteristics of Women Obtaining Abortions, 1974-2004, Henshaw SK and Kost K, 2008.

(For 2005) CDC 2005 Abortion Surveillance Report and unpublished tabulations of data from the Guttmacher Abortion Provider Surveys.

(For 2007) CDC 2007 Abortion Surveillance Report and unpublished tabulations of data from the Guttmacher Abortion Provider Surveys.

Importance of publicly funded family planning services

Approximately 36.2 million U.S. women of reproductive age (13-44) were estimated to be in need of contraceptive care in 2006 because they were sexually active, fecund, and not currently pregnant or trying to get pregnant. Some 17.5 million of them were in need of *publicly funded* services and supplies, equating to approximately half of that population [24]. Age and income have become the two greatest determining factors for whether or not women seek family planning services at public funded versus private clinics. Older and financially stable women were more likely to seek family planning services with private providers rather than publicly funded ones. In contrast, younger and financially disadvantaged women tend to obtain contraceptive services at publicly funded clinics [25]. Seventy-one percent (12.4 million) of clients in these clinics were low-income adults. Another 29% of them (5.1 million) were younger than 20 [24]. Contraceptive access and availability are vital to these women because they are far less likely to use any method of contraception when at risk for unintended pregnancy as well as the most likely to experience contraceptive failure [25]. From 2000 to 2006, there was an increase of more than one million women (approximately 7%) who needed publicly funded family planning services and supplies. In the U.S., forty percent of women of reproductive age have no health insurance coverage [1, 19, 26]. This further underscores the need for publicly funded services to provide greater assistance for young, economically disadvantaged women to gain access to the most reliable contraceptive methods and to promote consistent and effective use [25].

Title X-funded family planning services

Title X of the Public Health Service Act, enacted in 1970, is the only federal program in the U.S. devoted specifically to supporting family planning and reproductive health services, particularly serving the uninsured population who cannot afford private health care services. Title X-funded services provide voluntary, confidential reproductive health services, including educational

services and nondirective counseling on abstinence and contraceptive methods. Additional services offered include reproductive health services such as pregnancy testing; screening for breast cancer, cervical cancer, and sexually transmitted infections; breast and pelvic exams; hypertension and blood pressure measurement; as well as prenatal, postpartum and well-baby care [27-29]. Furthermore, Title X services promote confidentiality and are much more likely than private physicians to serve adolescents and minors without the need of parental permission, a characteristic that is a major deciding factor for many young women who seek care [30].

Most Title X patients are low-income women who are uninsured and ineligible for Medicaid (a state-administered funding program that covers health services based on income and eligibility [31]) - so, it is of no surprise that 6 out of 10 women who utilize Title X clinics use them as their only source of basic health care [32]. Women at or below the federal poverty level receive fully subsidized services, and women whose income is above the poverty level are able to receive services according to a standardized fee schedule: women with an income over 100 but less than 250 percent of the poverty level are charged on a sliding scale; and women with income over 250 percent of poverty are charged full fees [27]. In recent years, funding for the Title X family planning program had been an issue, but there is strong evidence that funding through Title X has a great impact on public health outcomes including birth rates, abortion rates, delayed prenatal care, and infant and neonatal mortality [33]. In 2008, Title X family planning services helped women avoid 973,000 unintended pregnancies, thereby preventing an estimated 433,000 births and 406,000 abortions nationally. This estimates taxpayers' total savings of $3.4 billion, which adds up to approximately $3.74 saved for every $1 spent on contraceptive care availability [34]. A recent publication has verified that it is economically more sound for taxpayers' money to go towards providing contraceptives than to compensate for the prenatal, labor, and delivery care of unintended pregnancies and the post-partum and neonatal care thereafter [35]. Without Title X-

funded services, it has been conjectured that U.S. unintended pregnancies and abortions would be nearly two-thirds higher among women overall- with the number of unintended pregnancies among poor women nearly doubling [36]. In the past, funding for Title X remained relatively stable when inflation was taken into account, thereby making access to family planning services more difficult for the economically disadvantaged in this time of recession [29]. Therefore, it is crucial to increase funding for these services to keep up with the demands of advancing technology and a diverse patient population [30]. Fortunately in recent years, funding for Title X has been appreciated. Congress had passed the FY'11 spending bill which includes $327 million for the Title X family planning program, an increase of $10 million each year for the past two years [28].

In 2006 in Georgia alone, unintended pregnancies resulting in live births cost approximately $696 million in public costs, including $422 million in federal costs, and $274 million in state costs [19]. These data reflect the importance of public funding for family planning services that could have prevented many of these unintended pregnancies from occurring in the first place. In 2006, there were 250 family planning clinics supported by Title X family planning program in Georgia providing contraceptive care with at least one publicly funded family planning clinic in each county. These clinics served 165,600 women, including 40,200 teenagers. That year, Georgia's Title X–supported clinics helped women avert approximately 34,100 unintended pregnancies, which prevented about 15,200 births and 14,200 abortions [24, 26, 33, 36]. In 2008, Title X services helped Georgia save $167,502,000 in public funds by avoiding unintended pregnancies and subsequent births [37].

In summary, research has shown that increasing contraceptive use results in a decrease in abortion incidence in settings where fertility is constant [12]. Thus, by providing increased access

to contraceptive services for populations most in need, an eventual decline in unintended pregnancies and subsequent abortions would theoretically be seen. However, accessibility encompasses a complex number of influential factors, including proximity to the nearest clinic, transportation, opening hours of a facility, patient fees, patient SES, and cultural and language barriers [14]. So, for this study, we will explore the ecological and spatial distribution of Title X family planning clinics in geographic regions of Georgia and the potential relationship of clinic proximity with the rate of pregnancy termination, specifically in the year 2006. We hypothesize an inverse relationship exists between the rate of pregnancy termination for a geographic area and the spatial accessibility to contraception/ family planning services.

CHAPTER II: MANUSCRIPT

Examination of the ecological correlation between rates of pregnancy termination and spatial proximity to family planning services in Georgia, 2006

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ABSTRACT

Introduction: Title X clinics offer contraceptive services, particularly to vulnerable populations such as young, low-income, minority women, with goals of decreasing the rate of unintended pregnancies and abortions. As an indirect measure of program impact, this study examines the geographic distribution of Title X family planning clinics in Georgia, and the potential relationship of clinic proximity with rates of pregnancy termination.

Methodology: In 2006, a record of abortions that occurred in Georgia was utilized with written permission from the state of Georgia Department of Public Health. The rate of abortion occurring by zip code area was calculated and compared to the distribution of Title X family planning services across Georgia.

Results: Abortion rates were highest among non-Hispanic Blacks, 20-24 year olds, in predominantly poor regions, and in metropolitan areas. When adjusting for all factors, the effect of distance from clinic to centroid of zip code showed a consistent linear pattern on abortion rate, with closest proximity having highest rates of abortion and farthest distance having lowest rates of abortion.

Discussion: We do not conclude that close proximity plays a causal role in increased abortion rates. Perhaps geographic access is not a barrier to receiving family planning services in Georgia, or spatial proximity and access are not as connected as thought and other confounding effects associated with family planning clinic location and abortion rates exist. Efforts to reduce abortion rates should extend beyond increasing the number of clinics, and include greater patient outreach and education, particularly to young, minority, low-income women.

INTRODUCTION

By the age of 45, approximately 50% of U.S. women will have had an unintended pregnancy- a proportion that distinguishes the United States as having one of the highest overall rates among developed countries [1, 2]. Forty percent of unintended pregnancies (or approximately 22% of all pregnancies) in the United States end in induced abortion, amounting to more than 45 million legal abortions from 1973 through 2005 [1].

Reducing unintended pregnancy is a public health necessity, because women with unintended pregnancies who choose to continue the pregnancy are at increased risk of receiving inadequate or delayed prenatal care and are more likely to engage in harmful behaviors prenatally such as smoking and drinking [3]. In turn, they are more prone to experience pregnancy complications and poorer pregnancy outcomes including low birth weight, preterm delivery, infant mortality, and maternal morbidity and mortality. Children that result from these pregnancies are more likely to experience developmental delays, learning disabilities, and have lower quality maternal-child relationships [4]. These risks are further magnified for adolescent mothers whose children born from unintended pregnancy more often experience neglect, behavioral problems, and poverty. These unintended pregnancies and poor outcomes are oftentimes repeated in a cycle due to the low accessibility and attainability of health services and contraception in vulnerable populations, particularly among minority and low socioeconomic status (SES) women [4, 5].

Preliminary studies supporting this stage of the research

Bongaarts and Westoff [6] found that the total abortion rate is inversely related to the prevalence of contraception use, the effectiveness of contraceptive methods, and lower fertility preferences. Alongside these findings, their research suggests that the total abortion rate is directly related to the rate of unintended pregnancy. This led to the belief that by increasing the prevalence of

contraceptive use and the availability and accessibility of effective methods via family planning services, an inevitable decline would be seen in pregnancies, unintended pregnancies, and induced abortion. Furthermore, it is projected that once highly effective contraceptive method use rises to 80% among women of reproductive age, the potential demand for abortion, and its incidence, will fall [12].

Previous studies suggest that the availability of publicly funded family planning services for women produces public health benefits - especially in terms of providing public assistance for those in financial difficulties and increasing the availability of options to prevent unintended pregnancies [13]. Studies have shown that when contraceptives are not used or fail, a woman's likelihood of having an abortion to avoid an unintended birth increases [12]. This non-use of a method of birth control is greatest for those who are young, poor, Black, Hispanic, or less educated. Therefore, increasing availability of contraceptive services to women of this group would be of greatest benefit to reduce abortion rates [13].

Investigators have also examined whether accessibility to contraceptive use is associated with reduced rates of unintended pregnancies. Outside the United States, various studies have found that areas with increased availability and accessibility to family planning services have increased contraceptive use and controlled fertility. In contrast, areas that lacked family planning services had higher rates of unintended pregnancies and abortions [12]. However, within the United States, a study that specifically examined geographic accessibility did not find a statistically significant trend between longer travel time to family planning clinics and higher risk of unintended pregnancies [14].

Significance and justification for current study

Despite popular belief, a majority of abortions in the United States do not occur among teens. Current statistics show that only 2 in 10 abortions occur among teens, with most of those occurring in the older age bracket (age 18-19). Women in their 20s account for more than half of all abortions. However, age is not the only correlate influencing abortion rates. Race and ethnicity are also important related factors. Black and Hispanic women are disproportionately likely to have an abortion because of the increased rate of unintended pregnancy among these groups (69% and 54% respectively) [1, 15]. Another significant factor that comes into play is income. From 1987 to 1994, patterns of abortion rates were comparable among lower- and higher-income women, but rates have drastically diverged since then [16]. Over the past decade, the overall unintended pregnancy rate has stayed relatively constant; however, category-specific rates have changed: the rate of unintended pregnancy among poor women actually increased 29% while decreasing by 20% among higher-income women [1]. In 2008, women who had incomes below 100% of the federal poverty level obtained more than 40% of all abortions, further illustrating that lower SES women are at an increased risk of unintended pregnancy and abortion outcomes [1, 4, 15]. These statistics give further evidence for the increased need to direct resources, availability of contraceptive use, sex education, and funding towards the populations with this unmet need: young, poor, Black or Hispanic women.

Because contraceptive methods are not 100% effective, consistent use does not always protect women from unintended pregnancies. Approximately 54% of women who have abortions reported using contraception during the month they became pregnant [1], illustrating the importance of educating women on the most effective contraceptive strategies they can practice, such as utilizing condoms in concordance with other highly effective contraceptive measures [17]. Still, a substantial proportion of pregnancies ending in abortion (46%) are to women who

had not used a contraceptive method during the month they became pregnant. An additional 8% of women who have abortions never used any form of birth control in their lifetime, with the greatest non-use being among young, less-educated, low-income, Black or Hispanic women [2, 18].

Importance of publicly funded family planning services

Approximately 36.2 million U.S. women of reproductive age (13-44) were estimated to be in need of contraceptive care in 2006 because they were sexually active, fecund, and not currently pregnant or trying to get pregnant. Some 17.5 million of them were in need of *publicly funded* services and supplies, equating to approximately half of that population [24]. Age and income have become the two greatest determining factors for whether or not women seek family planning services at public funded versus private clinics. Older and financially stable women were more likely to seek family planning services with private providers rather than publicly funded ones. In contrast, younger and financially disadvantaged women tend to obtain contraceptive services at publicly funded clinics [25], where 71% (12.4 million) were low-income adults and 29% (5.1 million) were younger than 20 [24]. Contraceptive access and availability are vital to these women because they are far less likely to use any method of contraception when at risk for unintended pregnancy and are the most likely to experience contraceptive failure [25].

Title X-funded family planning services

Title X of the Public Health Service Act, enacted in 1970, is the only federal program in the U.S. devoted specifically to supporting family planning and reproductive health services, particularly serving the uninsured population who cannot afford private health care services and are ineligible for Medicaid [28] - so, it is of no surprise that 6 out of 10 women who utilize Title X clinics use them as their only source of basic health care [32]. Strong evidence demonstrates that Title X

programs have a great impact on public health outcomes including birth rates, abortion rates, delayed prenatal care, and infant and neonatal mortality [33]. In 2008, Title X family planning services helped women avoid 973,000 unintended pregnancies, thereby preventing an estimated 433,000 births and 406,000 abortions nationally [34]. A recent publication has also verified that it is economically more sound for taxpayers' money to go towards contraceptive provisions than to compensate for the prenatal, labor, and delivery care of unintended pregnancies and the post-partum and neonatal care thereafter [35]. Without Title X-funded services, it has been conjectured that U.S. unintended pregnancies and abortions would be nearly two-thirds higher among women overall- with the number of unintended pregnancies among poor women nearly doubling [36].

In 2006 in Georgia alone, unintended pregnancies resulting in live births cost approximately $696 million in public costs, including $422 million in federal costs, and $274 million in state costs [19]. These data reflect the importance of public funding for family planning services. In 2006, there were 250 family planning clinics in Georgia supported by the Title X family planning program, with at least one publicly funded family planning clinic in each county. These clinics served 165,600 women, including 40,200 teenagers, helping them to avert approximately 34,100 unintended pregnancies, which prevented about 15,200 births and 14,200 abortions [24, 26, 33, 36]. In 2008, Title X services helped Georgia save $167,502,000 in public funds by avoiding unintended pregnancies and subsequent births [37].

Thus, providing increased access to contraceptive services for populations most in need should lead to an eventual decline in unintended pregnancies and subsequent abortions. However, accessibility encompasses a complex number of influential factors, including proximity to the nearest clinic, transportation, opening hours of a facility, patient fees, patient SES, and cultural and language barriers [14]. This analysis utilizes abortion information from 2006 in Georgia to

examine the association of spatial accessibility to the contraception/family planning services with abortion rates. We hypothesize an inverse relationship exists between the rate of pregnancy termination and the spatial accessibility to Title X family planning clinics for a geographic area.

METHODOLOGY

Data sources

We mapped the geographic location of all the Title X-funded family planning clinic sites distributed across Georgia for the year 2006 utilizing the directory from the US Office of Population Affairs [38]. For a record of all the induced pregnancy terminations occurring in the state of Georgia in the year 2006, use of the Induced Termination of Pregnancy (ITOP) file was granted by the Georgia Department of Public Health, Office of Health Indicators for Planning (OHIP) [39]. Specific variables within the ITOP data set included: event year, maternal age, maternal ethnicity and race, and maternal residence at the zip code level. We only included women who reported residence in Georgia. The American Community Survey (ACS) of the U.S. Census Bureau provided the total number of female residents by age and racial/ethnic group for each census tract in Georgia [40]. Because the 2005-2009 ACS did not have Zip Code Tabulation Areas (ZCTA) (a statistical geographic entity representing U.S. Postal Service zip code service areas) and the census tract data and ITOP file were on the zip code level, we used the U.S. Department of Housing and Urban Development (HUD) United States Postal Service (USPS) zip code crosswalk file to link the two files by identifying the proportion of census tract that contributes to each zip code [41]. Not all women are at risk for unintended pregnancy due to age- and race-specific differences in contracepting and sterilization. The 2006-2010 National Survey of Family Growth (NSFG) data file from the Centers for Disease Control and Prevention website was used to estimate the age- and race-specific women “at-risk” of an unintended pregnancy; this would theoretically be the subgroup of women from which abortions occurred in Georgia [42].

The 2005-2009 American Community Survey 5-year estimates provided us with census data on the poverty level for each census tract in Georgia [40]. Rural Urban Commuting Area Codes (RUCAs) were accessed through the WWAMI Rural Health Research Center [43]. They provided a classification scheme that utilizes zip code approximations of rural-and urban-defined areas in Georgia in 2006.

Population at risk of unintended pregnancy

Past studies utilized the NSFG definition of women who are considered to be "at risk" of unintended pregnancy. NSFG defines the "at risk" woman to be all women of reproductive age (15-44 years), which includes sterilized women and women relying on partner sterilization. However, studies that include these women greatly underestimate the risk-taking behavior for groups that were previously thought to be at lower risk of unintended pregnancy, such as older women. This is due to the fact that sterile women, a higher proportion of older women, are at very minimal risk of pregnancy [44]. Additionally, sterilization usage varies across demographics. Black and Hispanic women are more likely to use female sterilization methods (22% and 20% respectively). In contrast, only 16% of white females use sterilization for permanent contraception. The reverse is seen for partner sterilization. Eight percent of white women in America rely on male sterilization to prevent pregnancy, while Black and Hispanic women account for 1% and 3% respectively [18]. Because past studies did not account for these variables, previous estimates show distorted results that are likely underestimated or overestimated for certain populations. In order to obtain adjusted estimates of the number of women who are at risk of unintended pregnancy, we utilized the 2006-2010 National Survey of Family Growth (NSFG) female respondent data file to obtain a risk estimate for various age and race combinations based on their particular contraceptive status. We defined women at-risk who were sexually active, fecund, age 15-44, and utilizing non-permanent contraception (factoring in

the possibility of misuse or contraceptive failure) or no contraception. We included women who may have reported partner sterilization due to the fact that they are still fecund and cannot prove monogamy (refer to [44] for detailed means of calculation). Understandably, the population of "at-risk" women can include females younger than 15 years of age and older than 44; however, the percentage in our dataset is negligible to our study (0.49% and 0.19% respectively), and therefore was excluded. The population prevalence of women at risk was calculated separately by age category and ethnicity/race (non-Hispanic White, non-Hispanic Black, Hispanic, and Other).

Percentage of zip code below poverty status

Because poverty level was not assigned individually to each respondent in our pregnancy termination file, a calculated estimate from the Georgia census data had to be utilized to attain a poverty status on the census tract level. The number of female respondents who reported an income below the poverty level in the past twelve months was tabulated per census tract. The HUD Crosswalk file was used to combine census tract and zip code data, allowing us to calculate the percentage of females below poverty level per zip code. We subcategorized them into four groups: 0-10% of the zip code below poverty level, between 10 and 20% of the zip code below poverty level, between 20 and 30% of the zip code below poverty level, and greater than 30%. Certain zip codes from the crosswalk file were listed as commercial areas with nobody physically living there; however, there was a small number of women (1.1%, n=293) who had abortions in 2006 that reported residence in those particular zip codes. Additionally, there were some zip code discrepancies between the ITOP file and the population denominator file, where population data did not exist for several zip codes in the crosswalk file, but the ITOP data listed women (5.2%, n=1412) who had abortions living in those areas. Since we did not have a base population in those zip codes, women with pregnancy terminations who reported residence in these zip codes were excluded.

RUCA classification

In order to aggregate the zip codes into specific geographic characteristics defined as urban or rural areas, we grouped the data into three separate categories as suggested by WWAMI Rural Health Research Center (RHRC): 'urban' (considered as large metropolitan area with greater than 50,000 residents), 'large rural city/town' (also referred to as micropolitan areas consisting of 10,000-49,999 population), and 'small and isolated small rural town' with less than 10,000 individuals [43].

Measures of spatial accessibility

Spatial proximity to Title X family planning clinics was estimated as the quintile distribution of distance in meters from the centroid of each ZCTA (defined as the approximated geographical center of each zip code) and the geocoded street address of the closest Title X family planning clinic. Spatial joining and measurement of distance was calculated in ArcGIS 9.3.

Statistical Methods

The physical addresses of all 242 Title X publicly-funded family planning clinic sites in Georgia for the year 2006 were geocoded using ArcGis (ArcMapVersion 10). Next, we used the American Community Survey data files to characterize each zip code in Georgia with regard to key population-level characteristics (*e.g.*, proportion of households below the federal poverty line, and with characteristics such as race/ethnicity and age). The NSFG race- and age-specific estimates were used to estimate the proportion of the base population "at risk" of unintended pregnancy in each census tract and HUD tract-zip code crosswalk file were used to aggregate the population at risk in each zip code area. We then utilized Georgia's pregnancy termination file to calculate the number pregnancy terminations occurring for each of the state's zip codes for 2006. For each ZCTA, an abortion rate was calculated based upon the total number of terminated

pregnancies over the total number of women of reproductive age (15-44 years) at risk of unintended pregnancy residing in the geographic area. The covariates were variables that were both included in our dataset and in past studies shown to be associated with unintended pregnancies. These variables included the woman's age category (15-17, 18-19, 20-24, 25-29, 30-34, and 35-44), ethnicity and race (non-Hispanic White, non-Hispanic Black, Hispanic, and other), percentage poverty per zip code (0-10%, 10-20%, 20-30%, and 30+%), geographical characteristic (metropolitan/urban, micropolitan/large rural, and small/isolated rural town), and distance in meters away from the closest Title X family planning clinic (0-4000, 4000-7000, 7000-11000, 11000-15000, and 15000+ meters). Distance categories were based on the quintile distribution of abortion rates occurring from the ITOP file. The sum of all abortions per variable was calculated using Statistical Analysis System (SAS Institute, Inc., Cary, NC). The abortion rate per variable was analyzed using a Poisson model (SAS Proc Genmod) utilizing robust standard errors to account for multiple observations within each zip code area. The study was approved by the Emory University Institutional Review Board [8].

RESULTS

In the year 2006, there were 26,995 total abortions to Georgia residents, producing a rate of 56.0 per 1000 women aged 15-44 (Table 1 where 'event' describes the number of abortions that took place, and the 'at risk' population represents an estimate of all sexually active, fecund women in Georgia using non-permanent contraceptives or no contraceptives). The crude abortion rate per 1000 women aged 15-44 was highest among non-Hispanic Blacks (136.1), 20-24 year olds (97.9), 30+% of zip code below poverty status (78.2), and women living in a metropolitan area (67.1). Non-Hispanic Black women had 5.3 times the risk of having an abortion compared to non-Hispanic White women. Both Hispanic women and women of other races were at 2.3 times the risk of obtaining an abortion compared to non-Hispanic White women.

It was surprising to find that the trend seen for spatial proximity was the reverse of our hypothesis (Table 1). Our results showed closest distance (0-4000 meters) having the highest rate of abortion of 101.6, and the rest following in linear fashion: 4000-7000 meters having the next highest rate of 70.4, 7000-11,000 meters with a rate of 46.2, 11,000-15,000 meters with 20.6, and the furthest distance (15,000+ meters) with the lowest rate of 13.2. Women with shortest spatial access to the clinic (0-4000 meters) had ~7.7 times the risk of having an abortion as women who lived furthest away (15,000+ meters), illustrating that closer proximity to services is associated with higher abortion rates.

The highest rates of abortions were clustered within metropolitan areas, particularly in Atlanta and its surrounding areas (Figure 2.1, RUCA distribution shown in Figure 2.2). Zip code areas predominantly in the southwestern corner of Georgia were missing from the HUD crosswalk file. This may be due to discrepancies of U.S. postal zip codes along the Georgia/Alabama border. Distance from family planning clinic to centroid of zip code showed no major clustering effect in any one particular area.

When adjusting for all factors (distance, age, ethnicity/race, poverty, and RUCA), the effect of distance from clinic to centroid of zip code showed a consistent linear association between distance and abortion rate (Table 2). The 2-way interactions observing the variable ‘distance’ and all its covariates were not significant in final models (data not shown): ‘poverty and distance’ had a p-value of .0866; ‘age and distance’ had a p-value of .2862; ‘RUCA and distance’ had a p-value of .7576; ‘ethnicity/race and distance’ had a p-value of .055 when the race category ‘Other’ was not included.

When adjusting for age and race/ethnicity, the clustering effect shifted south, with the highest abortion rates seen along the mid-eastern edge of Georgia (Figure 2.1). When adjusting for all other factors, the clustering effect shifted back towards the increasingly predominant metropolitan areas (Figure 2.3).

Supplemental data provided in the Appendix showed that Non-Hispanic Black women, 20-24 years of age had the highest rate of abortion at 200.7 per 1000 women aged 15-44 (Table A1). Across all racial/ethnic groups, the abortion rate was consistently highest in 20-24 year olds. Poverty level distribution stratified by race showed Non-Hispanic Black women living in areas of higher poverty (10% and higher) having 1.4 times the risk of obtaining an abortion than those living in areas of lower poverty (0-10%) (Table A2). When stratifying distance from family planning clinic to centroid of zip code by race/ethnicity, non-Hispanic Black women with the closest proximity (0-4000 meters) experienced a rate of 204.0 per 1000 women aged 15-44 (Table A3). This spatial pattern continued to persist among all racial/ethnic groups and all poverty levels, with the highest percentage of poverty (30+% of zip code below poverty status) experiencing the greatest rate of abortions compared to areas with less poverty (132.9) (Table A4). When adjusting for race/ethnicity and all other variables, race was most strongly correlated with abortion rate than any other factor, with substantial differences between groups (non-Hispanic Black females experiencing the greatest difference) (Table A5).

DISCUSSION

Figure 2.2 illustrates that the highest rates of abortions occurred in metropolitan areas with decreasing population size experiencing lower rates of abortion accordingly. This may be attributable to the fact that a majority of abortion providers are concentrated in metropolitan counties. So, it is often easier for women who live in larger cities to obtain abortion services [16,

19, 23], although research has shown that 10% of women residing in the southeastern United States seeking abortions travel more than 100 miles to access services [45]. Some claim that having increased access to abortion clinics increases the abortion rate [46], which, if true, pertains to secondary prevention of an unintended birth, i.e., to the likelihood that an unintended pregnancy ends in abortion. Family planning services provide primary prevention.

Findings that the highest abortion rates were among non-Hispanic blacks, 20-24 year olds, and predominantly low-income areas are consistent with findings of previous studies. Ethnicity/Race is a major contributor to the risk of obtaining an abortion, with non-Hispanic Black women having the highest risk. It is interesting to see that the "trend" that seems apparent in White and especially Black women (between higher proportion poverty and abortion rate) does not seem apparent for Hispanic women - likely reflecting cultural variation by income for Hispanics and decision to carry unintended pregnancies to term, no matter the income level.

The trend for spatial proximity was interesting and unpredicted. These findings are not likely to be causal, but rather perhaps indicate that geographic distance is not a barrier to women who want to receive family planning services in Georgia. This also by no means indicates that having fewer family planning facilities and decreased spatial access will lead to a decreased risk of abortions. Our furthest spatial distance category was defined as 15,000+ meters (or a little over 9 miles), so traveling much farther than that could well lead to decreased use of contraceptives, and thus, more unintended pregnancies and subsequent abortions. It is possible that clinics have historically been placed where the need for services is greatest, but that mere physical proximity does not increase utilization in high-risk areas. Further, it is possible that clinic proximity and true access to contraception are not as connected as theorized, thus resulting in a different association than expected. For example, if there are counties where there is very little in terms of outreach and

education regarding family planning services, there could be higher rates of unintended pregnancies despite proximity to the county clinic.

Providing contraceptive access and availability fights only half the battle of decreasing unintended pregnancies, because if sexual partners are not even willing to use them, then access and availability become futile. Accordingly, there needs to be more studies that assess why people continue to put themselves at risk, because no matter how effective or safe a certain method is - it will not be used if the person does not like it. Therefore, alternative means of teaching patients the facts and dispelling myths so that they can make responsible and informed decisions is invaluable to battling the fight towards unintended pregnancies. It would also be advantageous if all health care providers devote more time to their patients (especially to young, poor, black or Hispanic women) to properly map out family planning goals and to personally discuss their options of pregnancy prevention strategies so that they will be satisfied, well informed, and cooperative about using the one they choose.

STRENGTHS AND LIMITATIONS

We only had information about Title X family planning sites, thereby lacking information on other publicly funded clinics, Medicaid providers, private physicians, or primary care facilities that provide access to family planning services. This unfortunately gives an incomplete picture of potential access to family planning services/contraception.

We discovered that certain zip codes from the HUD crosswalk file were listed as commercial areas with nobody physically living there, even though some women who had abortions in the ITOP file reported residence in those particular zip codes (1.1%). Excluding this small percentage could skew the data, but doubtfully significantly. The 5.2% of missing zip codes from the

crosswalk file were in a clustered region along the southwestern corner of the Georgia/Alabama border and unlikely to have a great effect on the picture as a whole.

Because our pregnancy termination dataset provided information on the zip code level and not the individual addresses of the residents, the spatial access to the nearest Title X family planning clinic is only approximated. We utilized the centroid of each zip code as the site of residence for the women who obtained abortions, which is a relatively crude measure of spatial proximity. This may give an inaccurate distance compared to what the actual distance should have been had we known the physical address of each respondent. Other methods of calculating distance may be relatively correlated with our crude measure and may not show drastic differences.

The covariates we used to control for confounding were limited and potentially weak measures of individual characteristics. Income levels of the women in our dataset were not self-reported measures, and an estimated 'percent below poverty level' was calculated based on the zip codes of residence. Past studies that incorporate poverty status into their studies risk a high level of measurement error due to lower response rates, respondent hesitancy to reveal actual numbers, or lack of certainty of family income [16]. So, while gauging income levels based on zip codes of residence may have a degree of inaccuracy, it is still a reasonable value to include in this study.

Another factor to consider is that reasons for abortions in certain subpopulations are not known. The rise in abortion rate among poor women could be due a number of mitigating circumstances. Firstly, financial hardships could have made it harder for poor women to access contraceptive services, thereby increasing the likelihood of unintended pregnancies and subsequent abortions. On the other hand, even if they may have felt equipped to support another child despite it being an unintended pregnancy, they may have felt inadequate to do so under the circumstances of

economic instability [15]. Other women may have felt pressured into thinking it was their best option at the time, were not ready financially or emotionally, lacked family or community support, could not handle the added stress, or could not fathom giving away their own child for adoption [47]. It is also possible that abortions of wealthier women are systematically under-reported because their private providers did not report the abortion. This may be particularly true for medical abortions provided outside of known abortion facilities.

Because the study population was limited to Georgia, this study is not nationally representative. Determination of generalizability of our findings would require similar studies in many other states that encompass varying regions of the nation, and perhaps including all other providers, including private physicians, those accepting Medicaid, and primary medicine clinics offering contraceptive services, for a more complete picture of potential access.

CONCLUSION

Title X programs and other publicly funded services have greatly improved access and availability of family planning and contraceptive services for minority and low SES women; however access still remains limited for many people. Based on the findings of this study, spatial access is not a potential barrier to receiving contraceptive services, and efforts to reduce the rate of unintended pregnancies need to extend beyond increasing the number of clinics in an area. Perhaps universal coverage for contraceptive services will even out the playing field and give equal access to vulnerable populations. Additionally, further in-depth research that increases understanding of unintended pregnancies in high-risk populations is essential to help policymakers develop successful strategies directed towards populations of differing age, SES, income, and racial differences, including overcoming the necessary financial and strategic obstacles to help non-English speaking populations seek the same care.

Table 1. Abortion rate per 1000 women in Georgia, 2006

	Event	At Risk*	Rate	95% Confidence Interval	
Total	26995	482008	56.0	55.36	56.65
Age					
15-17	1132	22678	49.9	47.08	52.75
18-19	2202	27065	81.4	78.10	84.62
20-24	8153	83308	97.9	95.85	99.88
25-29	6626	92104	71.9	70.27	73.61
30-34	4012	79992	50.2	48.64	51.67
35-44	3057	157613	19.4	18.71	20.08
Ethnicity/Race					
Non-Hispanic White	8020	312483	25.7	25.11	26.22
Non-Hispanic Black	14608	107305	136.1	134.08	138.19
Hispanic	1442	24216	59.5	56.57	62.53
Other	1112	18758	59.3	55.90	62.66
Percent of zip code below poverty status					
0-10%	5070	128248	39.5	38.47	40.60
10.1-20%	11649	211940	55.0	53.99	55.93
20.1-30%	6362	95722	66.5	64.89	68.04
30.1+%	2101	26852	78.2	75.03	81.46
Distance (in meters) away from family planning clinic					
0-4000	10006	98497	101.6	99.70	103.47
4000-7000	7932	112612	70.4	68.94	71.93
7000-11,000	4512	97768	46.2	44.84	47.47
11,000-15,000	1952	94860	20.6	19.67	21.48
15,000+	780	59024	13.2	12.29	14.14
Geographical characteristic					
Metropolitan [41] area	22708	338216	67.1	66.30	67.98
Micropolitan (Large rural city/town) area	1230	53113	23.2	21.88	24.44
Small & Isolated rural town	1244	71432	17.4	16.46	18.37

*Representing all sexually active, fecund women in Georgia in 2006 using non-permanent contraceptive or no contraceptive

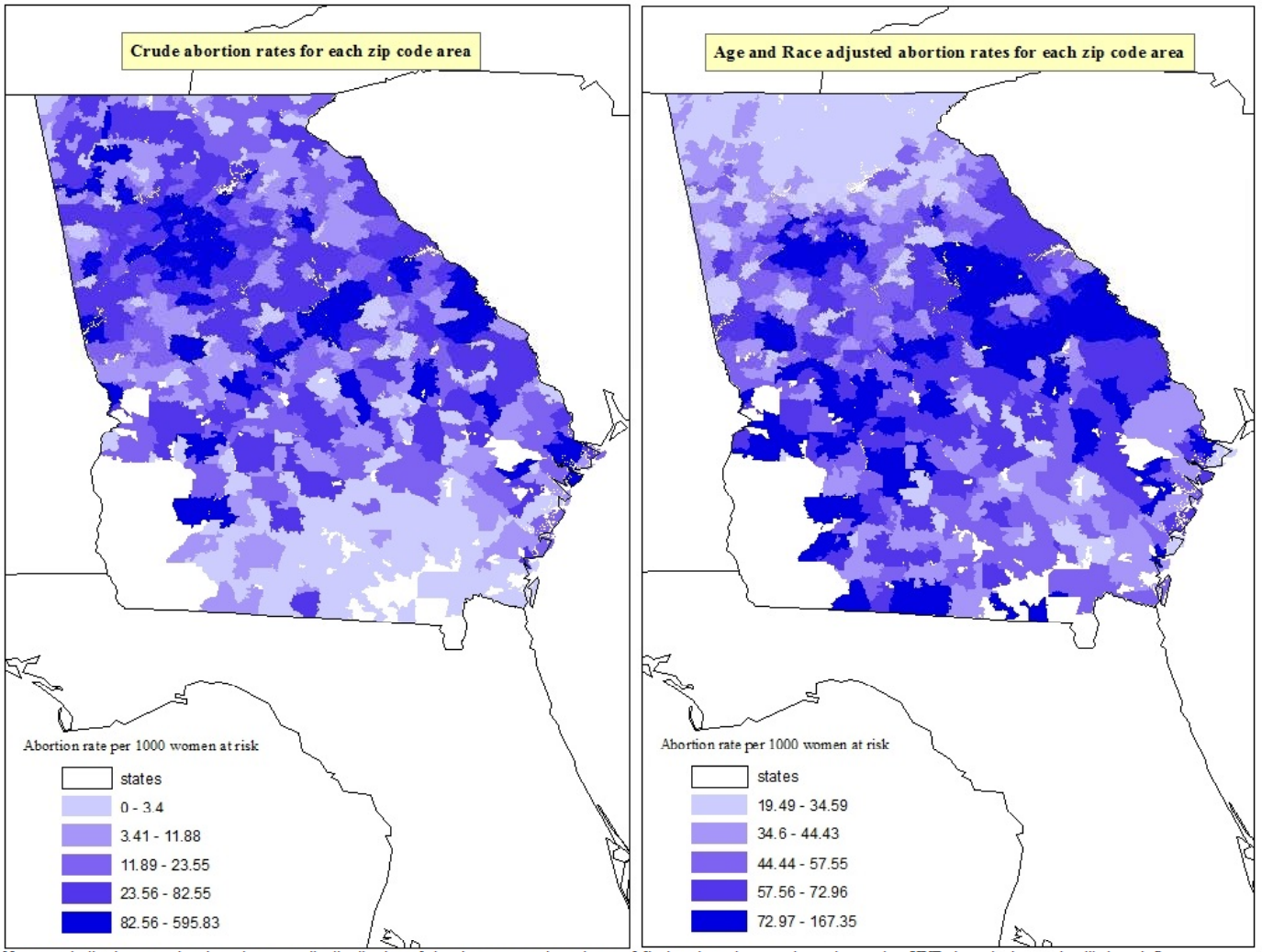
Table 2. Distance Adjusted Rate Ratios with Covariates from Poisson Model (continued on next page)

	Distance adjusted			Distance and age adjusted			Distance and ethnicity/race adjusted			Distance and poverty adjusted		
Characteristic	**Rate Ratio**	**95% CI**		**Rate Ratio**	**95% CI**		**Rate Ratio**	**95% CI**		**Rate Ratio**	**95% CI**	
Distance (meters) away from family planning clinic												
0-4000	1.00			1.00			1.00			1.00		
4000-7000	0.69	0.54	0.89	0.72	0.56	0.92	0.74	0.60	0.92	0.73	0.56	0.93
7000-11,000	0.45	0.32	0.65	0.49	0.34	0.70	0.55	0.40	0.76	0.48	0.33	0.70
11,000-15,000	0.20	0.15	0.28	0.22	0.16	0.30	0.27	0.20	0.36	0.22	0.16	0.30
15,000+	0.13	0.07	0.23	0.14	0.08	0.24	0.17	0.10	0.29	0.13	0.08	0.24
Age												
15-17				0.54	0.49	0.59						
18-19				0.83	0.77	0.90						
20-24				1.00								
25-29				0.72	0.68	0.76						
30-34				0.52	0.49	0.56						
35-44				0.21	0.19	0.23						
Ethnicity/Race												
Non-Hispanic White							1.00					
Non-Hispanic Black							4.47	4.01	4.99			
Hispanic							1.93	1.66	2.24			
Other							1.95	1.75	2.19			
% of zip code below poverty												
0-10%										1.00		
10.1-20%										1.18	0.91	1.53
20.1-30%										1.26	0.90	1.76
30.1+%										1.42	0.98	2.07

Table 2 continued

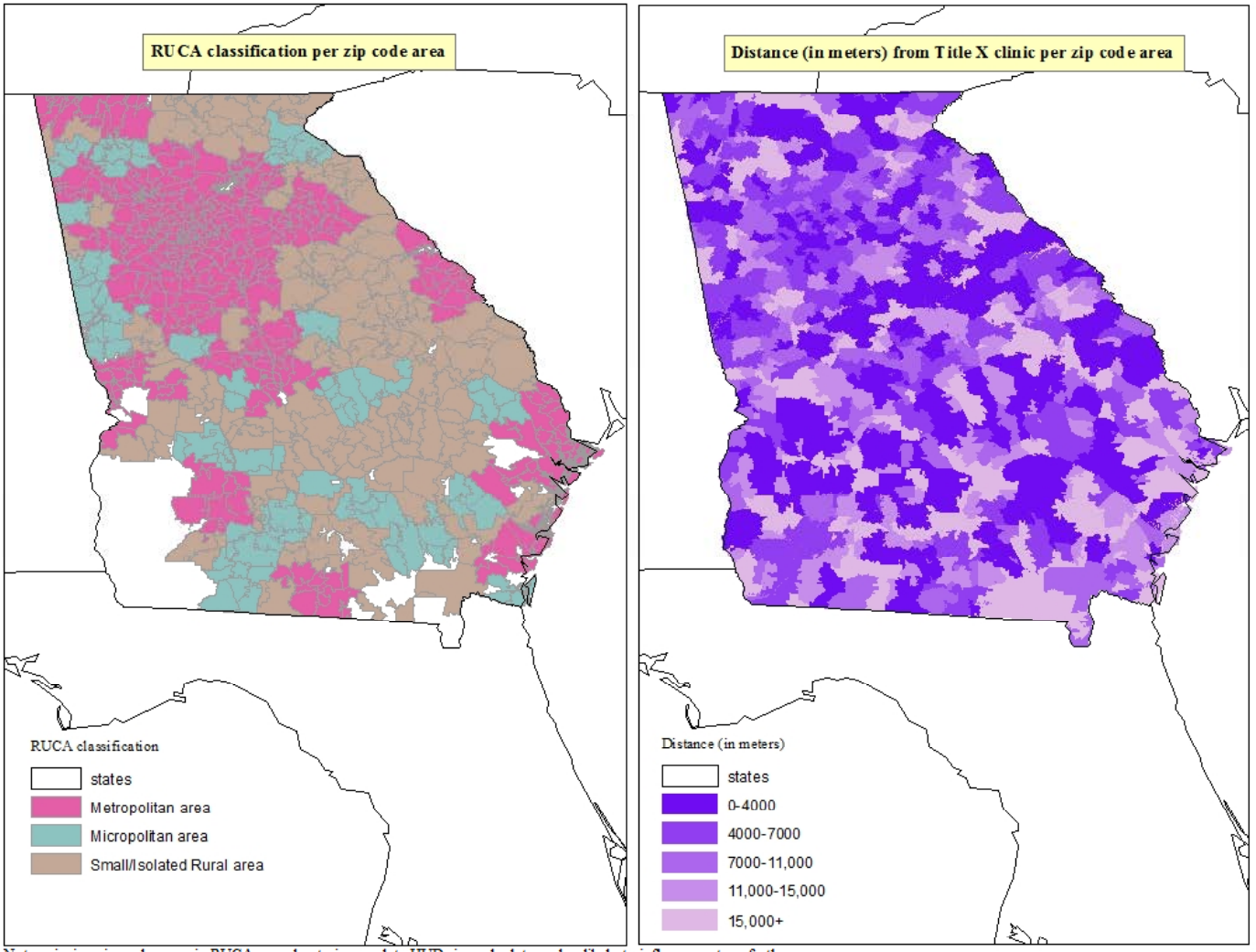
	Distance and RUCA adjusted			Distance, age, ethnicity/race, & poverty adjusted			Fully (All and RUCA) adjusted		
Characteristic	**Rate Ratio**	**95% CI**		**Rate Ratio**	**95% CI**		**Rate Ratio**	**95% CI**	
Distance (meters) away from family planning clinic									
0-4000	1.00			1.00			1.00		
4000-7000	0.65	0.51	0.84	0.74	0.60	0.92	0.75	0.62	0.92
7000-11,000	0.41	0.29	0.59	0.56	0.40	0.77	0.57	0.41	0.77
11,000-15,000	0.20	0.14	0.27	0.27	0.20	0.36	0.30	0.23	0.40
15,000+	0.16	0.09	0.27	0.18	0.10	0.30	0.25	0.15	0.40
Age									
15-17				0.48	0.44	0.52	0.49	0.45	0.53
18-19				0.86	0.79	0.93	0.90	0.83	0.97
20-24				1.00			1.00		
25-29				0.70	0.67	0.74	0.70	0.66	0.74
30-34				0.55	0.52	0.59	0.55	0.51	0.58
35-44				0.25	0.23	0.27	0.25	0.23	0.27
Ethnicity/Race									
Non-Hispanic White				1.00			1.00		
Non-Hispanic Black				4.08	3.67	4.55	3.78	3.41	4.19
Hispanic				1.75	1.51	2.04	1.55	1.35	1.78
Other				1.88	1.67	2.11	1.68	1.51	1.88
% of zip code below poverty									
0-10%				1.00			1.00		
10.1-20%				0.91	0.71	1.16	1.04	0.82	1.32
20.1-30%				0.88	0.65	1.19	1.31	0.96	1.78
30.1+%				0.81	0.58	1.15	1.32	0.96	1.81
Geographical characteristic									
Metropolitan area	1.00						1.00		
Micropolitan area	0.42	0.28	0.64				0.40	0.27	0.58
Small & Isolated rural town	0.26	0.21	0.34				0.24	0.19	0.31

Figure 2.1. Crude and adjusted abortion rates per ZCTA in Georgia, 2006



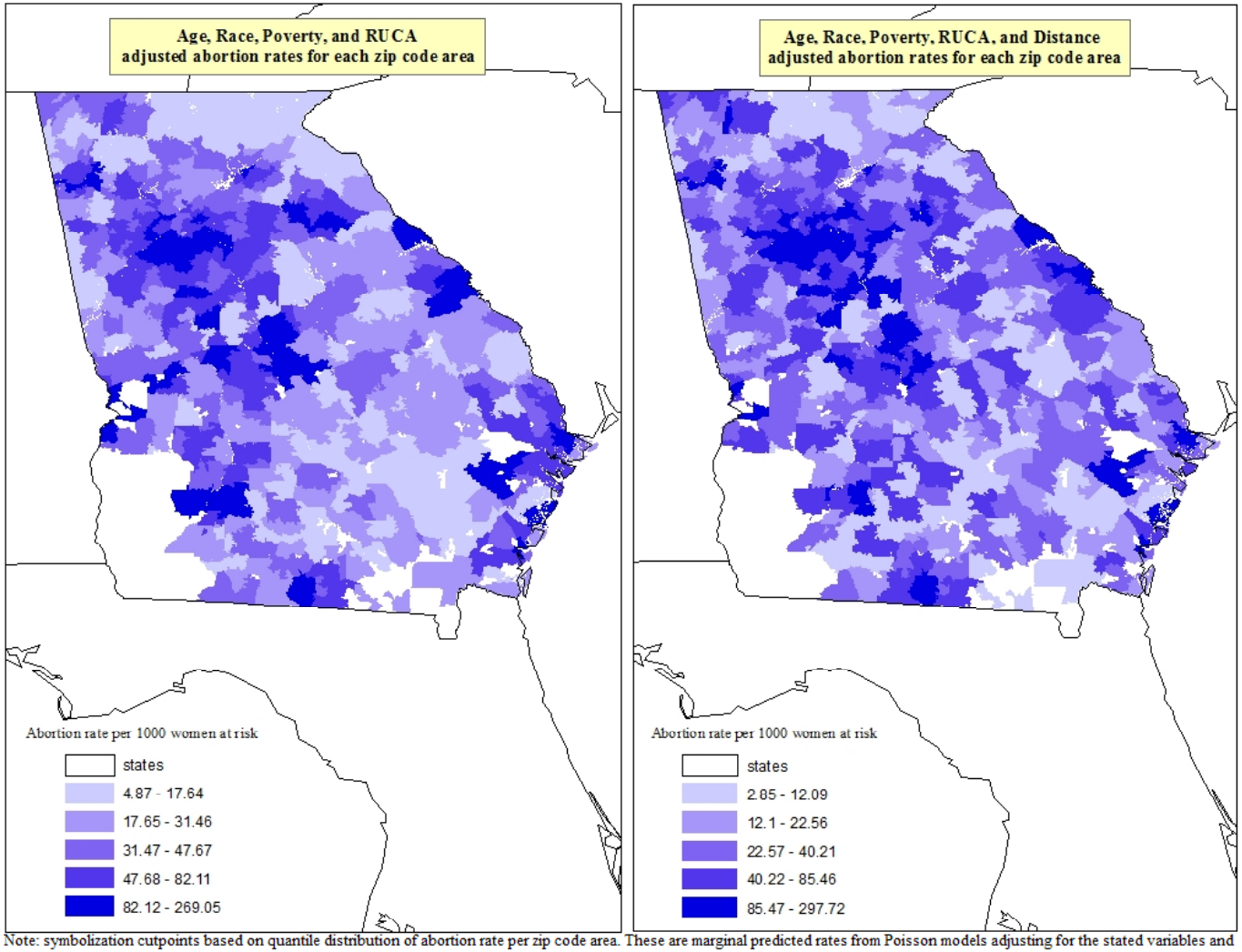
Note: symbolization cutpoints based on quantile distribution of abortion rate per zip code area. Missing zip code areas due to incomplete HUD zip code data and unlikely to influence rates of other areas.

Figure 2.2. RUCA classification and Spatial Proximity per ZCTA



Note: missing zip code areas in RUCA map due to incomplete HUD zip code data and unlikely to influence rates of other areas.

Figure 2.3. Adjusted abortion rates per ZCTA in Georgia, 2006



Note: symbolization cutpoints based on quantile distribution of abortion rate per zip code area. These are marginal predicted rates from Poisson models adjusting for the stated variables and accounting for clustering of women within zip code area. Missing zip code areas due to incomplete HUD zip code data and unlikely to influence rates of other areas.

CHAPTER III: DISCUSSION

Summary

Title X programs and other publicly funded services have greatly improved the access and availability of family planning and contraceptive services issues that the minority and low SES population had faced; however access still remains limited for many people. About half of all sexually active women of reproductive age are in need of publicly funded services, and only half of them actually receive care from these services under the current system [24, 36]. This group needs equality in contraceptive accessibility, availability, and education. Based on the findings of this study, spatial access is not a potential barrier to receiving contraceptive services, and efforts to reduce the rate of unintended pregnancies need to extend beyond increasing the number of clinics in an area. Perhaps universal coverage for contraceptive services will even out the playing field and give equal access to vulnerable populations. Additionally, further in-depth research that increases understanding of unintended pregnancies in high-risk populations is essential to help policymakers develop successful strategies directed towards populations of differing age, SES, income, and racial differences, including overcoming the necessary financial and strategic obstacles to help non-English speaking populations seek the same care.

Public Health Implications

Having legal and safe abortion services available are still necessary to round out the options that women should have about controlling their fertility, and placing legal restrictions on abortions would only force women to find alternative ways of obtaining them - making it more dangerous and risky [48, 49]. So, alternative means to combating this public health problem is a necessity. Providing contraceptive access and availability fights only half the battle of decreasing the issue of unintended pregnancies, because if sexual partners are not even willing to use them, then access and availability become futile. In 2002, only 54% of boys and 62% of girls in the United

States were educated about contraceptive methods before their first sexual experience [10], leaving many others deprived of basic information that they should have been entitled to. However, continual research shows that even when people are knowledgeable about safe sex, they continue to choose not to use it despite not wanting to get pregnant [50]. Accordingly, there need to be more studies that assess why people continue to put themselves at risk. Is it because they had a bad experience with one method, but still do not know the range of options? Is it because they are unsure about how different methods work or how to use them correctly? Is it because they are too embarrassed or afraid to talk to their provider about contraception? The bottom line is that it does not matter how effective or safe a certain method is - it will not be used if the person does not like it. Therefore, alternative means of teaching patients the facts and dispelling myths so that they can make responsible and informed decisions is invaluable to battling the fight towards unintended pregnancies.

Possible Future Directions

Very few data exist that assess how health care providers counsel their patients about contraceptive use, which may greatly affect a patient's decision to start/stop a contraceptive method and to use it with proper consistency. Many health professionals most likely assume that patients will be cooperative and consistent with contraception or that they would feel overwhelmed with too much information; however people often reported that they would rather know more than less [50]. For that reason, it would be advantageous if all health care providers devote more time to their patients (especially to young, poor, black or Hispanic women) to properly map out family planning goals and to personally discuss their options of pregnancy prevention strategies so that they will be satisfied, well-informed, and consistent about using the one they choose.

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APPENDIX

Table A1. Abortion rate per 1000 women in Georgia, 2006, based on Ethnicity/Race and Maternal Age

	Event	At Risk*	Rate	95% Confidence Interval	
Non-Hispanic White Female					
15-17 yrs old	356	13325	26.7	23.98	29.46
18-19 yrs old	814	17478	46.6	43.45	49.70
20-24 yrs old	2816	52462	53.7	51.75	55.61
25-29 yrs old	1886	57186	33.0	31.52	34.44
30-34 yrs old	1074	53540	20.1	18.87	21.25
35-44 yrs old	1074	118493	9.1	8.52	9.60
Non-Hispanic Black Female					
15-17 yrs old	717	7729	92.8	86.30	99.23
18-19 yrs old	1216	6911	176.0	166.98	184.94
20-24 yrs old	4589	22866	200.7	195.50	205.89
25-29 yrs old	4063	25707	158.0	153.59	162.51
30-34 yrs old	2448	17519	139.7	134.60	144.86
35-44 yrs old	1575	26573	59.3	56.43	62.11
Hispanic Female					
15-17 yrs old	41	913	44.9	31.46	58.31
18-19 yrs old	112	1476	75.9	62.37	89.39
20-24 yrs old	445	4749	93.7	85.41	101.99
25-29 yrs old	416	6267	66.4	60.21	72.54
30-34 yrs old	270	4547	59.4	52.51	66.25
35-44 yrs old	158	6264	25.2	21.34	29.11
Other Female					
15-17 yrs old	18	711	25.3	13.77	36.87
18-19 yrs old	60	1201	50.0	37.64	62.28
20-24 yrs old	303	3232	93.7	83.70	103.80
25-29 yrs old	261	2944	88.7	78.39	98.93
30-34 yrs old	220	4386	50.2	43.70	56.62
35-44 yrs old	250	6284	39.8	34.95	44.62

*Representing all sexually active, fecund women in Georgia in 2006 using non-permanent contraceptive or no contraceptive

Table A2. Abortion rate per 1000 women in Georgia, 2006 based on Ethnicity/Race and Percentage Poverty within zip codes

	Event	At Risk*	Rate	95% Confidence Interval	
Non-Hispanic White Female					
0-10% below poverty status	2484	96350	25.8	24.78	26.78
10.1-20% below poverty status	3418	142978	23.9	23.11	24.70
20.1-30% below poverty status	1619	59607	27.2	25.86	28.47
30.1+% below poverty status	499	13547	36.8	33.66	40.01
Non-Hispanic Black Female					
0-10% below poverty status	1931	18484	104.5	100.06	108.88
10.1-20% below poverty status	7030	49651	141.6	138.52	144.66
20.1-30% below poverty status	4114	27713	148.5	144.26	152.64
30.1+% below poverty status	1533	11457	133.8	127.57	140.04
Hispanic Female					
0-10% below poverty status	271	5427	49.9	44.14	55.73
10.1-20% below poverty status	717	11498	62.4	57.94	66.78
20.1-30% below poverty status	421	6075	69.3	62.91	75.68
30.1+% below poverty status	33	1216	27.1	18.00	36.27
Other Female					
0-10% below poverty status	384	7987	48.1	43.39	52.77
10.1-20% below poverty status	484	7813	61.9	56.60	67.30
20.1-30% below poverty status	208	2326	89.4	77.82	101.01
30.1+% below poverty status	36	632	57.0	38.89	75.03

*Representing all sexually active, fecund women in Georgia in 2006 using non-permanent contraceptive or no contraceptive

Table A3. Abortion rate per 1000 women in Georgia, 2006 based on Ethnicity/Race and Distance away from nearest Title X family planning clinic (in meters)

	Event	At Risk*	Rate	95% Confidence Interval	
Non-Hispanic White Female					
0-4000 m	2686	56536	47.5	45.76	49.26
4000-7000 m	2536	68761	36.9	35.47	38.29
7000-11,000 m	1497	68480	21.9	20.77	22.96
11,000-15,000 m	908	72835	12.5	11.66	13.27
15,000+ m	393	45870	8.6	7.72	9.41
Non-Hispanic Black Female					
0-4000 m	6273	30757	204.0	199.45	208.45
4000-7000 m	4457	30340	146.9	142.92	150.89
7000-11,000 m	2609	20262	128.8	124.15	133.37
11,000-15,000 m	905	15673	57.7	54.09	61.40
15,000+ m	364	10273	35.4	31.86	39.01
Hispanic Female					
0-4000 m	634	6731	94.2	87.21	101.16
4000-7000 m	543	7564	71.8	65.97	77.61
7000-11,000 m	199	4595	43.3	37.42	49.19
11,000-15,000 m	52	3569	14.6	10.64	18.50
15,000+ m	14	1756	8.0	3.81	12.13
Other Female					
0-4000 m	413	4472	92.3	83.86	100.83
4000-7000 m	396	5947	66.6	60.25	72.92
7000-11,000 m	207	4430	46.7	40.51	52.94
11,000-15,000 m	87	2783	31.3	24.79	37.72
15,000+ m	9	1125	8.0	2.80	13.21

*Representing all sexually active, fecund women in Georgia in 2006 using non-permanent contraceptive or no contraceptive

Table A4. Abortion rate per 1000 women in Georgia, 2006 based on Percentage Poverty within zip codes and Distance away from nearest Title X family planning clinic (in meters)

	Event	At Risk*	Rate	95% Confidence Interval	
0-10% of zip code below poverty status					
0-4000 m	646	10953	59.0	54.57	63.39
4000-7000 m	1902	31794	59.8	57.22	62.43
7000-11,000 m	1403	33468	41.9	39.77	44.07
11,000-15,000 m	989	38668	25.6	24.00	27.15
15,000+ m	130	13365	9.7	8.06	11.39
10-20% of zip code below poverty status					
0-4000 m	4632	45566	101.7	98.88	104.43
4000-7000 m	4109	52542	78.2	75.91	80.50
7000-11,000 m	1811	44995	40.2	38.43	42.06
11,000-15,000 m	742	39224	18.9	17.57	20.27
15,000+ m	355	29612	12.0	10.75	13.23
20-30% of zip code below poverty status					
0-4000 m	3374	31790	106.1	102.75	109.52
4000-7000 m	1369	22280	61.4	58.29	64.60
7000-11,000 m	1227	15282	80.3	75.98	84.60
11,000-15,000 m	120	14182	8.5	6.95	9.97
15,000+ m	272	12187	22.3	19.70	24.94
30+% of zip code below poverty status					
0-4000 m	1354	10188	132.9	126.31	139.50
4000-7000 m	552	5996	92.1	84.74	99.37
7000-11,000 m	71	4023	17.6	13.58	21.72
11,000-15,000 m	101	2786	36.3	29.31	43.19
15,000+ m	23	3859	6.0	3.53	8.39

*Representing all sexually active, fecund women in Georgia in 2006 using non-permanent contraceptive or no contraceptive

Table A5. Various Adjusted Rate Ratios from Poisson Model (continued on next page)

	Ethnicity/race and poverty-adjusted			Age and poverty adjusted			Age and ethnicity/race adjusted		
Characteristic	**Rate Ratio**	**95% CI**		**Rate Ratio**	**95% CI**		**Rate Ratio**	**95% CI**	
Distance (meters) away from family planning clinic									
0-4000									
4000-7000									
7000-11,000									
11,000-15,000									
15,000+									
Age									
15-17				0.52	0.48	0.57	0.46	0.42	0.50
18-19				0.83	0.77	0.90	0.86	0.80	0.93
20-24				1.00			1.00		
25-29				0.74	0.70	0.79	0.73	0.69	0.77
30-34				0.53	0.49	0.56	0.56	0.53	0.60
35-44				0.21	0.19	0.22	0.25	0.23	0.27
Ethnicity/Race									
Non-Hispanic White	1.00						1.00		
Non-Hispanic Black	5.16	4.63	5.75				4.71	4.21	5.27
Hispanic	2.28	1.93	2.69				2.08	1.75	2.47
Other	2.36	2.10	2.66				2.25	2.00	2.53
% of zip code below poverty									
0-10%	1.00			1.00					
10.1-20%	1.15	0.90	1.48	1.29	0.98	1.69			
20.1-30%	1.26	0.93	1.70	1.48	1.07	2.04			
30.1+%	1.20	0.82	1.75	1.67	1.14	2.43			
Geographical characteristic									
Metropolitan area									
Micropolitan area									
Small & Isolated rural town									

Table A5 continued

	Ethnicity/race, age, & poverty adjusted			Ethnicity/race, age, poverty, & RUCA adjusted		
Characteristic	**Rate Ratio**	**95% CI**		**Rate Ratio**	**95% CI**	
Distance (meters) away from family planning clinic						
0-4000						
4000-7000						
7000-11,000						
11,000-15,000						
15,000+						
Age						
15-17	0.47	0.43	0.51	0.48	0.44	0.52
18-19	0.86	0.80	0.93	0.90	0.84	0.97
20-24	1.00			1.00		
25-29	0.73	0.69	0.77	0.72	0.68	0.76
30-34	0.57	0.53	0.60	0.56	0.52	0.60
35-44	0.25	0.23	0.27	0.25	0.23	0.27
Ethnicity/Race						
Non-Hispanic White	1.00			1.00		
Non-Hispanic Black	4.66	4.17	5.19	4.21	3.80	4.66
Hispanic	2.06	1.74	2.43	1.76	1.51	2.05
Other	2.28	2.02	2.56	1.96	1.76	2.18
% of zip code below poverty						
0-10%	1.00			1.00		
10.1-20%	1.09	0.86	1.39	1.28	1.00	1.62
20.1-30%	1.14	0.84	1.53	1.82	1.36	2.44
30.1+%	1.06	0.74	1.53	1.94	1.39	2.70
Geographical characteristic						
Metropolitan area				1.00		
Micropolitan area				0.31	0.21	0.46
Small & Isolated rural town				0.20	0.15	0.25