



LUND
UNIVERSITY

Department of Economic History
Master Programme in Economic Demography

The Impact of Health Insurance and Abortion Policy on Women's Choice of Contraceptive Intensity in the United States

Josephine Jacobs

Jcjacobs57@hotmail.com

EKHR02
Master's thesis (15 credit points)
Spring 2010

Supervisor:
Dr. Maria Stanfors

Table of Contents

ABSTRACT	1
1. INTRODUCTION.....	2
1.1. AIM AND SCOPE	3
1.2. RESEARCH PROBLEM	4
1.3. OUTLINE OF THE THESIS	4
2. BACKGROUND: THE AMERICAN CONTEXT	5
2.1. CONTRACEPTIVE USE ACROSS THE UNITED STATES	5
2.2. HEALTH INSURANCE CONTEXT	6
2.3. STATE ABORTION ACCESS CONTEXT	9
3. PREVIOUS RESEARCH AND THEORETICAL CONSIDERATIONS	10
3.1. PREVIOUS RESEARCH OVERVIEW	11
3.1.1. CONTRACEPTIVE PRICE FINDINGS	12
3.1.2. HEALTH INSURANCE FINDINGS.....	13
3.1.3. ABORTION POLICY FINDINGS	14
3.1.4. CONCLUDING REMARKS	16
3.2. THEORETICAL BACKGROUND	16
3.2.1. THE BASIC ECONOMIC FRAMEWORK	17
3.2.2. THE DECISION TO AVERT A BIRTH	17
3.2.3. THE IMPACT OF HEALTH INSURANCE ON CONTRACEPTIVE CHOICE	20
3.2.4. OTHER SHIFT FACTORS.....	20
3.3. HYPOTHESES	24
4. MODEL, DATA, AND METHODS.....	24
4.1.1. DATA SOURCE	25
4.1.2. SAMPLE	26
4.2. VARIABLE CONSTRUCTION AND MODEL SPECIFICATION.....	27
4.2.1. VARIABLE CONSTRUCTION	27
4.2.2. MODEL SPECIFICATION	29
4.3. METHODS.....	30
4.3.1. STATISTICAL MODEL	30
4.3.2. DISCUSSION OF THE VARIABLES	34
5. EMPIRICAL ANALYSIS.....	38

5.1. STATISTICAL RESULTS	39
5.2. DISCUSSION	41
5.3. LIMITATIONS	43
6. CONCLUSION	45
WORKS CITED.....	47
FIGURES	52
TABLES.....	58

ABSTRACT

Understanding the contraceptive decision making process of women has been the subject of a number of studies. However, few have employed economic models that explored the role that future costs may play in a woman's choice of contraception. The objective of this paper is to use an economic framework that takes into account contraceptive costs at the time of consumption (i.e. the presence of health insurance) and future costs in the event of contraceptive failure (i.e. expected abortion costs) to explain the choice of contraceptive intensity for women at risk for an unintended pregnancy. The paper uses Medicaid funding restrictions to proxy the cost of abortion across four regions in the United States. Using a multinomial logit regression, I determine the relative risk of using hormonal contraceptives and other contraceptives compared with a base category of using no contraceptive method. I use the 1995 cycle of the National Survey of Family Growth, and control for a woman's age, partnership status, education, religiosity, race, labour force status, and income. The results indicate a positive and significant association between having insurance and using hormonal contraceptives, and a negative and significant association between using hormonal contraceptives and living in a region where abortion access is less restricted.

Keywords: contraceptive intensity, health insurance, abortion policy, United States

1. INTRODUCTION

Since the 1960s, fertility rates in the developed world have undergone rapid and steady declines. Though a confluence of factors have contributed to falling fertility rates, the inception of the oral contraceptive pill has undoubtedly been an important facilitator of this decline. The pill's direct impact on fertility rates has been of debate, with some arguing that changes in women's fertility intentions have had more impact on fertility decisions than contraceptive technology itself (Pritchett, 1994, p. 1). However, few would argue that increased access to such an effective contraceptive method has played a pivotal role in allowing women to achieve their fertility intentions.

Based on this idea, Goldin and Katz (2002) conducted a breakthrough study that helped to establish the pill as a key mechanism in lowering the cost of long-duration professional education for women and in raising the age at first marriage (p. 730). The study outlined how highly effective contraceptive methods, such as the pill, can translate into a higher earnings capacity for women due to the ability to avoid unwanted pregnancies and to better time pregnancies to suit a woman's career goals. More recent studies, such as Miller (2009), have attempted to quantify the earnings premium associated with the ability to delay births for American women. Miller found that for each year of birth delay, women's earnings increase by nine percent (p. 1). Given these longer term ripple effects, it is not surprising that policy makers are trying to encourage the use of more effective contraceptive methods. Indeed, in 2002, the United States federal and state governments spent an estimated US\$1.73 billion on family planning, safe sex, and contraceptive promotion (Martin et. al., 2004).

Despite these expenditures, the United States has one of the highest rates of unintended (i.e. unwanted and mistimed) pregnancies in the developed world. Based on data from 2002, it is estimated that 49 percent of pregnancies in the United States are unintended. Of these unintended pregnancies, 52 percent and 43 percent respectively occur due to contraception non-use and imperfect contraception use (Trussell, 2008, p. 2). The implications of these statistics are twofold. Firstly, it is apparent that a relatively high proportion of unintended pregnancies are occurring because women are not opting to use contraception. Second, even when women do

use contraception, it would appear that the methods being chosen are highly dependent on user compliance and, therefore, less effective than other available methods (Speidel, 2009, p. 197).

There have been a number of studies exploring which factors may influence a woman's choice to contracept and her subsequent choice of contraception. The majority of these studies employ psychosocial models to predict contraception behaviour. These studies focus on women's personal characteristics and childbearing goals; sexual relationship characteristics and partner influences; social and economic characteristics; community, family and peer relationships; service access and provision; and method-specific experiences and attitudes (Frost, 2008, p. 94). Less emphasis has been placed on using economic demand models to analyze how the cost of various contraceptive alternatives may impact a woman's contraception decisions (Sen, 2006, p. 315).

When economic analyses have been conducted, the focus has primarily been on analyzing how costs at the time of consumption may impact a woman's contraceptive decisions. In particular, a number of studies have examined the impact of health insurance on contraceptive choice. For example, Culwell (2007), Sonfield (2004), Stolk (2008) all find that prescription contraceptive users are more likely to have insurance. A far less frequently explored cost component relates to how factors influencing *future* cost aversion may impact contraceptive choices. The impact of state regulated abortion laws, for instance, has been far less thoroughly examined in the literature, even though abortion and its associated costs may become very relevant in the case of contraceptive failure. Many researchers have acknowledged the important role that abortion can play in the contraceptive decision making process; few studies, however, have attempted to incorporate state-level abortion policies into a predictive model of contraceptive behaviour.

1.1. AIM AND SCOPE

The aim of this paper is to analyze the factors that contribute to whether or not a woman at risk for unintended pregnancy in the United States chooses to use hormonal contraceptive methods versus other methods or no method. I investigate whether having health insurance and living in a state where abortion access is limited will impact a woman's choice of contraceptive – a question that has not been explored in previous research.

1.2. RESEARCH PROBLEM

I focus on determinants of contraceptive choice because of the high rate of unintended pregnancies in the United States. Despite the comparatively widespread availability of highly effective hormonal contraceptives, there remains a large proportion of women opting for less effective contraceptive methods. Amongst the millions of women at risk for an unintended pregnancy in the United States, it is important to understand what differentiates those who choose more effective hormonal methods from those who choose no methods or less effective methods.

A number of factors contribute to a woman's choice of contraception, but I choose to focus on two factors that capture current and future costs respectively: health insurance and abortion access. Health insurance is of interest because it is a key factor that influences hormonal contraceptive costs at the time of consumption to women in the United States. The second factor, a woman's access to abortion, is of interest because there are strong theoretical grounds indicating that access to a failsafe like abortion is an important component of a woman's contraception decision-making process. Both of these factors should be of interest to policy makers, as policy can affect a woman's access to health insurance and to abortions.

1.3. OUTLINE OF THE THESIS

I will begin this paper with some background information about the American contraceptive use, health insurance, and abortion policy contexts. After that, I will discuss what previous research relating to cost determinants of contraceptive use has found. Third, I will outline the theoretical model that will be the basis of my analysis and provide an overview of the key hypotheses that are generated from this model. Following this, there will be an overview of the data, model, and statistical methods used to test my hypotheses. Next, I will provide a summary of the statistical analysis results and a discussion of these results. Finally, I will close with some concluding remarks outlining the implications of my findings.

2. BACKGROUND: THE AMERICAN CONTEXT

One of the unique features of the American context lies in the extreme variation in state-level culture and politics across the country. While there are a number of historical factors contributing to this variation, one characteristic of the United States that differentiates it from other developed countries lies in its population's religious practices. Silk (2005) suggests that the extreme differences in religiosity and religious affiliation across the country shape regional cultural and political differences (p. 265). In particular, he notes that there is a much lower propensity for certain regions, namely the South, to separate religion from politics. Further, certain regions, such as the Pacific Northwest, are much more likely to have residents who claim no religious affiliation (almost two out of three people) in comparison to the Middle Atlantic and South, where only one out of three people claim no religious affiliation (p. 267). These inter-region variations in culture and religion should be kept in mind when analyzing family planning trends across the country. In the following section, I will provide some background information about the American contraceptive use, health insurance, and abortion policy contexts and how trends in each vary across the country.

2.1. CONTRACEPTIVE USE ACROSS THE UNITED STATES

Contraceptive use across the United States is not uniform. The 2002 Behavioral Risk Factor Surveillance System Survey, administered by the Center for Disease Control (CDC), determined state-level contraceptive usage rates among women at risk for becoming pregnant.¹ The survey showed that the contraception usage rate among women at risk for a pregnancy ranged from 75 percent in Hawaii to 88 percent in Idaho. Looking at the breakdown by region, there is no particular pattern that emerges in terms of contraceptive use. Figure 1 provides a summary of the contraceptive usage rates by state, subdivided by region. This figure indicates that the South and West appear to have a large proportion of states with higher contraceptive usage rates than the Northeast and Midwest (Bensyl et. al., 2005, p. 10).

¹ Women defined as at risk for a pregnancy were those who reported that they or their partner were not pregnant, had not had a hysterectomy, were sexually active, were not too old to become pregnant, or were not the same sex as their partner (Bensyl et. al., 2005, p. 2)

When an analysis of contraception use data is further broken down into the primary types of contraceptives used by women in each state, there again do not appear to be regional trends. However, there are some outliers. Figure 2 provides an overview of oral contraceptive pill usage rates by state. While the majority of the states had oral contraceptive usage rates around 35 percent, three states – New Mexico, Pennsylvania, and Maine – were below 30 percent, and three states – Kansas, Hawaii, and South Dakota – were at 40 percent or higher. With respect to injectables and intrauterine devices (IUD), the rates were typically quite low, respectively at around three to six percent and one to two percent across states. However, states in the West had comparatively higher rates for IUD usage with Montana, Washington, California, and Utah ranging from four to almost six percent. Of the less effective methods, condoms were the most commonly used barrier contraceptive method, with condom use typically in the 10 to 15 percent range. Some states, namely New York and New Jersey, had rates well above 20 percent (Bensyl et. al., p. 11).

The implications of these different usage rates for women are important because of the differential effectiveness rates of each of these methods. Trussell and Wynn (2008) note the effectiveness rates with respect to pregnancy prevention for a number of contraceptive methods. Under typical – as opposed to perfect – use, hormonal methods are by far the most effective. Within the first year of use, it is estimated that 0.2, 3, and 8 percent of women will become pregnant while respectively using an IUD, an injectable, or the pill. Meanwhile, this rate is 15 percent with a condom and 85 percent with no method at all (p. 3). Table 1 summarizes the various effectiveness rates of different types of contraceptive methods under both typical and perfect use.

2. 2. HEALTH INSURANCE CONTEXT

Health Insurance Access. Health coverage in the United States comes from one of three sources: employers, the private market, and government programs. Approximately 77 percent of Americans younger than 65 are insured through employers, six percent through individual coverage, and 17 percent through government programs like Medicaid (Sonfield, 2004, p.72). Figure 3 provides a further breakdown of each type of insurance coverage in 2002, including a tabulation of the 15 percent of Americans who were uninsured in this year. It is apparent from

this tabulation that the majority of private insurance plans, 70 percent, are from employment-based insurance.

Information from the U.S. Census Bureau provides some further background about the distribution of health insurance in the United States. For those aged 18 to 64, workers were far more likely than non-workers to have health insurance – 82 versus 74 percent (U.S. Census Bureau, 2003, p. 3). Further to unemployment, youth and race appear also be connected to lower health insurance rates. Young adults aged 18 to 24 were 12 percent less likely to have health insurance than those aged 25 to 64 in 2002. Meanwhile, non-Hispanic Whites are far less likely to be uninsured, at a rate of 10 percent, when compared to Blacks, at 20 percent, and Hispanics, at 32 percent (p. 4). Of the foreign born population in the United States, 33 percent are uninsured, compared to 13 percent of native-born. The odds of not having insurance increase substantially, though, based on citizenship, where 43 percent of non-citizens in the United States were uninsured in 2002 (p. 6). Finally, education and income appear to be strongly linked to whether or not a person is insured. Those without a high school diploma are 20 percent more likely to be uninsured than those with a Bachelor’s level education while 23 percent of people making below \$25,000 were uninsured (p. 6).

Across the states, the differentials in insurance coverage are also quite substantial. States in the South and the West stand out with especially high rates of uninsured populations. In Texas and New Mexico, for instance, 24 and 22 percent of the states’ respective populations did not have health insurance in 2002. The remainder of the Southern and Western States, as can be seen in Table 2, had rates of uninsured people that were typically in the mid to high teens. The Northeastern and Midwestern United States, meanwhile, typically had lower rates of uninsured populations. In the Northeast, with the exception of New York and New Jersey, most states had rates of uninsured populations around 10 percent. Similar rates could be found in the Midwest, ranging from eight percent in Minnesota to 14 percent in Illinois (U.S. Census Bureau, 2003, p. 10).

Health Insurance and Contraception. Health insurance in the United States, however, does not necessarily imply that all the most effective contraceptive methods will be available and covered for the insured population. Trussell and Wynn (2008) point out the disparities in coverage both

across insurance types and across states. The authors note that while Medicaid and federal government health insurance plans cover contraceptive supply costs for poor women and federal employees and their dependents, respectively, there is variability across private insurers in terms of contraceptive coverage. In 2002, 89 percent of private insurance plans covered almost every reversible contraceptive supply and service, while 86 percent covered the five most popular prescription contraceptives. While these rates appear relatively high, the disparity in contraceptive coverage becomes apparent when a state-by-state approach to analyzing these rates is taken.

In the United States, a number of states have adopted legislation that requires health insurance policies covering other prescription drugs to also cover all FDA-approved contraceptive drugs and devices and all related medical services (Alan Guttmacher Institute, 2010, p. 1).² Trussell and Wynn note that depending on whether these legislative mandates have been adopted in each state, the level of contraceptive coverage by private insurers varies considerably. In states that have adopted these mandates, health insurance plans were much more likely to cover the five leading prescription contraceptives than in states without these mandates. These rates ranged from 87 to 92 percent in states with the mandates to 47 to 61 percent in states without the mandates (Trussell and Wynn, 2008, p. 1).

Maryland was the first state to adopt a contraceptive mandate in 1998, and as of 2010, 27 states had a legislative mandate. Of these 27 states, 17 states also required insurance companies to cover related contraceptive outpatient services (Alan Guttmacher Institute, 2010, p. 2).

Exclusions exist across a number of states for religious employers. When the states are broken down by regional area, there are some patterns that emerge. It is apparent that states in the South and Midwest are far less likely to have these legislative mandates – only six of the 16 and four out of 12 states had a mandate. These proportions are quite low when compared to states in the West and Northeast, where respectively eight out of 13 and eight out of nine states had the mandates (Alan Guttmacher Institute, 2010, p. 2). This unequal access by state should be kept in mind when analyzing the determinants of contraceptive use across the different states.

² The U.S. Food and Drug Administration (FDA) is the government agency responsible for the approval of both prescription and non-prescription drugs prior to marketing in the United States (see <http://www.fda.gov/Drug/DevelopmentApprovalProcess/HowDrugsareDevelopedandApproved/default.htm> for more detail)

2.3. STATE ABORTION ACCESS CONTEXT

Perhaps the most contentious issue to date in the United States, abortion laws across the states have a long and complicated background. It was not until *Roe v. Wade* in 1973 that the cost of terminating unplanned pregnancies for adult women in the United States was significantly lowered with the legalization of abortion (Guldi, 2006, p. 820). Legalized access at the federal level, however, translated very differently across the states. Once abortions were legalized, there were still three primary methods of limiting access to abortions at the state level: Medicaid funding restrictions, parental involvement laws for minors, and mandatory delays before abortions can take place (Levine, 2004, p. 15).

Medicaid Funding Restrictions. Medicaid is a government program that provides health insurance to citizens below a certain income level, and its financing is split between the federal and state governments (Levine, 2004, p. 15). Restrictions surrounding Medicaid coverage of abortions are important indicators of how accessible abortions are to women – in particular, low-income women. The Hyde Amendment of 1976 was a key piece of legislation that limited abortion coverage for low income women by prohibiting federal funds from being used to pay for abortions. This amendment implied that states could choose whether or not to fund abortions through Medicaid.

It was not until 1993 that an amendment to this legislation guaranteed Medicaid funding for abortions for women who were pregnant as a result of rape or incest. Presently, the amendment also covers cases where the pregnancy results in life endangerment for the mother. However, while this is federal legislation, it should be noted that a number of states continue to refuse to fund abortions. For instance, Henshaw (2009) notes that in 2001, Idaho, Illinois, Indiana, and Montana were under court order to pay for most or all medically necessary abortions, but in fact paid for none or almost none (p. 3).

A number of states have widened the scope of the “rape, incest, or life endangerment” conditions, and ensure that low income women have access to Medicaid funding for all or most medically necessary abortions. These are abortions deemed necessary to protect a woman’s physical or mental health. In total 17 states currently have such policies in place. However, 32 states presently only pay for abortions under the circumstances outlined by the 1993 Hyde

Amendment, while one state, South Dakota, only pays for abortions in cases of life endangerment (Henshaw, 2009, p. 3). Table 3 identifies the states that currently (as of 2010) only abide by the 1993 Hyde Amendment and those that have opted for wider Medicaid funding.

Parental Involvement Laws. A second indicator of how accessible abortions are involves the state-level policies surrounding minors' abortion access and coverage. A number of states have instituted parental involvement laws that require parental consent or notification before a minor – typically under 18 years of age – can access abortion services. These laws became especially popular in the 1980s and have remained in place in 34 states to date (Levine, 2004, p. 18). Of these, 20 states require parental consent from both parents, 10 states require parental notification, and four states require both parental consent and notification (Alan Guttmacher Institute, 2010, p. 1).

Mandatory Delay Laws. Finally, a third way to impose restrictions on abortion access is to require women to wait a specified period of time from the time that the abortion was requested until the time that the abortion could be performed. These laws are justified by the argument that women should be provided with information surrounding fetal development and abortion alternatives so “informed consent” can be given by the woman (Levine, 2004, p. 18). Although there were a number of court rulings prior to 1992 that prohibited these laws, a 1992 court ruling in Pennsylvania deemed these laws constitutional. Since 1992, 17 states have enacted mandatory delay laws (Levine, 2004, p. 19).

As seen above, the contraception, health insurance, and abortion policy contexts across the United States are extremely varied. In the remainder of this paper, I will assess how these variations, along with differences in the demographic, socioeconomic, and cultural contexts, come together to shape a woman's contraceptive decision-making process.

3. PREVIOUS RESEARCH AND THEORETICAL CONSIDERATIONS

In the following section, I provide an overview of the literature review conducted for this paper. This review outlines the most relevant previous research relating to cost components of the

contraceptive decision-making process. Following this, I explain the theoretical model that will be used as the basis of my analysis.

3.1. PREVIOUS RESEARCH OVERVIEW

A substantial amount of research has been conducted in an attempt to identify the determinants of contraceptive use. In fact, a JSTOR search with the key words “contracept*” and “determinants” brought to light over 94 such articles. However, the proportion of these articles that focus specifically on cost and policy factors is more limited. Using previous literature reviews conducted by Sen (2006) and Henshaw (2009), in addition the JSTOR search, internet search engines, and the reference sections of relevant articles, 19 studies were selected for further analysis. These were typically the most recent or commonly cited studies pertaining to cost factors that could impact contraception use.

Overall, it was found that there has not been any research looking explicitly at the impact of future costs on contraceptive intensity (i.e. on a woman’s choice of contraceptive method). The majority of the previous research looked at how contraceptive use could be impacted by the presence of health insurance. While not always the key dependent variable in question, the presence of health insurance was used as a control variable in over half of the studies (ten of 19). The impact of price and access to contraceptives was not as common in the literature in a developed country context, and so only five such studies were included in this review as these were the most commonly cited (Levin (1999) and Ciszewski (1995)) or the most relevant studies for the United States context (Gelberg (2002) and Matthews (1997)) and the Western European context (Oddens (1993)). Finally, there were a number of articles that looked at the impact of contraceptive use on abortion. However, studies that looked at the impact of abortion access on contraceptive use were far less common and all focused on teenage pregnancy. Overall, just four studies could be found that considered this perspective, and none of these focused on the impact of abortion on hormonal contraceptive use.

A great deal of the literature that was reviewed initially came from a developing country standpoint. However, as the focus of this paper was a developed country, 16 of the 19 studies analyzed for this paper were from a developed country perspective. In particular, most of the literature pertaining to contraceptive determinants in developed countries originated from the

United States, and these are largely the studies that have been included in this review. Fourteen of the articles are from the United States, while one is from the Netherlands, one from eight European countries, two are from Bangladesh, and one is from a number of developing countries. The latter three studies about developing countries, Pritchett (1994), Ciszewski (1995), and Levin (1999), were included due to their unique findings and the authors' application of an economic approach.

Finally, the methods employed by most of the articles in question were quite similar. Only two studies, Pritchett (1994) and Oddens (1993) used macro data, while the remaining 17 studies use micro-level data. Logistic and probit regressions were the most commonly used methods of analysis, with seven studies choosing these methods. It should be noted that six of the logit-based studies – Levin (1999), Gelberg (2002), Culwell (2007), Frost (2008), Heavey (2008) and Nearn (2008) – used cross-sectional as opposed to panel data. These were the most relevant studies with respect to methodology, as this paper will also use logistic regression analysis and cross-sectional micro data. Difference-in-difference techniques, OLS regressions, relative risks, Poisson regressions, correlation coefficients, and simple trend analyses were used by the remaining studies.

The findings of the previous research analyzed in this paper have been summarized in Table 4. This table indicates whether price, the presence of health insurance, or state policies that restrict abortion laws were found to have a positive or negative impact on female contraception use in the studies in question and whether these findings were statistically significant.

3.1.1. CONTRACEPTIVE PRICE FINDINGS

One commonly studied component of cost is the direct price of contraceptives. There have been a number of studies looking at the impact of price on contraceptive use and choice, but the ones cited in this paper are Levin (1999), Ciszewski and Harvey (1995), Gelberg (1995), Matthews (1997), and Oddens (1993). The findings of these studies have been mixed. Levin (1999) and Ciszewski and Harvey (1995) look at how price may impact people's choice of contraception in Bangladesh using an economic approach. In the first study, the author finds that clients were 30 percent *more* likely to use condoms than the pill as the price of condoms increased, indicating an association between price and value to these people (p. 11). Ciszewski and Harvey (1995),

however, find a negative but not significant impact of increasing contraception price on usage rates. In a simple trend analysis, they show that a 60 percent increase in price decreased condom sales by 29 percent and pill sales by 12 percent (p. 150).

The two American studies were Gelberg (2002) and Matthews (1997). Both studies found a negative impact of price on contraceptive usage. Gelberg (2002) found a statistically significant negative impact on contraceptive use while Matthews (1997) found that birthrates increased in areas where contraceptive prices had increased. The issue with respect to Gelberg's study, however, relates to its universal applicability, as it was a survey of homeless women. These findings may, therefore, not be relevant in wider settings, as homeless women face unique challenges including elevated drug use and depression rates (p. 280). Finally, the Western European study, Oddens (1993), did not find that differences in reimbursement schemes for contraceptives across eight European countries could account for their different usage rates. On the whole, none of the studies in the developed country context focused on contraceptive intensity and specifically how hormonal contraceptive use was impacted by price factors.

3.1.2. HEALTH INSURANCE FINDINGS

An important factor that may lessen the cost of contraceptives to a woman is the presence of health insurance. The impact of health insurance on oral contraception use was explored in nine of the articles included in this review. Of these studies, five found a positive and significant impact of health insurance on contraception use while four found a positive but non-significant impact of health insurance.

Culwell and Feinglass (2007) uses data from the Behavioral Risk Factor Surveillance System. The findings of this study indicate that American women without health insurance were 30 percent less likely to use oral contraceptives than women with public or private health insurance. Frost (2008), meanwhile, focused on insurance type and found that Medicaid users were half as likely as women with private insurance to use the pill (p. 97). Nearn (2009) also finds that women with private insurance or Medicaid were 3.31 times more likely than were uninsured women to use prescription contraceptives (p. 105). Krings (2008), meanwhile, looks at the determinants of pill use in urban women from New England, finding that users of the pill are more likely to have private insurance than women who identify the male condom as their

primary contraceptive choice (p. e47). Finally, in a Dutch study by Stolk (2008), the author finds that a policy change suspending reimbursement for the pill for women over the age of 21 likely led to three percent fewer women using the pill (p. 401). A shortcoming of these studies revolves around the more limited range of contraceptives considered by the authors. While comparisons of women using no contraception versus women using the pill were considered in Culwell and Feniglass (2007) and Nearn (2009), these studies omit women using alternative methods of contraception. Meanwhile, none of the studies consider other highly effective hormonal contraceptive choices, such as IUDs, the patch, or injectables.

The remaining four articles, Kearney (2009), Sonfield (2004), Pritchett (1994), and Heavey et al. (2008), find positive but not significant impacts of health insurance on contraceptive use. Kearney (2009) finds indirect evidence that health insurance in the United States impacts contraceptive use. She interprets lower teen birth rates for those with health insurance as being the result of women's increased health insurance access (p. 138). Heavey et al. (2008), meanwhile, finds that among uninsured American teens, those who could receive free hormonal methods from a family planning clinic were more likely to choose those methods as opposed to barrier methods (p. 45). Pritchett (1994) looks at a number of developing countries and concludes that health insurance does not have a large impact on contraception use in these countries. However, the study does attribute 10 percent of the differentials in total fertility rates across developing countries to contraceptive access (p. 1). Finally, Sonfield (2004) looks at the impact of contraceptive mandate laws on oral contraceptive use and finds that states with these mandates can attribute 30 percent of an increase in pill coverage to these mandates. None of these studies directly look at the impact of different types of insurance on contraception use, which is an aim of the present study.

3.1.3. ABORTION POLICY FINDINGS

No published articles have explored whether a woman's choice to use hormonal contraceptives is impacted by the state abortion context; however, it should be noted that an unpublished paper by Amanda Felkey has looked at the impact of abortion access on the use of the pill from a macro standpoint. Sen (2003) looks at the impact of abortion policies on STD rates and summarizes a number of articles looking at the impact of abortion policies on birthrates – both factors being

indirect indicators of contraception use; however, she does not find a consistent impact in the literature nor in her study (Sen, 2003, p. 314). There have also been a handful of studies that use micro data to test the impact of various abortion policies on more general contraception use. All of these papers have focused on teenage contraception use and parental involvement laws.

Only one study, Levine (2003), finds a positive and significant impact of state restrictions to teen abortions on contraceptive use. Using two waves of the National Survey of Family Growth (NSFG), Levine finds that parental involvement laws leads to a six percent reduction in unprotected sexual activity for women aged 15 to 18. The author finds that the effect is largely attributable to the greater reliance on contraception among teens, which is estimated to increase by 16.5 percent in response to a parental involvement law (p. 874).

Two of the remaining studies find a positive but not statistically significant impact of abortion restrictions on contraception use. Averett et. al. (2002) uses the 1995 wave of the NSFG as well, and finds that parental notification laws have a weak, positive effect on contraception use. However, these results were not robust to the inclusion of various county level controls. Meanwhile, restrictions on Medicaid funding for abortions and other cost variables were not significant predictors of contraceptive use at last intercourse in this study (p. 1773). Sen (2006) also finds that Medicaid funding restrictions on abortion increase the use of contraception using the 1997 National Longitudinal Survey of Youth in the United States. However, the author finds a positive but insignificant impact of parental involvement laws on contraception use (p. 327). Finally, Levine (2000) finds mixed results indicating that Medicaid funding restrictions and the mandatory waiting period laws had very small positive impacts on contraception use, while parental consent laws had a small negative impact (p. 57). He interprets these results as not supporting the hypothesis that abortion laws impact contraception use, but attributes the results to the limited variation in the abortion variables (p. 37). As none of the abovementioned studies have considered the impact of abortion access on the choice of contraceptive method or considered a sample of women beyond their teenage years, the current study can contribute to filling this considerable gap in the literature.

3.1.4. CONCLUDING REMARKS

The most commonly cited challenge among the studies that were reviewed revolved around the cross-sectional nature of the data that was used. Levine (2000), Henshaw (2009), and Sen (2006), all note that in their reviews of the literature, the cross-sectional nature of the data used was a hindrance. This was especially the case when policy variables were of interest. Sen (2006) points out that state abortion policies are likely to be correlated with unobservable beliefs and attitudes of the state's population, which could in turn influence the population's attitude towards contraception use (p. 319). Without panel data, which is not publicly available for a number of these studies, it is very difficult to correct for these omitted individual-specific effects. As such, Levine (2004) concludes that the impact of a number of these studies is weakened significantly (p. 81).

Overall, the findings of this literature review would indicate that health insurance is the cost variable that has most consistently been shown to impact women's contraception use. However, health insurance is also one of the easier variables to measure. Abortion context, meanwhile, has not been as widely explored in the literature. As such, the findings surrounding its impact on contraception use have not been as robust. These inconsistent findings provide further motivation for this study.

3.2. THEORETICAL BACKGROUND

The decision-making framework surrounding contraceptive choices has been explored extensively from a psychosocial vantage point, and the majority of the literature dealing with contraceptive decision-making employs these frameworks. However, there is a body of work that uses the economic decision-making approach which will be applied in this paper. The seedlings of the framework that will be used can be attributed to the early works of Ansley Coale (1973). In his work on fertility decline in Europe, Coale set out three important pre-conditions for fertility decline: 1) that fertility is within the calculus of conscious choice; 2) that reduced fertility is advantageous; and 3) that effective techniques of fertility reduction are available (p. 65). While these conditions were outlined to explain fertility decline in nineteenth century Europe, each of these three components will play an important role in the model I use to explain contemporary contraceptive choices at the individual level.

3.2.1. THE BASIC ECONOMIC FRAMEWORK

To understand the economic model of contraception choice, we must first understand how a simplified fertility model works. Economic models of fertility behaviour have their roots in Gary Becker (1960)'s New Home Economics model. At its simplest, this demand model assumes the people have varying tastes for goods and services, and children are considered one such good. Given people's time and income constraints, people will maximize their individual utility functions by allocating their time and money to the activities that maximize utility. If the cost of an activity – in this context represented by the costs of childbearing and childrearing – increases, then people will demand less of the activity.

There are two key simplifying assumptions within Becker's framework that are important to note before these models can be applied to contraceptive behaviour. Gauthier (2001) points out the first assumption in her criticism of the economic approach. She notes that New Home Economics assumes that individuals have full information of the costs and benefits of various alternatives prior to pregnancy (Gauthier, 2001, p. 4). This means that when they act, women are taking all of the relevant economic considerations into account. The second key assumption, as noted in Levine (2004), is that women can obtain perfect methods of contraception at zero cost (Levine, 2004, p. 45). Holding the first assumption while relaxing the second assumption – so that contraception is assumed to be costly and imperfect – introduces the possibility of "unwanted" births into these fertility models. These can be considered births that impose a cost, as opposed to net benefit, onto the parents (Levine, 2004, p.p. 47).

Knowing the costs and benefits associated with a birth, a woman can then take measures to reduce the likelihood of pregnancy. However, it is assumed that each additional measure to avoid pregnancy that she takes is increasingly costly. As such, a woman will first select the method with which she is most comfortable. As further more effective measures are required, greater sacrifices are assumed to be taken (Levine, 2004, p. 47).

3.2.2. THE DECISION TO AVERT A BIRTH

Model Assumptions. The model that will be used in this paper to explain a woman's choice of contraceptive intensity is largely based on the economic model of abortion and contraception

outlined in Levine (2004). The model has five assumptions. The first assumption is that the model represents the choices made by one woman looking forward. Women can use contraception and then have an abortion if contraception fails. Women can choose alternative combinations of levels of contraception and probabilities of abortions. The woman must decide how much she is willing to spend on a combination of contraception and abortion in order to avert a birth.³

The second assumption involves the marginal cost of contraceptive intensity. The marginal cost of contraceptive intensity can be defined as the additional cost associated with a shift from a less effective contraceptive method to a more effective (i.e. higher intensity) method. The marginal cost can be defined as follows: $MC = \Delta C / \Delta P$, where MC is the marginal cost of a unit reduction in the probability of a pregnancy, ΔC is the change in cost of moving from one method to a higher intensity method, and ΔP represents the change in the probability with which one avoids a pregnancy (Levine, 2004, p. 50). This model assumes that as the contraceptive intensity increases, so does the marginal cost of contraceptive intensity. In Figure 4, this increasing marginal cost of contraceptive intensity can be seen in the upward slope of the line representing the marginal cost of contraception. It should be noted that the above mentioned costs are monetary representations of the financial and psychological costs associated with different contraceptive methods.

The third assumption involves the marginal cost of abortion. The expected marginal cost of abortion represents the cost of an abortion to a woman multiplied by the probability that the woman will require the abortion (i.e. the probability of contraceptive failure). The model assumes that as the probability of requiring an abortion to avert a birth decreases, the marginal cost with respect to increasing contraceptive intensity remains constant. This implies that for every percentage reduction in the probability of requiring an abortion, the woman is paying the same additional amount. In Figure 4, this constant marginal cost is captured by the zero-slope marginal cost of abortion lines. Once again, these costs include financial and psychological costs associated with the expected value of a reduced probability of abortion.

³ It should be noted that contraception in this context is only considered for its function as a method of birth control. Contraceptive functions with respect to STD prevention, for instance, are not factored into this model.

The next assumption pertains to the marginal penalty cost for a birth. As noted earlier, we are assuming that a birth in this case is unwanted (i.e. the net costs of a birth outweigh the net benefits for each woman). Births have positive and negative aspects; in the case of an unwanted birth, we assume that the net cost is negative. The marginal cost of a birth is the total cost of the birth to a woman multiplied by the probability of the birth occurring. As with abortion, though, the model assumes that the marginal cost remains constant, so the woman gets the same benefit for every percentage decrease in the probability of a birth. While this birth cost is a penalty to the woman, it is important to note that the reduction of the penalty represents the expected benefit conferred to a woman by her birth aversion methods (contraception use and abortion). In Figure 4, the constant marginal cost of a birth is represented by the zero-slope birth penalty line. As was the case with the previous assumptions, the birth costs include financial and psychological costs associated with a birth. These financial costs take into account opportunity costs of childbearing and childrearing for a woman, which are predicted to increase as a woman's education and income increase.

The final assumption of this model is that the woman is a utility maximizer. To optimize her expected utility, the woman will choose the contraceptive method that maximizes her benefits when taking into consideration all costs and benefits in the model.

Model Conclusions. With these assumptions, the model can predict how various marginal costs of abortion, contraception, and births can impact a woman's choice of contraceptive intensity. To demonstrate this, we will consider two cases. In both cases, we can assume that the marginal cost of a birth is constant at \$1000. In the first case, we assume that the cost of an abortion is \$800 to the woman. This implies that the expected benefit for every 10 percent reduction in the probability of a birth is \$100 (i.e. moving from 0 to 100 in Figure 4), and the expected cost of abortion is \$80 for every 10 percent increase in the probability of an abortion (i.e. moving from 100 to 0 in Figure 4). Starting at a high probability of pregnancy, the woman will choose incrementally more intense contraceptive methods until the marginal cost of contraception is equal to the marginal cost of abortion. At this point, $p1^*$ in Figure 4 is the optimal combination of contraceptive intensity and probability of abortion where the woman will maximize her net benefit. Here, the woman incurs the lowest cost possible to avert a birth. She chooses a moderate level of contraceptive intensity, knowing that the expected cost of abortion in this case

is relatively low and is expected to be a comparatively cheap failsafe should her contraceptive method fail.

In the second case, we can assume that the marginal cost of abortion is higher, at \$1200. In this case, the marginal cost of abortion exceeds that of the birth penalty of \$1000. The woman will now choose a more effective contraceptive method at point $p2^*$ to maximize her utility. In this case she will pay up to this point to avoid the cost of a birth, but she will not pay beyond this point. Beyond $p2^*$, the marginal cost of more effective contraceptive methods begins to exceed the expected marginal cost of a birth, and it is no longer worthwhile for the woman to invest in more intense contraceptive methods. As such, the woman is willing to take on the remaining risk of a contraceptive failure rather than abort the birth.

3.2.3. THE IMPACT OF HEALTH INSURANCE ON CONTRACEPTIVE CHOICE

The impact of health insurance on a woman's choice of contraceptive intensity is quite straightforward. Using Figure 5, we can demonstrate the impact of a copayment-based health insurance plan on the marginal cost of contraception to a woman. With a plan where the user pays a certain dollar amount per unit of contraception, the presence of health insurance acts to shift the marginal cost of contraception curve downwards relative to a case where there is no health insurance. With this lowered cost, a woman can now choose a more expensive and effective method of contraception – that is, she can shift her choice from $p1^*$ to $p2^*$.

It should be noted that there are other types of copayment-based health insurance options available. Specifically, a woman could have a plan where she pays a certain percentage of the contraceptive costs that she incurs. In this case, the marginal cost of contraception curve would have a more gradual slope. Once again, though, the end effect is the same. The marginal cost of contraception curve would intersect with the birth cost curve at a higher contraceptive intensity – at $p2^*$ instead of $p1^*$, as demonstrated in Figure 6.

3.2.4. OTHER SHIFT FACTORS

It was noted in the overview of the basic economic framework, people's tastes are an important consideration in a utility maximization model. Previous research has shown that there are a number of factors that may impact a woman's attitude towards births, abortions, and

contraceptive methods. Below I discuss some of these findings and their theoretical implications for the above model.

Age. The age of a woman has been shown to have a significant impact on a woman's contraceptive behaviour. Frost (2008) found that being in a higher age bracket (35-44) is associated with less contraception use among women at risk for an unintended pregnancy. Furthermore, Hansen (2009) has found that for women in Denmark, the risk of abortion decreases with age; however, there is a greater impact of age for women who have already had children (Hansen, 2009, p. 665). To some extent, these trends can be explained by the increased prevalence of child postponement in developed countries. In the United States, in particular, Heck (1997) found that between 1969 and 1994, the proportion of first-time mothers who were age 30 or older increased from 4.1 percent to 21.2 percent (p. 81). As such, it would appear that women's attitudes towards childbearing become more positive as they reach the latter part of their fertile years. That is, the marginal cost of a birth would decrease with age while the marginal cost of abortion would increase with age. This downward shift of the birth penalty and upward shift of the expected abortion cost would lead to the prediction that a woman's contraceptive intensity declines with age.

Parity. As noted above, Hansen (2009) found a differential impact of age on abortion depending on whether a woman was nulliparous or not. Specifically, the study found that the risk of abortion was higher for women with children (p. 666). Likewise, Mosher (2004) demonstrates that as a woman's parity increases, she is more likely to use a form of contraception (p. 21). The latter study, however, does hold constant other factors. These findings fall in line with the hypothesis that women who have achieved their fertility intentions are more likely to take measures to prevent pregnancies. As such, higher parity births would impose a higher cost for these women. Given the higher propensity for both abortions and contraception use for women with children, it can be expected that the marginal cost of abortion and contraception use may decrease as parity increases. Given the shift in all three factors, the impact of parity on contraceptive intensity is not clear.

Race. Race is a second demographic factor that has been explored substantially in the literature with respect to attitudes towards contraception, abortion, and childbearing. While Culwell

(2007) finds that Black and Asian women are less likely to use prescription contraceptives, Wilcox (1997) finds that Black women are twice as likely to have abortions as White women and are more likely to support abortions (p. 249). Zabin et. al. (1993) explain the latter abortion trends with their conclusion that there is a high degree of ambivalence among inner-city Black women with respect to attitudes towards abortion and contraception (p. 67). While this attitude has been attributed to higher levels of poverty and lower education rates for inner-city women in the United States, few studies explain what the impact of race may be once education and income are controlled for. As such, from a theoretical standpoint, it is difficult to predict the impact of race on contraceptive intensity.

Income. Frost (2007) shows that higher income is associated with higher usage rates of more effective contraceptive methods. Meanwhile, Jones (2008) shows that 42 percent of women obtaining abortions have incomes below the federal poverty level (p. 12).⁴ Although a child is a comparatively larger burden for a woman with few financial resources, the opportunity cost of a child is higher for women with higher incomes. As such, the directional shift in the expected marginal cost of birth curve is somewhat unclear. The impact of income on abortion rates would be positive if a woman had to pay out of pocket for the procedure. However, depending on a woman's state of residence and whether abortions are covered by Medicaid in that state, the impact of income on the expected cost of abortion would vary. For women in states where abortions are not covered by Medicaid, having a lower income would likely also shift the expected marginal cost of abortion upwards. Finally, for women without insurance coverage, lower incomes would likely shift the marginal cost of contraceptives upwards. Overall, then, it is unclear what the exact impact of income would be on women's contraceptive intensity choice.

Education. Frost (2007) has found that having less than a college education is associated with lower intensity contraceptive behaviour, while Blunt (2007) finds that pro-choice support increases with years of education (p. 6). These results fall in line with the findings of Heck (1997) that age at first birth has increased rapidly among women with 12 or more years of education – nearly half of college graduate women who had their first birth in 1994 were age 30 or older (p. 81). These results support the hypothesis that there is a higher opportunity cost

⁴ The federal poverty level was \$10,830 for a single woman with no children in the United States in 2008 (Jones, 2008, p. 12)

associated with a birth for more educated women. The higher expected earnings of more educated women would cause the expected marginal cost of a birth to shift upwards relative to abortion costs. As such, it would be expected that more educated women would opt for higher contraceptive intensity and would be more likely to choose an abortion over a birth.

Labour Force Participation and Gender Roles. Labour force status can be expected to shift contraceptive intensity upwards for two reasons. As with higher educated women, if a woman is participating in the labour force and earning income, her opportunity cost of childbearing is expected to be higher. Further, Luker (1984) demonstrates that a more traditional attitude towards gender roles implies that a woman is more likely to be pro-life. If a woman has a less positive attitude towards traditional gender roles (of which labour force participation can be an indicator) and is earning income, it can be assumed that both the psychological and monetary costs associated with a birth would be higher. This would imply that labour force participation and less traditional views towards motherhood would lead to an upward shift in the expected marginal cost of a birth and to a higher contraceptive intensity.

Partner Status. Whether or not a woman has a steady, monogamous partner has been found to be associated with less consistent contraception use among women at risk for unintended pregnancy according to Frost (2007). Meanwhile, women who have never been married and are not currently cohabiting comprise 45 percent of abortions in the United States (Alan Guttmacher Institute, 2010). From the perspective that the presence of a partner may increase both the financial and emotional capital required to raise a child, it would make sense that women with a partner would have a lower birth penalty than single women. As such, it would be expected that having a partner would shift the expected marginal cost of having a child downwards. This would likely decrease the contraceptive intensity of a woman.

Religion. Previous research has shown that women with a higher degree of religiosity also tend to have more negative attitude towards abortion (Scott, 1998, p.178). Along similar lines, Raine (2003) found that women who were raised religious were much less likely to use hormonal methods of contraception (p. 21). In the case of highly religious women, it can be assumed that the psychological costs associated with both contraception use and abortion would be high if these are factors that are frowned upon by their religious communities – as may be the case with

Catholics and Evangelical Protestants in the United States, for instance (Evans, 2002, p. 397). As such, for highly religious women, the expected marginal costs of abortion and contraception are predicted to shift upwards, potentially decreasing a woman's contraceptive intensity.

3.3. HYPOTHESES

The model discussed above leads to a number of predictions that have been summarized in Table 5. With respect to the impact of abortion costs on the choice of contraceptive intensity, it is predicted that, holding all shift factors constant, as the cost of an abortion increases, the choice of contraceptive intensity will increase. With respect to the research question at hand, this implies that as an abortion becomes less accessible for a woman – for instance, through restrictive state abortion laws – she will be more inclined to choose the more effective hormonal contraceptive methods over less effective methods and over no method. The model also predicts that if a woman is covered by a copayment-based insurance plan, her contraceptive intensity will increase. With respect to the research question, this implies that if a woman is covered by public or private insurance – both of which cover most hormonal contraceptive methods – she is more likely to choose a hormonal contraceptive method.

4. MODEL, DATA, AND METHODS

To test my hypotheses, I will conduct multinomial logit regression analysis on micro-level survey data from the National Survey of Family Growth. I will also use a macro-level abortion policy indicator based on data from the Alan Guttmacher Institute. As my theoretical model indicates, the variables that should be incorporated in my statistical analysis include a measurement of a woman's contraceptive intensity and factors impacting the relative costs of contraceptives, a birth, and an abortion to a woman. These include factors such as health insurance, state abortion regulations, and other shift factors like age, parity, race, partnership status, labour force status, educational attainment, and income. Given available data, it is possible to isolate some of these variables for inclusion in my model. There are, however, limitations regarding how targeted this analysis can be and how accurately the available data will measure the variables outlined in my theory. As such, most of the variables in my empirical model will be proxies for the theoretical variables.

4.1.1. DATA SOURCE

Cross-sectional micro-data from the 1995 cycle of the National Survey of Family Growth (NSFG) was used to test the outlined hypotheses. Due to constraints with respect to gaining regional and state-level identifiers for other cycles of the survey, only the 1995 cross section was used in this analysis. The 1995 cycle was the only cycle that included a publicly available regional identifier for each woman in addition to the variables required to test the hypotheses.⁵⁶

The NSFG data was collected from personal interviews, which were conducted in the homes of a national sample of women aged 15 to 44 in the civilian, non-institutionalized population in the United States. The 1995 data was the fifth cycle of this survey, of which there are six, spanning from 1973 to 2002. The survey for this cycle was conducted by the National Center for Health Statistics, a branch on the U.S. Department of Health and Human Services (CDC, 2009). The interviews were conducted by the University of Michigan, which utilized professional, female interviewers from the university's Survey Research Center. Interviews were 100 minutes in length and conducted in the interviewees' homes. Interviewees were paid US\$20 to participate in the survey.

For the 1995 cycle, 10,847 women were interviewed. The interview sample was taken from across the United States, with over-samples of Black and Hispanic households. The data is not nationally representative in its original form, but can be made so with the use of sample weights included in the dataset. These weights correct for oversampling, non-response, and non-coverage (Lepkowski et. al., 2006, p. 25).⁷

There are some additional factors relating to the nature of the data that should be noted due to their potential to bias the study results. In some cases, the variables that were used included imputed values. The most relevant example of an imputed variable for this study is the CONSTAT1 variable. Whenever imputation techniques are used, there is a risk of inaccuracy that should be taken into account. The imputation methods used in this survey involved logical,

⁵ While using multiple cross sections would have been preferable in this context, this was not a possibility with the publicly available data. The implications of the use of only one cross section are discussed further in the Limitations section below.

⁶ I attempted to gain access to state-level identifiers, but due to the process length, using this data was not feasible for this paper.

⁷ For a detailed account of the weighting techniques applied by the CDC, please see Lepkowski et. al. (2006)

hot deck, and regression techniques (Lepkowski et. al., 2006, p. 35).⁸ Another potential source of bias exists due to the content of the survey questions. Due to the sensitive nature of survey questions dealing with sexual and contraceptive behaviour, and the in-person nature of the data collection, it is possible that interviewees may not have been completely straightforward in the answers provided. These factors should be kept in mind throughout the analysis.

4.1.2. SAMPLE

Previous studies have used NSFG data to identify women at risk for unintended pregnancies. Consistent with these papers, women in this study were identified as being at risk for an unintended pregnancy if they were currently not pregnant, not seeking pregnancy, they or their partners were not sterile (due to natural causes or due to sterilization procedures), and if they had reported heterosexual intercourse in the three months preceding the interview (Nearn, 2008, p. 106). To identify these women, one variable, CONSTAT1, was used. This variable identifies the woman's current contraceptive status, identifying whether she or her partner has been sterilized or is sterile and what her primary contraceptive method is. If the woman does not have a contraceptive method, this variable identifies whether it is because she is pregnant, post-pregnancy, currently trying to become pregnant, has never been sexually active or has not been sexually active in the last three months.

After adjustments were made based on the above definition of a woman at risk for an unintended pregnancy, the sample size decreased from 10, 847 to 4,775 women. The most common reason for exclusion from the sample was sterilization. A total of 2,950 women who were excluded from the sample had identified that they or their partner had been sterilized or were naturally sterile. The second largest group that was excluded was comprised of women who had never been sexually active. They accounted for 967 of the excluded women. After the total sample had been reduced to 4,775 women, an additional four women were dropped from the sample because they had not answered the question pertaining to religious attendance.

It should be noted that by creating a sub-sample of sexually active women, there is an implicit assumption that the contraception decision-making process is undertaken only after a woman has

⁸ Hot bed imputation was commonly used in Cycle 5. This technique involves imputing a missing value from a randomly selected similar record (Lepowskie et. al., 2006, p. 35).

made the decision to be sexually active (Sen, 2006, p. 318). Sen (2006) notes that there are other studies that have taken this approach to studying contraception behaviour (see Hogan et. al., 1985); however, a handful of studies have employed sample selection corrections to account for the fact that the study population is a non-random selection of the full sample of reproductive-aged women. While I acknowledge this as a potential source of bias, I have opted not to employ a Heckman sample selection bias correction approach for this paper. Previous studies that have employed this technique focused on teenage contraception use, and were able to find a valid identification restriction for sexual activity in a woman's age since menarche. This was not possible in my case given the age range of the women in my study. Instead, I assume that the decision to become sexually active is independent of the decision to contracept.

4.2. VARIABLE CONSTRUCTION AND MODEL SPECIFICATION

Below, I provide a more detailed account of the empirical model and the variables that comprise it. Table 6 provides a summary of the variables that will be used in my empirical model, along with a brief description of the how the variables were constructed and what they measure.

4.2.1. VARIABLE CONSTRUCTION

To measure contraceptive intensity, my empirical model will use a categorical variable called *constat*. This variable is a construct from the CONSTAT1 variable in the data. This *constat* variable subdivides the women into three groups: those who use hormonal methods of contraception (the pill, an injectable, an implant, or an intrauterine device), those who use alternative methods (diaphragm, male or female condom, foam, cervical cap, sponge, suppository, jelly or cream, natural family planning, calendar rhythm, withdrawal, or other methods), and those who use no method at all (chance). The rationale for this subdivision follows from the theoretical model and research question at hand. As can be seen in Table 1, hormonal methods can be considered the highest intensity contraceptives, with typical use effectiveness rates ranging from 92 percent to 99.9 percent. These are also typically the most expensive methods and cannot be attained without physician consultation – therefore at a higher cost to the woman. The remaining methods range in effectiveness from 73 percent to 85 percent with typical use, and these tend to be much less expensive and more easily available than

hormonal methods.⁹ Finally, no method has a pregnancy prevention effectiveness rate of 15 percent. Given our intent to determine if women using hormonal methods are different from women using other or no methods, constructing the dependent variable in this way can be justified.

For the independent variables, health insurance status will be measured by two indicator variables for the presence of health insurance coverage. *Public ins* indicates the presence of public insurance (Medicaid or military) and *Private ins* indicates the presence of private insurance. Both dummies are compared to a base category of no insurance (*No ins*). Abortion accessibility is ascertained based on a series of three regional indicators: *Northeast*, *Midwest*, and *West* which each have increasing levels of abortion access when compared to the base category of *South*. Specifically, this variable was based on state laws from 1995 stipulating whether abortions were paid for by Medicaid for cases outside the federally mandated rape, incest, or life endangerment requirements. Because a woman's state of residence could not be directly identified, I calculated the proportion of the population in each region living in a state where court rulings stipulated that Medicaid must pay for abortions beyond the federal mandates.¹⁰ These calculations were based on state population estimates from 1995.¹¹ In total, 17 states had wider abortion access, and this translated into eight percent of the population in the South, 26 percent of the population in the Midwest, 64 percent of the population in the Northeast, and 83 percent of the population in the West having wider abortion access. Tying this back to the hypotheses, it would be expected that relative to the South, women in the Midwest, Northeast, and West would incrementally choose lower contraceptive intensities.

A number of the shift factor variables could be measured with relatively direct proxies. Age will be measured by the variable *age*, which is a nominal value of the woman's age at the time of the survey. The presence of a long-term partner is captured by the *partner* dummy variable, which indicates whether the woman identified herself as married or living with a partner. Educational

⁹ It should be noted that while most of these methods can be obtained over the counter in the United States, the cervical cap and diaphragm require a health care professional for implantation. The cost and effectiveness, however, are still comparatively lower than hormonal techniques.

¹⁰ In this case, wider Medicaid abortion funding is being used as a proxy for lower abortion costs in a state. While Medicaid funding restrictions would only directly impact abortion costs of lower income women, for the purposes of this study, I assume that increased availability for lower income women also reflects increased abortion availability for all women compared to states where the Medicaid funding is more restricted.

¹¹ The population estimates were from the U.S. Census Bureau website

attainment is measured by the *education* variable, which is the total number of years of schooling the woman recorded. Religiosity is captured by the *Very religious* (implying the woman attends religious services weekly) and *Somewhat religious* (implying the woman attends religious services monthly or less) indicator variables, which are compared to the base category of *Not religious*. The race indicator variables are *Hispanic*, *Black*, or *Other* (which is comprised primarily of Asian and South Asian women), and are compared to a base category of *White*.

To measure a woman's parity, a continuous variable, *parity*, is used which measures the number of births that she has had. A woman's labour force participation and attitude towards gender roles can be proxied with the labour force participation indicator variables, which identify whether a woman is working full time (*FT*), part time (*PT*), or not at all (the base category *No LFP*). This variable can be considered an indicator for a woman's opportunity cost of childbearing, with women working full time likely having a higher opportunity cost of childbearing. Finally, as a proxy for a woman's income, the total family income is measured as incremental indicator variables which identify whether the woman's household makes less than US\$20,000 (*<\$20,000*), between US\$20,000 and US\$39,000 (*\$20K-39K*), between US\$40,000 and US\$70,000 (the base category *\$40K-\$70K*), or over US\$70,000 (*>\$70,000*). Using family income in place of the woman's income could pose potential problems, especially in cases where the women are quite young and living with parents, or where they are not participating in the workforce. The implications of these indirect proxy choices will be discussed further in the Limitations section below.

4.2.2. MODEL SPECIFICATION

The model is written as follows:

$$\begin{aligned} \text{Constat}_i = & \beta_1 + \beta_2 \text{Publi_ins}_i + \beta_3 \text{Private_ins}_i + \beta_4 \text{Northeast}_i + \beta_5 \text{Midwest}_i + \beta_6 \text{West}_i + \beta_7 \text{age}_i \\ & + \beta_8 \text{partner}_i + \beta_9 \text{education}_i + \beta_{10} \text{Very_religious}_i + \beta_{11} \text{Somewhat_religious}_i + \beta_{12} \\ & \text{Hispanic}_i + \beta_{13} \text{Black}_i + \beta_{14} \text{Other}_i + \beta_{15} \text{FT}_i + \beta_{16} \text{PT}_i + \beta_{17} \text{<\$20,000}_i + \beta_{18} \text{\$20K-} \\ & \text{39K}_i + \beta_{19} \text{>\$70,000}_i + u_i \end{aligned}$$

In this model, β_1 represents the constant in the equation, while β_2 through β_{19} are the estimated coefficients for each respective variable. The multinomial logit model can be written as:

$$P(y_i=j) = \frac{\exp\{x_i \beta_j\}}{1 + \exp\{x_i \beta_2\} + \dots + \exp\{x_i \beta_M\}}, j=1, 2, \dots, M,$$

where $P(y_i=j)$ denotes the probability that an individual will select alternative j . Slope coefficients and an intercept can be calculated for all but one of the alternatives (the base category) with the multinomial logit model. In this model, a positive β coefficient implies that people attach positive utility to the corresponding characteristic (Verbeek, 2008, p. 222).

One important feature of the multinomial logit model revolves around its error term, u_i . The error terms in a multinomial logit model are assumed to be independent across observations and identically distributed (iid).¹²¹³ As with other maximum likelihood estimation techniques, the estimators from a multinomial logistic model are not considered unbiased; however, they have large sample properties of consistency, normality, and efficiency (Dow, 2004, p.10). It should be noted that a multinomial probit model was also used to estimate the coefficients and standard errors, but due to reasons that will be discussed further in the Methods section, it was decided that a multinomial logit model would be more appropriate.

4.3. METHODS

In the following section I will discuss the statistical model that will be used, the rationale for its selection, and the statistical techniques applied to account for the complex sample survey data used. Additionally, I will discuss the variables that will be used in the model and how they were constructed.

4.3.1. STATISTICAL MODEL

To estimate the above specified model, a multinomial logit model will be used with cross-sectional data. As noted in the Model Specification section, however, there were some concerns with respect to the model selection that should be discussed due to their potential impact on the estimation results.

¹² The iid assumption also forces an assumption known as the independence of irrelevant alternatives (Kropko, 2008, p. 2). The implications of this property will be discussed further in the Statistical Model section below.

¹³ The iid assumption is satisfied when a simple random sample has been used. In the case of complex survey data, however, the iid assumption is not satisfied because the survey weights are already specified (Pitblado, 2009, pp. 4). An important implication of this property with respect to the ability to calculate a pseudo R-squared will be discussed further in the Results section.

Multinomial Logit vs. Multinomial Probit. In estimating models of individual decision-making with respect to more than two alternatives, the most commonly used models are the multinomial logit (MNL) and multinomial probit (MNP). MNL has the distinct advantage of being computationally simpler and more easily interpretable, due to the ability to calculate relative risks and odds ratios from its regression outputs. However, one of the most cumbersome and commonly cited drawbacks of the MNL involves its independence of irrelevant alternatives (IIA) property. This property stipulates that among the alternatives, the relative odds of selecting between two alternatives should be independent of the number of alternatives (Dow, 2004, p. 109). That is, if one of the alternatives was removed or another alternative was added, the probability of selecting a given alternative would not change. In applied settings, this property has proven to be difficult to meet. It is often recommended that if this property is not met, then alternative models that waive the IIA assumption – such as the MNP model – should be considered (Verbeek, 2008, p. 223).

As such, a Hausman test and Small-Hsiao test were conducted to determine if the removal of the second and third alternatives (other contraceptive methods and no method) impacted the odds of selecting the first alternative (hormonal contraceptives). The results of these tests can be found in Tables 7 and 8 respectively. The two tests yield inconsistent results. The Hausman test fails to reject the null hypothesis that the odds of selection of the first alternative are independent of the removal of the third alternative. Meanwhile, the Small-Hsiao test does not fail to reject the null of independence of alternatives. Given the inconsistent results, a Wald test for collapsing categories was performed to determine whether combining categories would be appropriate. The test rejects the null hypothesis that collapsing categories would be appropriate.

In light of these inconclusive findings, a MNP model was considered and estimated. The results of the MNP model were compared to the results of the MNL model and the comparison of their respective marginal effects outputs can be found in Table 9. Given the almost identical nature of the results with the two models, the MNL model was selected as the final model due to its easier interpretability.

Further substantiating the selection of the MNL model over the MNP model are a handful of recent studies comparing MNL and MNP results in applied individual choice models. Dow

(2004), for instance, found that the MNP model is often more weakly identified than the MNL model. Weak identification is a difficult quality to diagnose, but can lead to misleading inferences due to optimization errors. The MNL model, meanwhile, is less prone to optimization errors (p. 109). Dow (2004) also notes that for many applications, the IIA property is neither relevant nor restrictive in estimating MNL models because IIA is a logical-property of decision-making, as opposed to a statistical property (like consistency or unbiasedness) (p. 112). Similar findings by Kropka (2008) further demonstrate that even when the IIA assumption was violated, MNL provided more accurate results than MNP when Monte Carlo simulations were conducted (p. 1).

Adjustments due to Complex Sample Design. Due to the use of complex sample survey data with over-samplings of certain population segments, the statistical estimation technique required the use of weights to properly compute regression coefficients. The sampling weights can be thought of as the number of women in a given population that a woman represents (Lepkowski et. al., 2006, p. 3). Further adjustments were also required for the estimation of standard errors. Because standard software treats data as though the sample was selected with simple and random sampling methods, standard errors will be underestimated if estimated without accounting for the complex sample design. This underestimation would result in inflated test statistics that overstated coefficient significance (Lepkowski et. al., 2006, p. 38).¹⁴ As such, estimation techniques that accounted for stratification, clustering, and weighting were integrated using pre-estimation commands.

Heteroskedasticity. Heteroskedasticity can be problematic in logistic models. While it will not lead to an inconsistent maximum likelihood estimator, it may lead to biases in the t-values which would lead to inaccurate hypothesis tests. Given these concerns, it should be noted that by accounting for geographic clustering in the standard error estimation with the aforementioned pre-estimation commands, the standard errors are also heteroskedasticity-robust. A Huber-White variance estimator was applied, which is robust to both heteroskedasticity and within-cluster dependence (Ross, 2004, p. 804). This is because the statistical package used, STATA v. 10,

¹⁴ The underestimation of standard errors due to clustering results because clustering in this context implies that a number of women were selected from a similar geographic region. Due to this geographical similarity, these women may be more inclined to have similar characteristics than if they were randomly selected from across the country (Sturgis, 2004, p. 1).

uses the same statistical technique (first-order Taylor series linear approximation) to calculate the adjusted standard errors for both clustering and for heteroskedasticity-robust standard errors (Stata Press, 2009, p. 7).

Multicollinearity. Based on a correlation matrix of the independent variables, there was some concern that several of the variables may be linearly related. This collinearity could make it more difficult to differentiate the effect of different variables on the dependent variable. In particular, for the lower income bracket, there were correlation coefficients of 0.4 and -0.41 with the public and private insurance variables. To determine if collinearity was an issue here, variance inflation factors (VIFs) were calculated for linear regressions with these variables.¹⁵ The VIF values were just above one (1.15 and 1.18 when insurance and income were respectively the dependent variables). As VIF values below 10 generally do not warrant further attention, it was decided that multicollinearity was not a major issue with the independent variables (UCLA, 2010).

Endogeneity. The most worrisome problem with this model involves the potential for endogeneity. As with the potential for sample selection bias mentioned in previous sections, endogeneity is a possible source of bias for my model. Specifically, because I use cross-sectional data as opposed to panel data, the inability to control for unobserved state-level characteristics that may influence the variables in my model is a concern. For instance, it was noted previously that certain cultural and political characteristics differ significantly across the states. While I attempt to control for some cultural factors through the inclusion of a religion measure, the inability to identify each woman's state of residence is a drawback. Not controlling for state-level cultural and political factors implies that these omitted variables could be influencing both a woman's contraceptive behaviour as well as the abortion policy variable. In this case, causal interpretations with respect to the impact of abortion policy on contraception use would be invalid, as unobserved state-level cultural factors may be driving both these variables (Verbeek, 2008, p. 137).

To deal with this issue, it is possible to use instrumental variable estimation, assuming that an instrument can be found for unobservable state attitudes (Sen, 2006, p. 319). For instance, it is

¹⁵ The regressions run to determine the VIF values accounted for the fact that survey data was being used by using the "svy" pre-estimation command.

possible that a state-level variable indicating the political affiliation of the state may impact the abortion policy variable, but not contraceptive behaviour. In my case, however, it was not possible to obtain the state level identifiers for each woman. As such, finding a valid instrument would be difficult. In the absence of a valid instrument, I assume away endogeneity for my model, but note that for future research where the state-level identifier is available, I would attempt instrumental variable estimation. Additionally, when interpreting my statistical results, I will have to be cautious when drawing conclusions with respect to causality.

4.3.2. DISCUSSION OF THE VARIABLES

Prior to the statistical analysis, I conducted a preliminary investigation of each of the variables that would be included in the empirical model. This investigation provides an overview of what the sample looks like and helps to identify if there are any outliers or anomalies in the data. The means and standard deviations that are provided in Table 10 have been weighted with survey weights to reflect the actual population, as opposed to the survey population (i.e. the values have been corrected for oversamples). For each independent variable, I provide an overview of the overall sample summary statistics, determine how these differ within each of the subgroups, and whether these differentials fall in line with my predictions.

Contraceptive Intensity. The dependent variable, *constat*, is divided into three subgroups: women using hormonal contraceptives, women using other contraceptive methods, and women using no contraceptive method. Figure 7 shows the proportion of women in the sample belonging to each subgroup. The sample is not evenly divided between the three subgroups. As can be seen in Figure 7, the largest proportion of the 4,771 women, 45 percent, use hormonal contraceptives. Other contraceptive methods are a close second, with 43 percent of the sample opting for non-hormonal contraceptive methods. Meanwhile, only 580 women, 12 percent of the sample, use no contraceptive method at all. While this is substantially smaller than the other two subgroups, it is still large enough for inclusion in the statistical analysis without concern about statistical inferences.

Insurance. The mean values of the insurance coverage categorical variables indicate the proportion of the sample that falls into each category. Overall, in this sample 13 percent of women have public insurance, 74 percent have private insurance, and 13 percent have no

insurance. For women using hormonal contraceptive methods, the majority of the sample, 73 percent, had private insurance, but this is somewhat lower than their share of the overall sample. Meanwhile, 15 and 11 percent respectively had public insurance or no insurance at all. This indicates that women with public insurance are over-represented in the group of women using hormonal contraceptives. Of the subgroup of women using other contraceptive methods, women with private insurance comprised 77 percent of the sub-sample and so were over-represented. Women with public insurance were under-represented at 10 percent. In line with my hypothesis that being uninsured would lead to less contraceptive intensity, women without insurance were significantly over-represented in the *No Method* subgroup, at 18 percent. Similarly, 68 percent had private insurance and 14 percent had public insurance, which could indicate that the decision not to contracept may be more than just a cost issue to these insured women.

Abortion Cost. With respect to the abortion cost proxy – the regional indicators – 21 percent of the overall sample lived in the Northeast, 25 percent in the Midwest, 31 percent in the South, and 23 percent in the West. Amongst the women using hormonal contraception, I would expect the South and Midwest to be over-represented and the Northeast and West to be under-represented. In this sample, the Northeast is significantly under-represented, with only 17 percent of the subgroup from this region compared to 21 percent overall. Meanwhile, the West is also under-represented by one percent. The South, as would be expected, is over-represented by three percent, as is the Midwest by 3 percent. I would expect the opposite for women who use no method, which again is the case. Among these women, the Northeast and West over-represented by one and four percent, while the South and Midwest are under-represented by two percent compared to the overall sample breakdown. For women using other methods, the differentials between the overall sample breakdown and the subgroup breakdown are smaller, with the Northeast over-represented by five percent and the Midwest and South under-represented by two and three percent respectively.

Race. With respect to race, in the overall sample Hispanics, Whites, Blacks, and Other respectively account for 10, 73, 13, and 4 percent of the overall sample. Comparing this to the breakdown by contraceptive intensity, it is apparent that Hispanics, Blacks, and Whites account for a similar proportion of the women using hormonal contraceptive methods. Women in the *Other* category, however, are under-represented in this category, as they account for just three

percent of this group compared to four percent overall. However, *Other* women in the *Other Methods* category account for six percent of this group, which means they are over-represented here. The proportion of women of each race for the women using no method of contraception appear to be the most anomalous compared to the overall sample. In this category, White women are significantly under-represented, while Black women are significantly over-represented (18 percent of the *No Method* subgroup compared to 13 percent overall). Hispanics are marginally over-represented here too, while *Other* women are slightly under-represented.

Religion. Overall, women who attend religious services weekly comprise 28 percent of the sample. Meanwhile, women who attend services occasionally or never respectively account for 47 and 25 percent of the sample. As predicted in the hypothesis section, religious women are under-represented in the *Hormonal* subgroup and over-represented in the *Other Methods* and *No Method* subgroup. Women who are not religious at all are over-represented within the *No Method* sub-group, which is not in line with expectations, but may be different when multivariate analysis controls for other factors. Meanwhile, the categorization of women who are somewhat religious is not as easily predicted, as they are over-represented in the *Hormonal* category and under-represented in the *Other Methods* and *No Method* categories.

Presence of a Partner. Overall, 58 percent of the women in the sample indicated that they were married or had a live-in partner. As would be predicted, women using the most effective contraceptive techniques, hormonal methods, indicated with less frequency that they had a partner (55 percent). Meanwhile, 63 percent of women in the *Other Methods* subgroup had a partner. As this subgroup includes less intense contraceptive methods, like natural family planning, this is not a surprising finding. Women who had a partner were under-represented in the *No Method* sub-group, which would contradict my predictions. Once again, multivariate analysis may give a more clear indication of the effect of partnership status.

Labour Force Status. Labour force status is meant to indicate both a woman's attitude towards gender roles and to be an indicator of her opportunity cost of childbearing. As such, it would be expected that women who work full time would be over-represented in the *Hormonal* category and under-represented in the *No Method* subgroup. In this sample, 44 percent of the women work full time, 27 percent work part time, and 29 percent do not work at all. As predicted, full

time workers are over-represented in the *Hormonal* subgroup by three percent and under-represented in the *Other Methods* and *No Method* subgroup by two and four percent respectively. Similarly, women who do not work are under-represented in the *Hormonal* category by three percent and over-represented in the *No Method* category by seven percent. In the case of the United States, women who do not work are less likely to have health insurance, and so this could be a confounding factor that leads to these results. As such, a multivariate analysis controlling for the presence of insurance is needed.

Income. With respect to income, the expectations are a little unclear as the proxy I use measures family income, as opposed to the woman's income, and will likely also be confounded by the presence of health insurance. Overall in the sample, 23 percent of women had family incomes less than \$20,000, 30 percent between \$20,000 and \$39,000, 29 percent between \$40,000 and \$70,000, and 18 percent above \$70,000. Controlling for other factors, I would expect lower income women to be over-represented in the *No Methods* subgroup and higher income women to be over-represented in the *Hormonal* subgroup. However, this is not the case for the *Hormonal* subgroup, where there is an over-representation of women with family incomes below \$20,000 and an under-representation of women with incomes over \$70,000. For the *No Method* subgroup, though, lower income women are over-represented and higher income women under-represented, as would be expected.

Age. With respect to age, my hypotheses were that older women would be over-represented in the *Other Method* or *No Method* section, as they would be less averse to having children than younger women who are just starting their careers and are less likely to be in stable relationships. Indeed, the mean age of women using hormonal contraceptives is two years lower than the mean age of the overall sample, 29 years. Women using other methods and no methods are respectively 30 and 29 years of age.

Education. The mean number of years of education for the overall sample is 13 years – which would be one year more than a high school education. This is the same mean as women using hormonal methods and slightly less than the approximately 14 years of education for women using other methods. This is somewhat surprising, as education is considered another measure of opportunity cost for women, and so it would be expected that contraceptive intensity increases

with education. As predicted, women using no method have a lower mean number of years of education, at 12 years. Multivariate analysis is needed to clarify this effect further.

Parity. Overall, the mean number of births for the women in this sample is one. As would be expected, women using hormonal methods have had fewer births on average (0.86) than the overall sample. Women using other methods had slightly higher than average, while women using no method had exactly the average.

In conclusion, the summary statistics when broken down by contraceptive intensity subgroup are not surprising in some cases. For instance, the insurance, abortion access, and age all had mean values that were in line with my theoretical predictions. However, for the religion, partner status, labour force status, income, and education variables, the trends were less clear, and it was evident that multivariate analysis would be needed to control for other confounding factors. The following section of the paper will outline the results of this multivariate analysis.

5. EMPIRICAL ANALYSIS

The initial outputs of a multinomial logit regression are difficult to interpret directly. The coefficients represent the independent variables' impact on the latent level utility of the dependent variable. As such, alternate forms of these coefficients, such as marginal effects or relative risk ratios, are often used instead. In this case, I use the relative risk ratio of the first two contraceptive choice alternatives, *Hormonal* and *No Method*, compared to the base category of *No Method*. The relative risk ratio will indicate how the probability of choosing a given alternative relative to the base category changes if the independent variable is increased by one unit. I have chosen this format because in the context of a decision-making framework, it is likely that a woman would decide upon a relative contraceptive intensity by comparing the different alternatives available to her. Furthermore, a base category of *No Method* is likely to factor into her decision making process, as it represents an extreme alternative in terms of cost and effectiveness with which a woman is likely to compare all her alternatives.

To calculate the relative risk ratios, we would first take the probability of a certain outcome for an individual (Spermann, 2008):

$$P(y_i=j)=p_{ij}$$

The relative risk ratio would be:

$$\exp(\beta_j) = (p_{ij}^*/p_{i0}^*) / (p_{ij}/p_{i0}), \text{ where } p_{ij}/p_{i0} = \exp(x_{ij}\beta_j) \text{ and } (p_{ij}^*/p_{i0}^*) = \exp((x_{ij}+1)\beta_j)$$

The relative risk ratios are calculated by STATA using a post-estimation command.

5.1. STATISTICAL RESULTS

The statistical results of the multinomial logit regression are summarized in Table 11. The table also includes the standard error estimations and t-values for each coefficient. Significance at the one, five, and ten percent levels, based on the calculated t-values, is indicated in the table as well. The relative risk ratios are calculated with the *No Method* category as the base category. It should be noted that while pseudo R-squared values can normally be calculated for multinomial logit regressions, this calculation is not possible when survey weights have been applied to the estimation. This inability to calculate a pseudo R-squared stems from the fact that survey data is not independently and identically distributed. The pseudo R-squared calculation depends upon the calculation of likelihood ratios, which require the iid property to be met (Alonso, 2006). In its absence, an F-test is conducted, the null hypothesis of which is: all of the slope parameters are jointly equal to zero. As the null hypothesis is rejected ($p=0.00$) for the regression outputs, I can be confident that the overall model is significant.

Hormonal Contraceptive Use. For women using hormonal methods, it was found that the impact of both public and private insurance on a woman's probability of using hormonal contraceptives relative to no method was statistically significant at the one percent level. Women with public insurance were more than twice as likely as women without insurance to use hormonal contraceptive methods, while those with private insurance were 51 percent more likely to use hormonal contraceptive methods. The region in which a woman resides also significantly impacts her use of hormonal contraceptives. Women in the Northeast and West were respectively 34 percent and 31 percent less likely to use hormonal contraceptives, holding all other variables constant. These findings were significant at the five and ten percent levels respectively.

Meanwhile, race was not found to have a significant impact on the use of hormonal contraceptives when controlling for other variables. Being religious (i.e. attending religious services weekly) decreased a woman's likelihood of using hormonal contraceptives by 25 percent, but being somewhat religious did not have a significant impact on hormonal contraceptive use. Having a partner, however, more than doubled a woman's likelihood of using hormonal contraceptives, and was significant at the one percent level. Further, working full time and part time respectively increased a woman's likelihood of using hormonal contraceptives by 64 percent and 46 percent over women who did not work at all. While having a lower family income (below \$20,000) actually appeared to increase a woman's probability of using hormonal contraceptives by 35 percent, this finding was only significant at the 10 percent level.

A one year increase in age, decreased the likelihood of using hormonal contraceptives by eight percent – a finding that was significant at the one percent level. Having an additional year of education, meanwhile, increased a woman's likelihood of using hormonal contraceptives by 18 percent. For each additional birth that a woman has had, her likelihood of using hormonal contraceptives increases by 15 percent. The latter two findings were significant at the one and five percent levels respectively.

Other Contraceptive Methods. The statistical results with respect to other contraceptive methods were not as conclusive as the results for hormonal contraceptives. A woman's insurance status appeared to have no significant effect on the use of these methods. With respect to the region where a woman lived, only living in the West, where lower abortion costs are experienced by the highest proportion of the population, had an impact on using these other contraceptive methods that was significant at the five percent level. Specifically, living in the West decreased a woman's likelihood of using other contraceptive methods by 26 percent.

In the case of Other women (mainly comprised of Aisan and South Asian women), race had a significant impact on the use of these contraceptive methods relative to no method. Women in the latter category were 160 percent more likely than White women to use other types of contraceptives. While religion, labour force status, family income, and age did not have significant impacts on the use of other contraceptive methods, having a partner increased the likelihood of using these methods by 83 percent. For an additional year of education, the

likelihood of using other contraceptive methods increased by 18 percent, as was the case with the hormonal methods. Previous births also had a similar effect on the use of other contraceptive methods, as for each additional birth, the likelihood of using other methods increased by 19 percent. The latter two coefficients were both significant at the one percent level.

5.2. DISCUSSION

Based on the above findings, there are some important implications for the theoretical model I am testing. The first key finding relates to the association of health insurance and the use of hormonal contraceptives. As predicted, my findings indicate that the presence of insurance does increase the use of the most expensive and effective hormonal contraceptive methods. This finding substantiates previous research by Culwell (2007) that women with insurance are 30 percent more likely to use prescription contraceptives, although the magnitude of the impact was greater in the present study (100 percent and 51 percent for public and private insurance respectively).

One noteworthy point with respect to the association of insurance and hormonal contraceptive use revolves around the differential impact of private and public insurance. Frost (2008) and Nearn (2009) both found that women with private insurance coverage are more likely than those with Medicaid to respectively use the pill and prescription contraception methods. My findings indicate that when considering hormonal methods, this likelihood is reversed: women with public insurance are almost 50 percent more likely to use hormonal contraceptives than women with private insurance. In addition to different methodologies, a second possible explanation for these differential findings relates to the cycles of data used in each study. The aforementioned studies use data respectively from 2004 and 2002 – time periods following a number of states' implementation of the contraceptive mandates mentioned in the Background section. It could be that a more substantial number of the private companies insuring women in my sample do not cover the same array of hormonal contraceptives since insurance companies were not subject to the contraceptive mandates in 1995 (the first mandate was not introduced until 1998). This finding could be considered indirect support for the Sonfield (2004) finding that between 1993 and 2002, part of the increase in the pill coverage can be attributed to contraceptive coverage mandates.

Further breaking the insurance findings down contributes some added insights into the association of health insurance and contraceptive intensity. Figure 8 graphically depicts the upward shift that the presence of health insurance (public and private insurance combined) causes with respect to the use of hormonal contraceptives. This graph shows how the predicted probability of using hormonal contraceptives changes with age and with the presence of health insurance. As can be seen, the impact of health insurance is especially pronounced in a woman's teens and early twenties and becomes somewhat smaller as she gets older. Throughout all her reproductive years, though, the presence of health insurance appears to be strongly associated with a woman's use of hormonal contraceptives.

With respect to the impact of abortion costs on contraceptive intensity, there were some significant findings in relation to the regional variables' association with hormonal contraceptive use. Based on my hypotheses, it was expected that the Midwest (where 26 percent of the population had lower abortion costs), the Northeast (where 64 percent of the population had lower abortion costs), and the West (where 83 percent of the population had lower abortion costs), would incrementally have lower probabilities of hormonal contraception use than the South (where eight percent of the population had lower abortion costs). These predictions were validated to some extent in the Northeast and the West, although it was the Northeast, not the West, that had the lowest likelihood of hormonal contraception use relative to the South. Tying these findings back to my theory, it would appear that women in the South who experience higher abortion costs relative to women in the West and Northeast compensate by using higher intensity contraceptive methods. What is unclear, however, is why women in the Northeast would be less inclined than those in the West to use higher intensity contraceptive methods. It could be that the marginal cost of a child is not as high to women in the Northeast, although further research would be required to test this hypothesis.

Although the regional proxy is far from perfect, these findings are interesting in light of the inconclusive results from previous studies that controlled for state-level abortion access. Averett (2000), Levine (2000), and Sen (2006) were three studies noted in the Previous Research section that did not find a significant impact of state-level abortion policies on contraception usage rates among teenagers. Levine (2003) was the only exception, which found that parental involvement laws increased teenage contraception use by 16.5 percent. While there are a number of possible

explanations for these inconsistent findings, one possibility revolves around the age of the women in these studies. When the effect of these regional level variables is broken down by age, as in Figures 9 and 10, some interesting findings become apparent that may shed light on why previous literature's findings were more inconclusive than my own.

In the case of the Northeast in Figure 9, throughout a woman's reproductive life, being in a region where abortion can be considered less costly has a negative impact on the use of hormonal contraceptives. However, this impact is smaller in a woman's teenage years, increasing as she reaches her twenties, and then gradually decreasing with age. The confounding effect of the teen years is even more apparent in the West. In a woman's mid-teens, the impact of being in a region with lower abortion costs actually appears to increase the likelihood of her using hormonal contraceptives. This trend reverses in the woman's later teens, and then the impact of being in the West remains consistently negative. Given the much higher cost that a birth poses to a teenager than an older woman, this is not a wholly unexpected finding. When we decompose the effect of abortion regulation by age, it is not surprising that previous research has yielded inconclusive results about the impact of abortion laws on teen's contraceptive behaviour. If we analyze a woman's entire reproductive span, however, it appears as though decreased abortion costs may be negatively associated with contraceptive intensity and a woman's use of hormonal contraceptives.

5.3. LIMITATIONS

There were some interesting and unique findings uncovered with this study. As noted earlier, though, any interpretations of the results should keep in mind the study's limitations. Below, I will discuss how some of the limitations of both the data and the specified model may impact the results of this study.

Data Limitations

When measuring the impact of a state-level policy – in this case abortion policy – the use of panel data that could control for time-invariant state-level characteristics would be optimal. As noted earlier, without the ability to control for state-level fixed effects, the ability to differentiate the impact of state-level characteristics from the policy variable itself becomes impossible. In light of the use of cross-sectional data in this study, the regional findings should be interpreted with caution. It could be that

regional-level characteristics aside from abortion policy are driving the results. In future research, I would use multiple waves of the NSFG and construct a panel data set.

A second data concern revolves around the potential for bias due to imputation techniques and the sensitive nature of the questions. While these potential sources of bias cannot be ameliorated by researchers using this data, they should be kept in mind when interpreting the results of survey data. In this case, due to the rigorous techniques outlined by the CDC staff, the potential for bias was not deemed to be that significant. The potential for sample selection bias, however, could be a significant drawback of this study. As noted, because sexually active women are self-selected into the sample being analyzed, there is a potential for bias. In future research, I would hope that a suitable identification restriction could be found that impacted sexual activity and not contraception use so that sample selection correction techniques could be employed.

Finally, the use of poor proxies in several cases may have impeded the interpretation of the results. Most central to this study was the poor proxy for state-level abortion policies. Because a state-level indicator could not be obtained, the regional proxies were used instead. Without the ability to pinpoint the exact state and relevant policy for each individual, it cannot be ascertained with certainty that state-level abortion policy effects are causing the observed associations. With future studies, I would hope that state-level identifiers could provide a more straightforward test of my abortion cost hypothesis.

Model Limitations

The assumption that there was independence of irrelevant alternatives was also a limitation of this study. While it was demonstrated that a model that waived this assumption (multinomial probit) yielded similar results, it cannot be said with complete certainty that there was independence of irrelevant alternatives in my model. In future studies, I may attempt nested logit regression analysis to account for the fact that the decision-making process may involve first a decision to contracept or not to contracept followed by the decision of the type of contraception.

The potential for endogeneity was discussed earlier. As noted, unobserved state-level effects very likely do have an impact on the contraceptive decision-making process, which could have

biased my results. In addition to controlling for state-level effects, I would also attempt instrumental variable estimation in the future if I could find an appropriate instrument in the data. A possible instrument for the abortion variable would be a state-level instrument indicating the party affiliation of the state.

Finally, the inability to calculate a pseudo R-squared with the survey estimation techniques can be considered a limitation. Due to this inability, it is not clear how much of the variation in the model was accounted for by the independent variables. However, this is a shortcoming of survey estimation techniques that cannot be overcome. From the perspective that survey estimation techniques provide significant advantages by enabling population-wide implications to be made, this limitation may not be as big of a drawback as it would initially seem.

6. CONCLUSION

In this paper, I set out to determine the impact of health insurance and abortion costs on a woman's contraceptive intensity. I have established that the cost at the time of consumption for a woman, as proxied by the presence of health insurance, is positively and significantly associated with a woman's choice of contraceptive intensity. In a country where 15 percent of the population is uninsured, these findings imply that equitable access to the most effective contraceptive methods should be a major concern for policy makers.

Furthermore, it appears as though women also consider the expected future costs of contraceptive failure in their decision making process. The negative and significant association between living in regions where abortions were more accessible and the use of hormonal contraceptives was a unique finding in this paper. While future research should look to improve the abortion proxy and use panel data, there are still some interesting implications from the latter finding.

Based on 2002 population estimates, states comprising approximately 60 percent of the US population have adopted more restrictive abortion funding policies. My results indicated that women in these states have responded to abortions restrictions by choosing higher intensity contraceptive methods. However, women in these states also face much higher abortion or birth

costs in the case of contraceptive failures. Given these higher costs, policy makers should also consider the impact that restrictive abortion policies may have on the proportion of women going through with unwanted births and what the downstream effects of these births may be.

WORKS CITED

- Alan Guttmacher Institute. "In Brief: Facts on Induced Abortion in the United States." May 2010. <http://www.guttmacher.org/pubs/fb_induced_abortion.html>.
- . State Policies in Brief as of April 1, 2010: Insurance Coverage of Contraceptives. New York: Alan Guttmacher Institute, 2010.
- . State Policies in Brief as of April 1, 2010: Parental Involvement in Minors' Abortions. New York: Alan Guttmacher Institute, 2010.
- . State Policies in Brief as of March 1, 2010: State Funding of Abortions Under Medicaid. New York: Alan Guttmacher Institute, 2010.
- Alonso, Juan Diego. "Pseudo R-Squared with Svylogit." May 26, 2006. <<http://www.stata.com/statalist/archive/2006-05/msg00953.html>>.
- Averett, S. L., D. I. Rees, and L. M. Argys. "The Impact of Government Policies and Neighborhood Characteristics on Teenage Sexual Activity and Contraceptive use." American Journal of Public Health 92.11 (2002): 1773-8.
- Becker, Gary. "An Economic Analysis of Fertility", in Demographic and Economic Change in Developed Countries, NBER Conference Series No. 11, Princeton University Press, Princeton, NJ, 1960.
- Bensyl, Diana M., et al. Contraceptive use — United States and Territories, Behavioral Risk Factor Surveillance System, 2002. in Surveillance Summaries. Vol. 54-SS6. Center for Disease Control and Prevention, 2005.
- Blunt, Christopher. Turnaround on Abortion. Loda, Illinois: Fred Steeper Market Strategies, Inc., 2007.
- CDC/National Center for Health Statistics. "About the National Survey of Family Growth." 2009. <http://www.cdc.gov/nchs/nsfg/about_nsfg.htm>.
- Ciszewski, R. L., and P. D. Harvey. "The Effect of Price Increases on Contraceptive Sales in Bangladesh." Journal of Biosocial Science 26.1 (1994): 25-35.
- Coale, Ansley J. "The Demographic Transition." Proceedings of the International Population Conference. Liège, 1973.
- Culwell, K. R., and J. Feinglass. "The Association of Health Insurance with use of Prescription Contraceptives." Perspectives on sexual and reproductive health 39.4 (2007): 226-30.
- Dow, Jay K., and James Endersby. "Multinomial Probit and Multinomial Logit: A Comparison of Choice Models for Voting Research." Electoral Studies 23 (2004): 107-22.

- Evans, John H. "Polarization in Abortion Attitudes in U.S. Religious Traditions, 1972-1998." Sociological Forum 17.3 (2002): 397-422.
- Felkey, Amanda. Variation in Pill use: Do Abortion Laws Matter?, Abstract presented at the "7th World Congress of Health Economics". Beijing, China, 2010.
- Frost, J. J., S. Singh, and L. B. Finer. "Factors Associated with Contraceptive use and Nonuse, United States, 2004." Perspectives on sexual and reproductive health 39.2 (2007): 90-9.
- Gauthier, Anne H. "The Impact of Public Policies on Families and Demographic Behaviour." Paper Presented at the ESF/EURESCO Conference 'The Second Demographic Transition in Europe'. Bad Herrenalb, Germany, 2001.
- Gelberg, L., et al. "Chronically Homeless Women's Perceived Deterrents to Contraception." Perspectives on sexual and reproductive health 34.6 (2002): 278-85.
- Goldin, Claudia Dale, and Lawrence F. Katz. "The Power of the Pill : Oral Contraceptives and Women's Career and Marriage Decisions." Journal of Political Economy 110.4 (2002): 730-70.
- Guldi, M. "Fertility Effects of Abortion and Birth Control Pill Access for Minors." Demography 45.4 (2008): 817-27.
- Hansen, Marie-Louis, et al. "Rates of Induced Abortion in Denmark According to Age, Previous Births, and Previous Abortions." Demographic Research 21.22 (November 3, 2009).
- Heavey, E. J., et al. "Differences in Contraceptive Choice among Female Adolescents at a State-Funded Family Planning Clinic." Journal of midwifery & women's health 53.1 (2008): 45-52.
- Heck, K. E., et al. "Delayed Childbearing by Education Level in the United States, 1969-1994." Maternal and child health journal 1.2 (1997): 81-8.
- Henshaw, Stanley K., et al. Restrictions on Medicaid Funding for Abortions: A Literature Review. New York: Guttmacher Institute, 2009.
- Hogan, D., N. Astone, and E. Kitagawa. "Social and Environmental Factors Influencing Contraceptive use among Black Adolescents." Family Planning Perspectives (1985): 165-9.
- Jones, Rachel K., Lawrence B. Finer, and Susheela Singh. Characteristics of U.S. Abortion Patients, 2008. New York: Guttmacher Institute, 2010.
- Kearney, M. S., and P. B. Levine. "Subsidized Contraception, Fertility, and Sexual Behavior." The review of economics and statistics 91.1 (2009): 137.

- Krings, K. M., et al. "Contraceptive Choice: How do Oral Contraceptive Users Differ from Condom Users and Women Who use no Contraception?" American Journal of Obstetrics and Gynecology 198.5 (2008): e46-7.
- Kropko, Jonathan. Choosing between Multinomial Logit and Multinomial Probit Models for Analysis of Unordered Choice Data, Paper Presented at the Annual Meeting of the Midwest Political Science Association, 2008.
- Lepkowski, J. M., W. D. Mosher, and K. E. Davis. National Survey of Family Growth, Cycle 6: Sample Design, Weighting, Imputation, and Variance Estimation. Ed. Vital Health Stat. 2 (142) ed. National Center for Health Statistics, 2006.
- Levin, A., B. Caldwell, and B. Khuda. "Effect of Price and Access on Contraceptive use." Social science & medicine (1982) 49.1 (1999): 1-15.
- Levine, Philip B. Sex and Consequences: Abortion, Public Policy, and the Economics of Fertility. Princeton, New Jersey: Princeton University Press, 2004.
- . The Sexual Activity and Birth Control use of American Teenagers. JCPR Working Papers 161. Northwestern University/University of Chicago Joint Center for Poverty Research, 2000.
- Levine, P. B. "Parental Involvement Laws and Fertility Behavior." Journal of health economics 22.5 (2003): 861-78.
- Martin, Shannan, Melissa Pardue, and Robert Rector. Government Spends \$12 on Safe Sex and Contraceptives for Every \$1 Spent on Abstinence. January 14, 2004: The Heritage Foundation, 2004.
- Matthews, S., D. Ribar, and M. Wilhelm. "The Effects of Economic Conditions and Access to Reproductive Health Services on State Abortion Rates and Birthrates." Family planning perspectives 29.2 (1997): 52-60.
- Miller, Amalia R. "The Effects of Motherhood Timing on Career Path." Journal of Population Economics (2009): March 4, 2010.
- Mosher, William D. et. al. "Use of Contraception and use of Family Planning Services in the United States: 1982-2002." Advance Data 350 (2004): 1-46.
- Nearns, J. "Health Insurance Coverage and Prescription Contraceptive use among Young Women at Risk for Unintended Pregnancy." Contraception 79.2 (2009): 105-10.
- Oddens, B. J. "Evaluation of the Effect of Contraceptive Prices on Demand in Eight Western European Countries." Advances in Contraception : The Official Journal of the Society for the Advancement of Contraception 9.1 (1993): 1-11.

- Pitblado, Jeff. Survey Data Analysis in Stata. StataCorp, 2009.
- Pritchett, Lant H. Desired Fertility and the Impact of Population Policies. Vol. Working Paper No.1273. The World Bank, 1994.
- Ross, Hana, and Frank Chaloupka. "The Effect of Public Policies and Prices on Youth Smoking." Southern Economic Journal 70.4 (2004): 796-815.
- Scott, Jacqueline. "Generational Changes in Attitudes to Abortion: A Cross-National Comparison." European Sociological Review 14.2 (1998): 177-90.
- Sen, Bisakha. "An indirect test for whether restricting Medicaid funding for abortion increases pregnancy-avoidance behavior." Economics Letters. 81.2 (2003): 155-163.
- . "Frequency of Sexual Activity among Unmarried Adolescent Girls: Do Stat Policies Pertaining to Abortion Access Matter?" Eastern Economic Journal 32.2 (2006): 313-30.
- Silk, Mark. "Religion and Region in American Public Life." Journal for the Scientific Study of Religion 44.3 (2005): 265-70.
- Sonfield, A., et al. "U.S. Insurance Coverage of Contraceptives and the Impact of Contraceptive Coverage Mandates, 2002." Perspectives on sexual and reproductive health 36.2 (2004): 72-9.
- Speidel, J. J., C. C. Harper, and W. C. Shields. "The Potential of Long-Acting Reversible Contraception to Decrease Unintended Pregnancy." Contraception 78.3 (2008): 197-200.
- Spermann, Alexander. Logit Models. Germany: University of Freiburg, 2008.
- Stata Press. STATA Survey Data Reference Manual. College Station, Texas: Stata Press Publication, 2009.
- StataCorp LP. Stata v. 10. College Station, Texas: 2007.
- Stolk, P., et al. "Impact Analysis of the Discontinuation of Reimbursement: The Case of Oral Contraceptives." Contraception 78.5 (2008): 399-404.
- Sturgis, Patrick. "Analysing Complex Survey Data: Clustering, Stratification and Weights." Social Reserach Update 2004.
- Trussell, J., and L. L. Wynn. "Reducing Unintended Pregnancy in the United States." Contraception 77.1 (2008): 1-5.
- U.S. Census Bureau. Health Insurance Coverage in the United States: 2002. U.S. Department of Commerce, Economics, and Statistics Administration, 2003.

UCLA: Academic Technology Services, Statistical Consulting Group. "How Can I Check for Collinearity in a Survey Regression?"
<<http://www.ats.ucla.edu/stat/stata/faq/svycollin.htm>>.

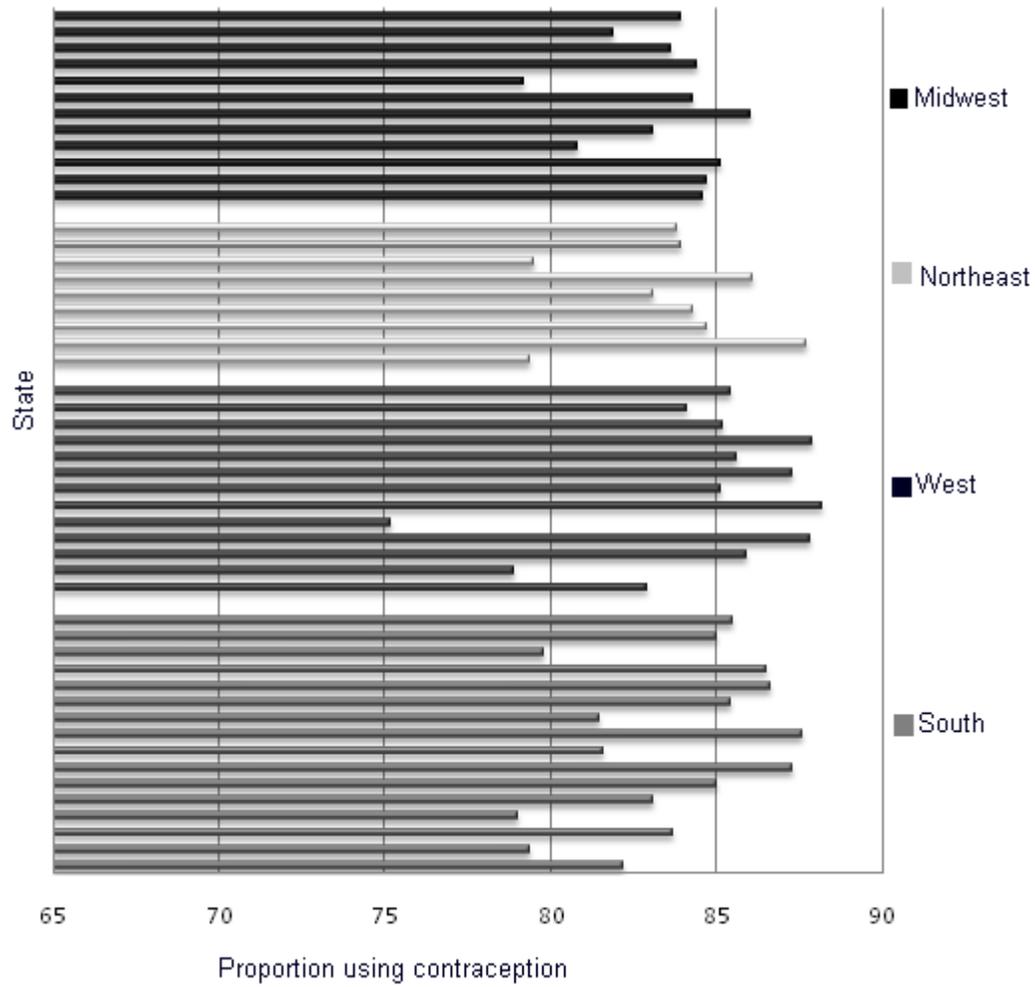
Verbeek, Marno. A Guide to Modern Econometrics. 3rd ed. Chichester, England: John Wiley & Sons, Ltd., 2008.

Wilcox, C. "Race Differences in Abortion Attitudes: Some Additional Evidence." Public opinion quarterly 54.2 (1990): 248-55.

Zabin, L. S., N. M. Astone, and M. R. Emerson. "Do Adolescents Want Babies? the Relationship between Attitudes and Behavior." Journal of research on adolescence : the official journal of the Society for Research on Adolescence 3.1 (1993): 67-86.

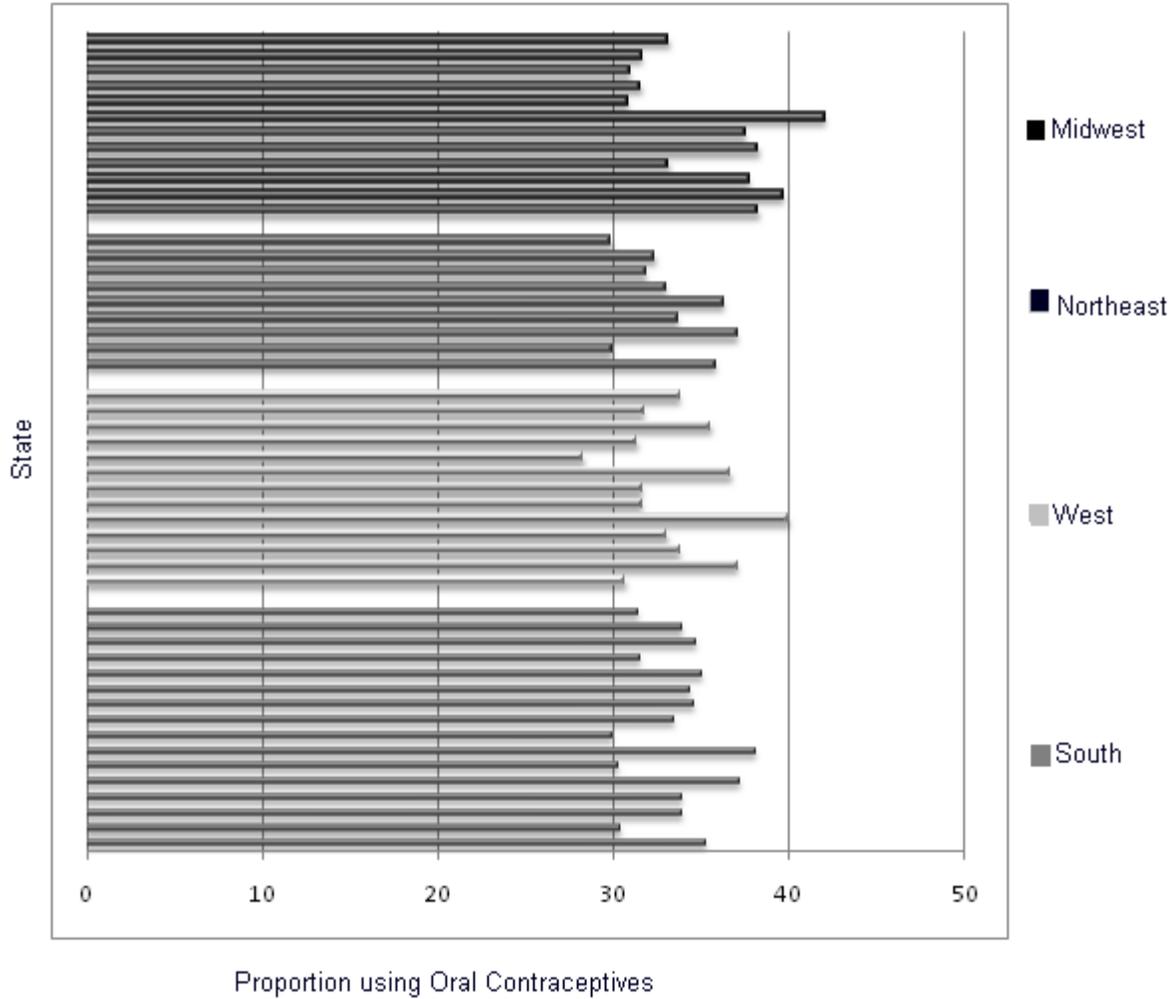
FIGURES

Figure 1: Self Reported Contraception Usage Rates Among Women 15-44 by State, 2002



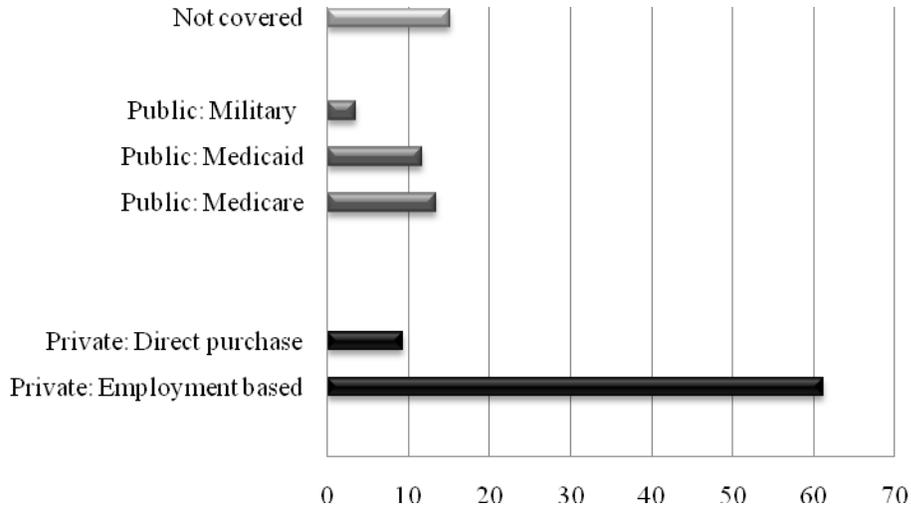
Source: Adapted from CDC, 2005, p. 10

Figure 2: Self Reported OC Pill Usage Rates Among Women 15-44 by State, 2002



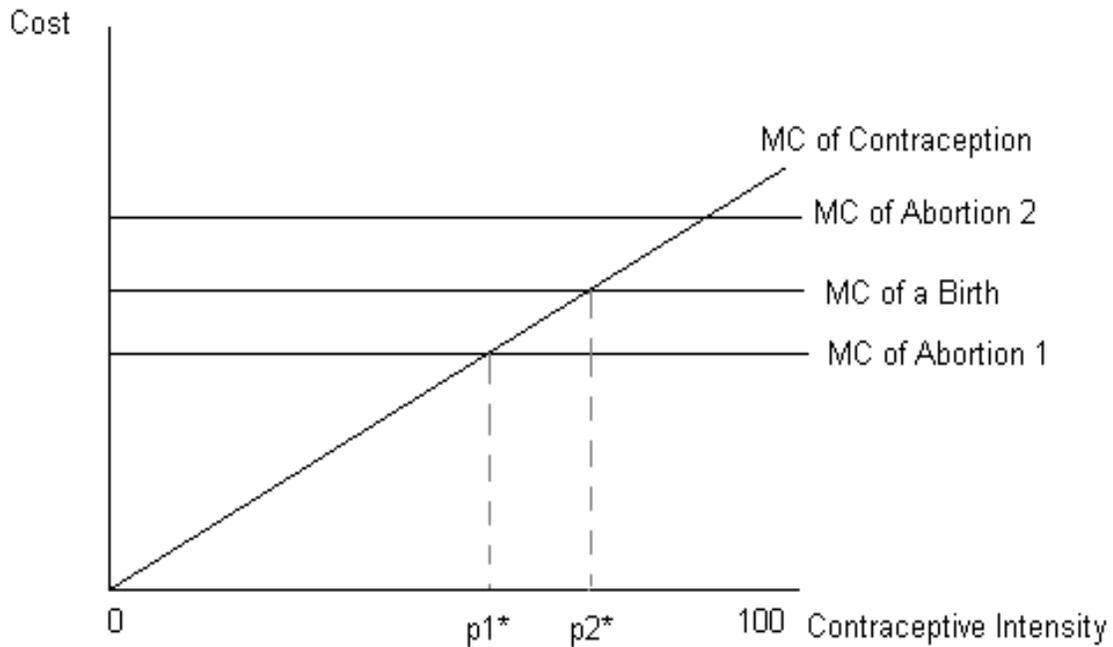
Source: Adapted from CDC, 2005, p. 11

Figure 3: Self Reported Proportion of Population by Type of Health Insurance, 2002



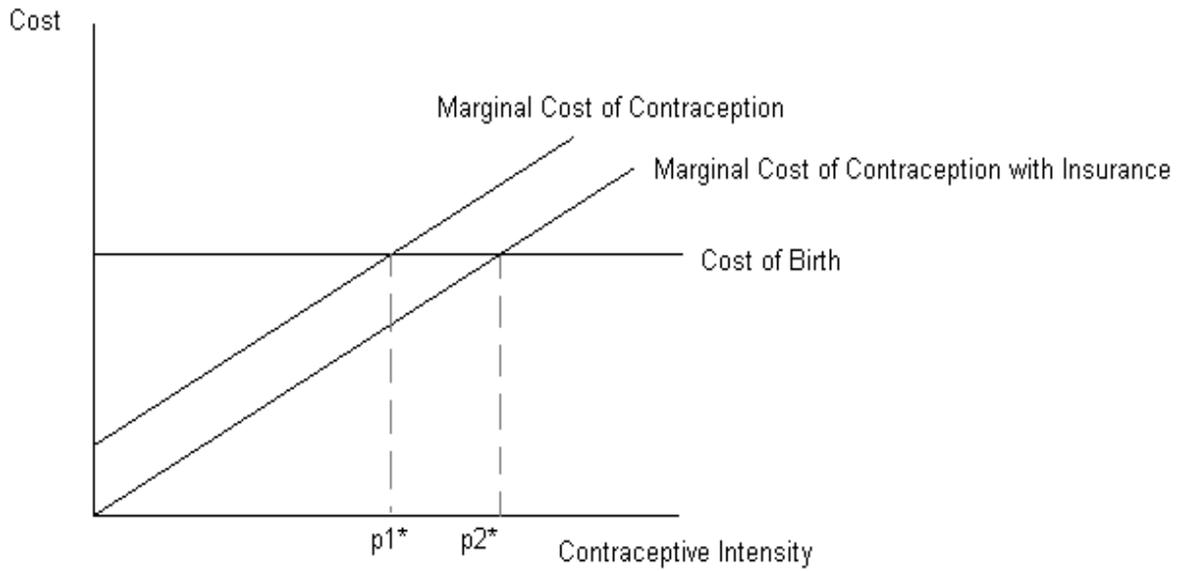
Source: CDC, 2010, p. 1

Figure 4: Contraceptive Intensity as MC of Contraception, Birth and Abortion Shift



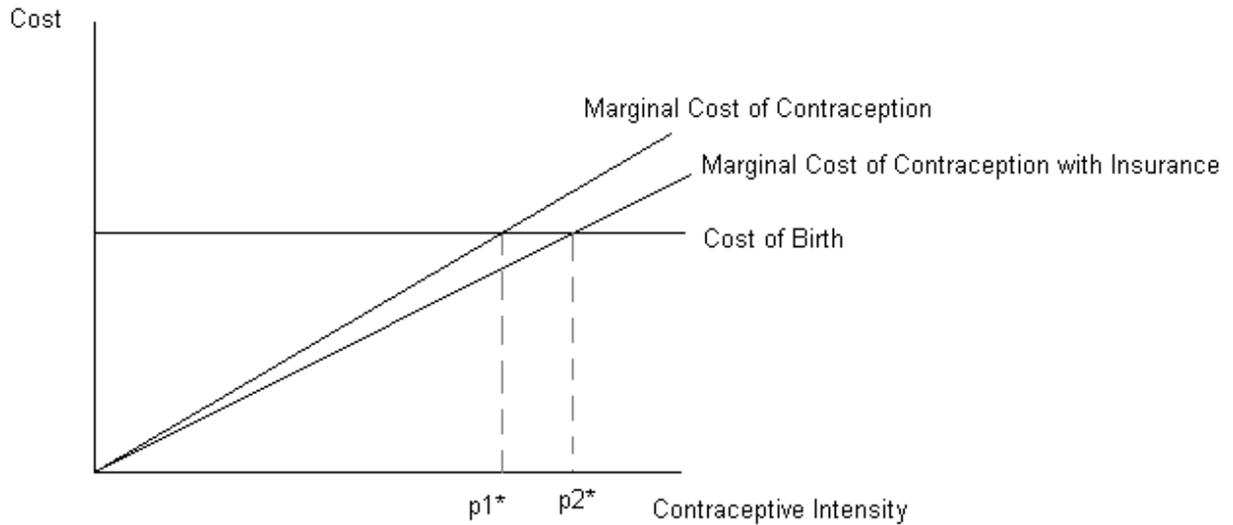
Source: Adapted from Levine, 2004, p. 53

Figure 5: Impact of Health Insurance on Contraceptive Intensity



Source: Adapted from Levine, 2004, p. 50

Figure 6: Impact of Health Insurance on Contraceptive Intensity



Source: Adapted from Levine, 2004, p. 50

Figure 7: Proportion of Sample using Hormonal, Other, and No Contraceptive Methods

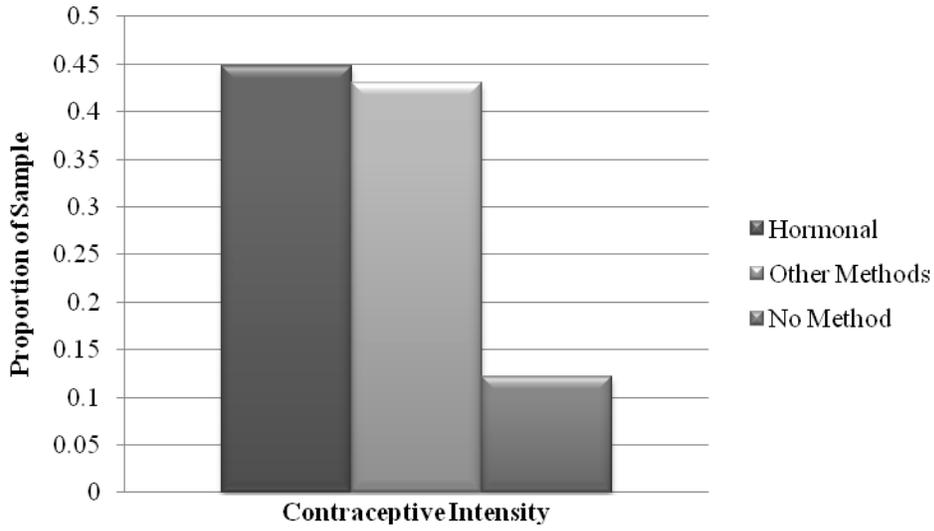


Figure 8: Impact of Insurance on Probability of Using Hormonal Contraceptives as Age Increases

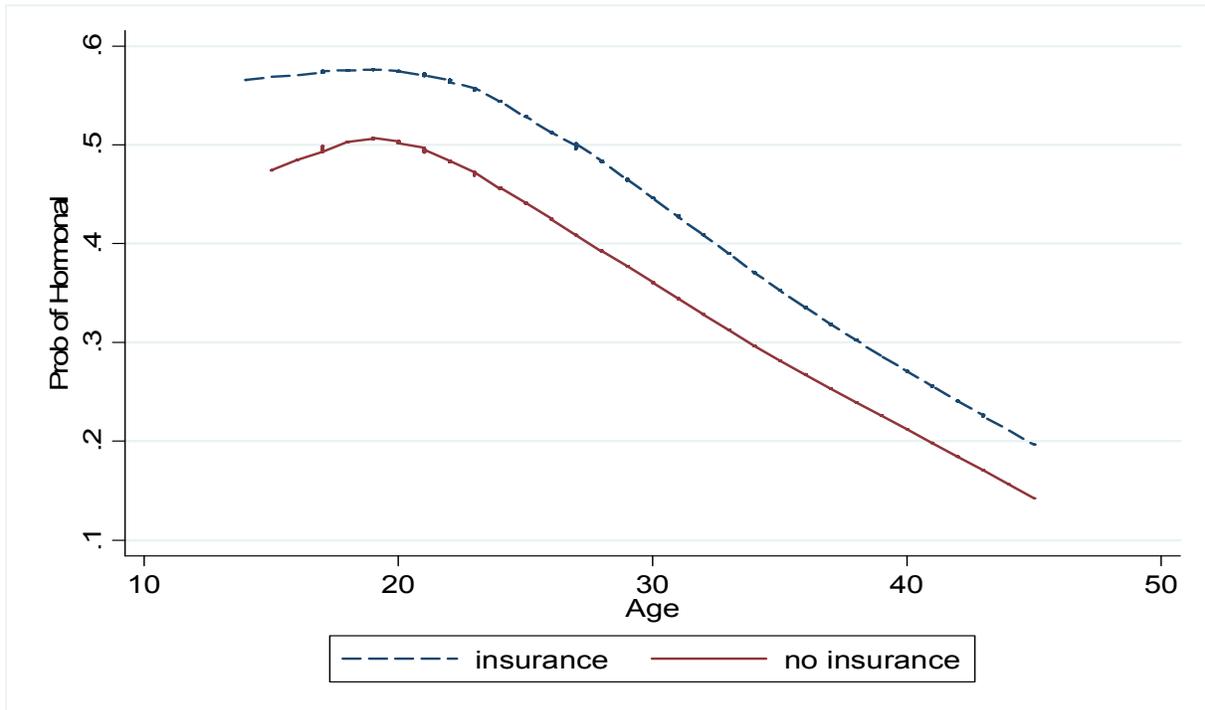


Figure 9: Impact of Living in the Northeast (vs. the South) on Probability of Using Hormonal Contraceptives as Age Increases

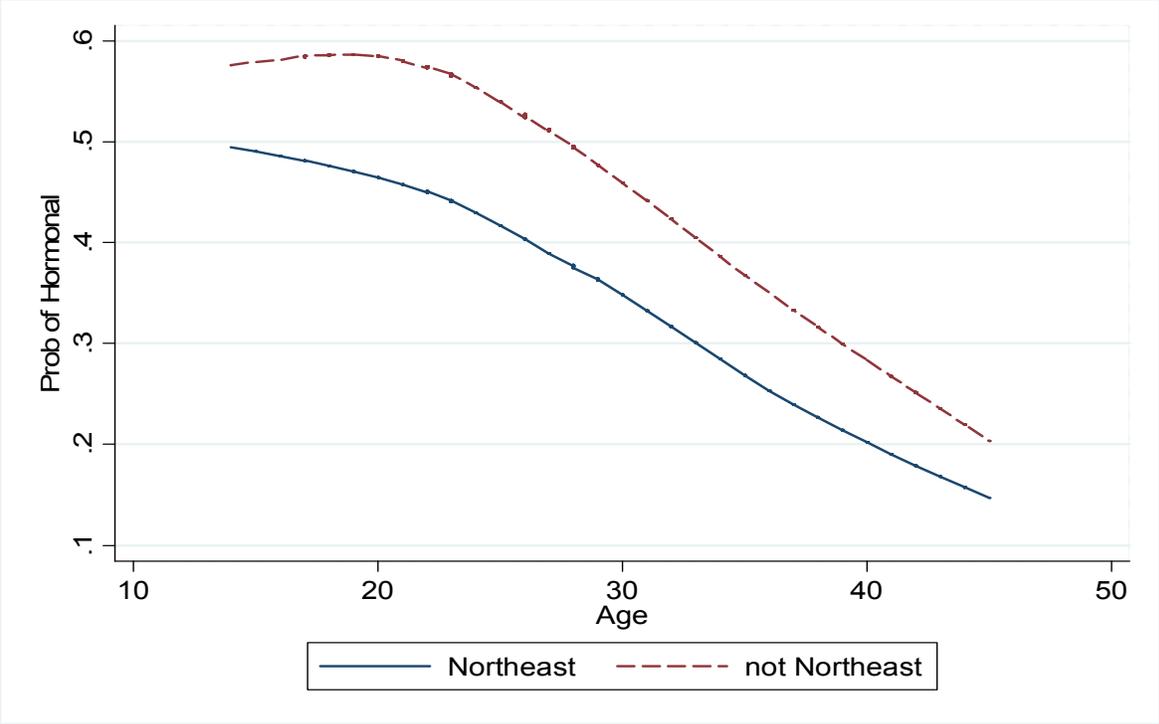
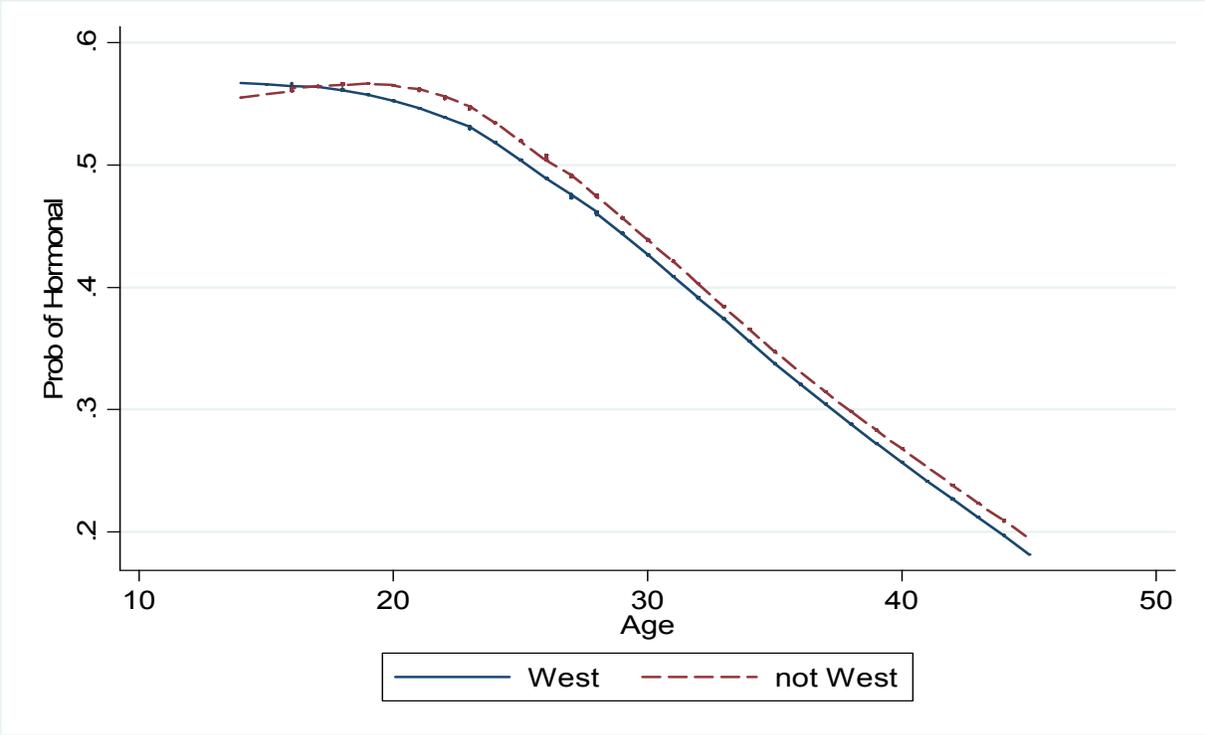


Figure 10: Impact of Living in the West (vs. the South) on Probability of Using Hormonal Contraceptives as Age Increases



TABLES

Table 1: Effectiveness Rates of Contraceptive Methods after One Year of Use

Birth Control Method	Typical Use	Perfect Use
Abstinence (No Sexual Contact)	100.00%	100.00%
IUD- Mirena	99.90%	99.90%
Male Sterilization (Vasectomy)	99.85%	99.90%
NuvaRing	92.00%	99.70%
Evra Patch	92.00%	99.70%
Birth Control Pill	92.00%	99.70%
Depo Provera	97.00%	99.70%
Female Sterilization (Tubal Ligation)	99.50%	99.50%
IUD- Copper T	99.20%	99.40%
Male Condom	85.00%	98.00%
Natural Family Planning	75.00%	96.25%
Withdrawal	73.00%	96.00%
Female Condom	79.00%	95.00%
Diaphragm	84.00%	94.00%
Sponge (Nulliparous Women)	84.00%	91.00%
Chance	15.00%	15.00%

Source: Adapted from Trussell and Wynn, 2008, p. 3

Table 2: Proportion of Residents without Health Insurance by State, 2002

State	Proportion Uninsured		
		Oregon	13.3
South		Utah	13.6
Delaware	9.5	Washington	13.6
Florida	17.5	Wyoming	16.4
Georgia	15.7	Northeast	
Maryland	12	Connecticut	10.2
North Carolina	14.9	Maine	10.8
South Carolina	12.3	Massachusetts	9
Virginia	12	New Hampshire	9.2
West Virginia	14	Rhode Island	8.3
Alabama	13	Vermont	9.6
Kentucky	13.2	New Jersey	13.1
Mississippi	15.6	New York	15.8
Tennessee	11	Pennsylvania	9.7
Arkansas	15.6	Midwest	
Louisiana	18.6	Iowa	8.6
Oklahoma	18.2	Kansas	10.9
Texas	24.1	Minnesota	8
West		Missouri	10.4
Alaska	17.8	Nebraska	9.6
Arizona	17.1	North Dakota	10.7
California	18.7	South Dakota	10.6
Colorado	15.3	Illinois	13.9
Hawaii	9.7	Indiana	12
Idaho	16.4	Michigan	10.4
Montana	15.2	Ohio	11.4
Nevada	17.5	Wisconsin	8.4
New Mexico	22	United States Average	14.7

Source: U.S. Census Bureau, 2003, p. 10

Table 3: State Medicaid Abortion Restrictions by State, 2010

State	Funds limited to life endangerment, rape, and incest (2010)
South	
Florida	Yes
Georgia	Yes
Maryland	No
North Carolina	Yes
South Carolina	Yes
Virginia	Yes
West Virginia	No
Delaware	Yes
Alabama	Yes
Kentucky	Yes
Mississippi	Yes
Tennessee	Yes
Arkansas	Yes
Louisiana	Yes
Oklahoma	Yes
Texas	Yes
West	
Washington	No
California	No
Oregon	No
Hawaii	No
Alaska	No
Idaho	Yes
Wyoming	Yes
Montana	No
Nevada	Yes
Utah	Yes
Arizona	No
New Mexico	No
Colorado	Yes
Northeast	
Maine	Yes
New Hampshire	Yes
Vermont	No
Massachusetts	No
Rhode Island	Yes
Connecticut	No
New York	No
New Jersey	No
Pennsylvania	Yes
Midwest	
North Dakota	Yes
South Dakota	Yes
Nebraska	Yes
Minnesota	No
Iowa	Yes
Kansas	Yes
Missouri	Yes
Wisconsin	Yes
Michigan	Yes
Illinois	No
Indiana	Yes
Ohio	Yes

Source: Alan Guttmacher Institute, 2010, p.1

Table 4: Overview of Previous Literature Findings

Author	Year	Country	Data	Dependent Variable	Method	Contraception Impact
Price						
Levin	1999	Bangladesh	Micro surveys of 1993 and 1994	Contraceptive use, method choice, choice of service provider	Multinomial logistic model	+
Ciszewski and Harvey	1995	Bangladesh	Macro sales figures	Sale of contraceptives	Bivariate analysis	-
Gelberg	2002	U.S. -L.A. County	Survey of 974 homeless women	Attitude towards contraception use	Logistic regression	--
Matthews	1997	U.S.	state level macro variables	State abortion and birth rates	OLS regression	-
Oddens	1993	8 European countries	Country-level macro data; surveys of providers	Contraceptive usage rates	Pearson and Spearman rank correlation coefficients	-
Author	Year	Country	Data	Dependent Variable	Method	Contraception Impact
Health Insurance						
Culwell	2007		2002 Behavioral Risk Factor Surveillance Survey	Risk of unintended pregnancy, prescription contraceptive use and health insurance status	Logistic regression	++
Frost	1994	U.S.	Survey of family planning providers	Whether implant is provided	Simple percentage distribution	+
Frost	2008	U.S.	Phone survey of 2000 women	Choice of contraception (most effective vs. less effective methods) and consistency of use	Logistic regression	++

Heavey et. al.	2008	U.S.	Patient level data from a family planning clinic	Likelihood of using types of contraception before and after a visit to the family planning clinic	Logistic regression	+
Kearney	2009	U.S.	Vital stats, Guttmacher abortion data, 88/95/02 NSFG	Contraceptive use in the past 3 months, births and births by eligible women	Difference-in-difference	+
Krings	2008	U.S. (Urban New England)	Micro survey data (collected in a RCT)	Use of OC, condom, no contraception	Multivariable robust Poisson regression	+
Nearns	2009	U.S.	NSFG 2002	Use of prescription contraceptives (implant, injection, pill, patch, IUD, diaphragm, or cervical cap)	Logistic regression	++
Pritchett	1994	71 developing countries	Country-level macro data	AINC, DTFR, WFR	OLS multiple regression	+
Sonfield	2004	USA	Data collected from a survey of insurance providers	Contraceptives covered	Trend comparison between states	+
Stolk	2008	Netherlands	Microdata on patients using OC	Discontinuation and switching patterns of OC use	Relative Risks	++
Author	Year	Country	Data	Dependent Variable	Method	Contraception Impact
Abortion Policy						
Averett et. al.	2002	U.S.	NSFG 1995	Decision to have sex, decision to use contraception at last sexual encounter	Bivariate probit	+
Levine	2000	U.S.	Youth Risk Behavior Survey and state-level data	Contracepted teen sex activity	Probit regression	+/-

Levine	2003	U.S.	NSFG 1988, 1995	Impact on abortions, births, and pregnancies; sexual activity and contraception use	difference-in-difference models	++
Sen	2006	U.S.	NLSY 1997	Frequency of intercourse and non-contracepted intercourse	Zero-inflated negative binomial (count) model	+

Note: “++” and “- -” indicate statistically significant findings, while “+” and “-” indicate that the findings were not statistically significant.

Table 5: Hypotheses Based on Economic Model

Control Factors	Predicted Relationship with Contraceptive Intensity (Use of Hormonal Contraception)
Age	—
Race	+/-
Household income	+ /-
Education	+
Presence of a partner	—
Parity	—
Labour force status	—
Religiosity	—
Abortion Policy	Predicted Relationship with Contraceptive Intensity (Use of Hormonal Contraception)
Policy allowing easier access	—
Insurance Coverage	Predicted Relationship with Contraceptive Intensity (Use of Hormonal Contraception)
Insurance that covers hormonal contraceptive use	+

Table 6: Theoretical and Empirical Variable Summary and Description

Theoretical Variable	Empirical Variable	Variable Description
Contraceptive Intensity	<i>constat</i>	Categorical variable constructed for those that identified hormonal methods as being their current contraception method, those who identified other methods and those who identified no method.
Presence of Insurance	<i>Private ins, Public ins, No ins</i>	Method of insurance coverage (dummies for public (Medicaid and military)/private/no insurance)
Abortion cost	<i>Northeast, Midwest, South, West</i>	Indicator variables respectively for the Northeast, Midwest, South, and West
Income	<i><\$20,000, \$20K-39K, \$40K-70K, >\$70,000</i>	Total income of individual's family, divided into <US\$20,000 (<i>incdum1</i>), US\$20,000 <= US\$40,000 (<i>incdum2</i>), US\$40,000<=US\$70,000 (the base category <i>incdum3</i>), or > US\$70,000 (<i>incdum4</i>)
Age	<i>Age</i>	Age as a continuous variable
Education (opportunity cost of a birth)	<i>Education</i>	Number of years of schooling as a continuous variable
Race	<i>Hispanic, Black, White, Other</i>	Race dummies for Hispanic, Non-Hispanic White, Non-Hispanic Black, and Non-Hispanic Other respectively (base category)
Presence of a long term partner	<i>Partner</i>	A dummy variable for whether the woman has a husband or is living with partner vs. does not have a husband or live-in partner
Religiosity	<i>Very religious, somewhat religious, not religious</i>	Dummies for religious from frequency of attending religious services: weekly or more, monthly, or never (base category) respectively
Attitude towards children	<i>Parity</i>	Number of children (number of babies less the ones placed for adoption), as a continuous variable
Employment status (opportunity cost of a birth)/ Attitude towards gender roles	<i>FT, PT, No LFP</i>	Current labour force status (dummies for full time/part time/Not employed)

Table 7: Hausman Test for Independence of Irrelevant Alternatives

Omitted	chi2	df	P>chi2	Evidence
2	17.915	19	0.394	for Ho
3	33.66	19	0.009	against Ho

Ho: Odds(Outcome-J vs Outcome-K) are independent of other alternatives

Table 8: Small-Hsiao Test for Independence of Irrelevant Alternatives

Omitted	lnL(full)	lnL(omit)	chi2	df	P>chi2	Evidence
2	-669.123	-662.272	13.7	19	0.688	for Ho
3	-1368.931	-1358.909	20.044	19	0.272	for Ho

Ho: Odds(Outcome-J vs Outcome-K) are independent of other alternatives

Table 9: Comparison of Marginal Effects from Multinomial Logit and Probit Regressions

Variable	Hornonal				Other Methods				No Method			
	Probit		Logit		Probit		Logit		Probit		Logit	
	dy/dx	Std. Err.	dy/dx	Std. Err.	dy/dx	Std. Err.	dy/dx	Std. Err.	dy/dx	Std. Err.	dy/dx	Std. Err.
Insurance	0.086**	0.023	0.086**	0.023	-0.049**	0.023	-0.052**	0.024	-0.037**	0.017	-0.034**	0.017
Hispanic	0.107**	0.052	0.107**	0.053	-0.158**	0.051	-0.153**	0.050	0.051	0.038	0.046	0.041
White	0.146**	0.046	0.149**	0.046	-0.199**	0.048	-0.202**	0.049	0.054**	0.023	0.053**	0.024
Black	0.107**	0.054	0.104*	0.056	-0.188**	0.045	-0.187**	0.044	0.082**	0.041	0.083*	0.046
Very religious	-0.027	0.021	-0.027	0.021	-0.001	0.022	0.001	0.022	0.027*	0.015	0.025*	0.014
Somewhat religious	0.024	0.020	0.024	0.020	-0.022	0.019	-0.023	0.020	-0.002	0.012	-0.002	0.012
Partner	0.068**	0.021	0.068**	0.022	0.001	0.020	0.001	0.020	-0.070**	0.015	-0.069**	0.015
FT	0.108**	0.020	0.109**	0.021	-0.082**	0.022	-0.082**	0.022	-0.026**	0.013	-0.027**	0.013
PT	0.050**	0.023	0.050**	0.024	-0.023	0.024	-0.023	0.024	-0.027**	0.012	-0.027**	0.011
<\$20,000	0.077**	0.025	0.078**	0.026	-0.063**	0.026	-0.064**	0.027	-0.014	0.016	-0.014	0.016
\$20K-\$39K	0.041*	0.021	0.042**	0.022	-0.044**	0.022	-0.043**	0.022	0.002	0.012	0.000	0.012
>\$70,000	-0.042*	0.021	-0.042**	0.022	0.038*	0.023	0.038*	0.023	0.003	0.014	0.004	0.014
AGER	-0.018**	0.001	-0.018**	0.001	0.013**	0.001	0.014**	0.001	0.005**	0.001	0.005**	0.001
EDUCAT	0.009**	0.004	0.008**	0.004	0.008**	0.004	0.008**	0.004	-0.017**	0.002	-0.016**	0.002
PARITY	0.002	0.009	0.002	0.009	0.013	0.008	0.013	0.008	-0.016**	0.006	-0.015**	0.006
Northeast	-0.118**	0.020	-0.119**	0.020	0.104**	0.022	0.105**	0.008	0.015	0.016	0.014	0.016
Midwest	-0.003	0.020	-0.004	0.020	-0.004	0.020	-0.002	0.008	0.006	0.013	0.006	0.013
West	-0.031	0.023	-0.032	0.023	-0.004	0.022	-0.003	0.008	0.035**	0.014	0.035**	0.015

* Indicates significance at the 10 percent level

** Indicates significance at the 5 percent level

Table 10: Summary Statistics Sorted by Contraceptive Intensity*

Variable	Hormonal				Other Methods				No Method			
	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max
Public ins	0.152	0.36	0	1	0.099	0.299	0	1	0.141	0.349	0	1
Private ins	0.731	0.443	0	1	0.771	0.42	0	1	0.681	0.467	0	1
No ins	0.116	0.321	0	1	0.130	0.336	0	1	0.178	0.383	0	1
Hispanic	0.098	0.297	0	1	0.101	0.301	0	1	0.119	0.324	0	1
White	0.742	0.438	0	1	0.722	0.448	0	1	0.675	0.469	0	1
Black	0.133	0.339	0	1	0.117	0.322	0	1	0.183	0.387	0	1
Other	0.028	0.164	0	1	0.060	0.238	0	1	0.023	0.150	0	1
Very religious	0.251	0.434	0	1	0.298	0.457	0	1	0.305	0.461	0	1
Somewhat religious	0.495	0.500	0	1	0.452	0.498	0	1	0.426	0.495	0	1
Not religious	0.254	0.435	0	1	0.250	0.433	0	1	0.269	0.444	0	1
Partner	0.551	0.497	0	1	0.634	0.482	0	1	0.455	0.498	0	1
FT	0.469	0.499	0	1	0.420	0.494	0	1	0.402	0.491	0	1
PT	0.270	0.444	0	1	0.285	0.452	0	1	0.243	0.430	0	1
No LFP	0.261	0.439	0	1	0.295	0.456	0	1	0.355	0.479	0	1
<\$20,000	0.258	0.437	0	1	0.196	0.397	0	1	0.270	0.444	0	1
\$20-39K	0.320	0.467	0	1	0.277	0.448	0	1	0.319	0.467	0	1
\$40-70	0.277	0.448	0	1	0.306	0.461	0	1	0.261	0.440	0	1
>\$70,000	0.145	0.352	0	1	0.221	0.415	0	1	0.150	0.357	0	1
Age	26.73	6.38	14	44	30.47	7.69	14	45	28.91	8.90	15	45
Education	13.21	2.64	1	19	13.58	2.73	1	19	12.38	2.42	1	19
Parity	0.86	1.06	0	8	1.16	1.20	0	8	0.96	1.29	0	7
Northeast	0.165	0.372	0	1	0.259	0.438	0	1	0.215	0.411	0	1
Midwest	0.275	0.446	0	1	0.228	0.420	0	1	0.230	0.421	0	1
South	0.344	0.475	0	1	0.284	0.451	0	1	0.294	0.456	0	1
West	0.216	0.412	0	1	0.229	0.420	0	1	0.261	0.440	0	1

Observations: 2135

Observations: 2056

Observations: 580

* The mean and standard deviations have been weighted with survey weights

Table 11: Relative Risks from Multinomial Logit Regression Analysis Assessing Associations between Selected Characteristics of Women at Risk of Unintended Pregnancy and Contraceptive Intensity (Base Category of No Method)

Variable	Hormonal			Other Methods		
	Relative Risk	Std. Err.	t- value	Relative Risk	Std. Err.	t-value
Public ins	2.092***	0.409	3.78	1.163	0.222	0.79
Private ins	1.507***	0.251	2.47	1.169	0.189	0.98
No ins (ref)	1.00	-	-	1.00	-	-
Northeast	0.66**	0.109	-2.51	1.103	0.185	0.59
Midwest	0.937	0.130	-0.47	0.941	0.133	-0.43
West	0.69*	0.099	-2.57	0.74**	0.102	-2.19
South (ref)	1.00	-	-	1.00	-	-
Hispanic	1.024	0.167	0.15	1.234	0.170	1.17
White (ref)	1.00	-	-	1.00	-	-
Black	0.787	0.119	-1.59	0.871	0.124	-0.97
Other	1.197	0.375	0.57	2.67***	0.860	3.04
Very religious	0.75**	0.108	-1.98	0.803	0.118	-1.5
Somewhat religious	1.074	0.140	0.55	0.966	0.123	-0.27
Not religious	1.00	-	-	1.00	-	-
Partner	2.13***	0.323	4.98	1.83***	0.257	4.29
FT	1.64***	0.229	3.53	1.068	0.159	0.44
PT	1.46**	0.193	2.84	1.239	0.173	1.54
No LFP (ref)	1.00	-	-	1.00	-	-
<\$20,000	1.35*	0.239	1.72	0.985	0.187	-0.08
\$20-39K	1.094	0.141	0.69	0.903	0.120	-0.76
\$40-70; (ref)	1.00	-	-	1.00	-	-
>\$70,000	0.880	0.131	-0.86	1.054	0.166	0.34
Age	0.92***	0.009	-9.01	0.987	0.009	-1.41
Education	1.18***	0.029	6.98	1.18***	0.028	6.95
Parity	1.15**	0.079	2.09	1.19***	0.078	2.59

* Indicates significance at the 10 percent level

** Indicates significance at the 5 percent level

*** Indicates significance at the 1 percent level