PRESCRIPTION CONTRACEPTION USE AND GOVERNMENT INTERVENTION:

ANALYZING THE MANDATE EFFECT

A Thesis

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by

Maria Cecilia White

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Department of Public Policy and Administration

Abstract

of

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Maria Cecilia White

Unwanted pregnancies are a burden on women, their families, and government programs. Contraceptives reduce the incidence of unwanted pregnancies and abortions. Among the various methods of contraception, prescription contraceptives are the most effective at avoiding pregnancy. This raises the public policy question of whether a requirement for insurance companies to cover prescription contraceptives would prompt people to use them more.

Fortunately, it is possible to use quantitative analysis to address the above question. Prior to the implementation of the Affordable Care Act, which mandates insurance companies to cover prescription contraceptives without an out-of-pocket cost for the consumer, some states had mandates for insurance companies to cover prescription contraceptives. I hypothesized that living in a state that mandates insurance companies to provide such coverage increased the odds of using prescription contraception as opposed to using less effective methods, such as over the counter contraceptives, rhythm, or withdrawal when compared to states that do not mandate contraceptive coverage.

I analyzed data from the 2011 Behavioral Risk Factor Surveillance System (BRFSS) and included fertile women from 18 to 44 years old who engaged in sexual activity with males and used contraception. I compared a state that had a mandate (Arizona) with two states without a mandate (South Carolina and Tennessee). I used various statistical methods, including propensity score matching, and found that living in a state that had a mandate had a statistically insignificant relationship with the use of prescription contraceptives, a result that does not support my hypothesis. I identified two possible explanations for this surprising finding, the particular states that participated in the BRFSS and the way that insurance companies set insurance policies. Further research is needed, including identification of methods to incentivize the use of effective contraceptives.

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Edward L. Lascher Jr., Ph.D.

_____
Date

DEDICATION

I dedicate this thesis to my husband, my best friend, one of the smartest people I know and the best soundboard ever. Tim White, this belongs to both of us. To my girls, Isabel, Miranda and Sarah, you make me want to be the best version of me. To my parents, Lolis and Miguel, and my siblings, Magdalena, Juan, Pablo, Carlos and Luis, ¡Los quiero un montón!

To those who are willing to spend their lives researching for the wellbeing of all, Thank you!

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Chapter One

INTRODUCTION

In the last hundred years, effective birth control has been revolutionizing women's lives by allowing them to control when and if they want to be pregnant. Birth control increased the availability of women in the workplace by allowing them to reduce the number of children they conceived. Avoiding motherhood became a choice (Bailey, 2013).

Although a personal choice, contraception is a matter of public health. Unintended pregnancies increase medical expenses and the use of abortion services (Kearney and Levine, 2009). By reducing unintended pregnancies, there is a net savings for the public system. The Guttmacher institute calculates that for every additional dollar spent on contraceptives, the government stands to save seven dollars (Guttmacher, 2015c). If the reduction of unintended pregnancies is desirable, we must understand what leads women to use the more effective birth control methods and reduce the barriers to obtaining them.

One of the strategies used by state governments is mandating insurance companies to cover prescription contraception, potentially lowering the out of pocket cost to women. Implemented between the late 1990s and 2010, state mandates attempted to reduce barriers to the access of prescription contraception through the legislated measures with the intent that women had increased access to more effective methods of birth control.

With the introduction of the Patient Protection and Affordable Care Act, better known as the "Affordable Care Act" (ACA, 2009), reproductive health has experienced a deep, nationwide transformation. Before ACA, health insurance services did not always offer coverage for prescription contraceptives and the out-of-pocket costs varied depending on the plan. The ACA required that beginning in 2012-2013 health insurers provide subscribers with prescription contraceptives with no copayments or deductible, increasing access and reducing costs for the users. Studies have shown that women who have health insurance use prescription contraceptives at a higher rate than those without insurance (Nearns, 2009). The ACA also required individuals to have health insurance or face a yearly penalty. Together, requiring insurance companies to provide coverage without out-of-pocket costs and increasing the number of insured women are expected to increase the overall use of prescription contraception.

While it still too early to assess the direct consequences of the ACA on contraceptive use, it is possible to infer the effect by examining prior efforts to require coverage. In this thesis, I examine the year before the implementation of the Affordable Care Act's no-cost access to prescription medication to assess whether states that have mandated insurance companies to cover contraceptives have a higher use of prescription contraceptives. I expect that my contribution could be utilized as a framework to analyze the impact of the new healthcare requirements once the implementation is completed.

In Chapter two, I offer a literature review that highlights relevant research. I follow in Chapter three by proposing a working model. In Chapter four I analyze the data obtained from the Behavioral Risk Factor Surveillance System (BRFSS) on 2011, a

survey produced nationwide by the Center for Disease Control. In Chapter five, I conclude that there is no statistically significant effect on women's use of prescription contraceptives based on whether or not they reside in a state with a mandate to cover prescription contraception. There are a number of possible reasons for this surprising finding, and I explore some of them in Chapter five as well. The ACA will provide a large array of information that will allow researchers to evaluate not only the effectiveness of a mandate but the effect of eliminating out of pocket expenses for effective contraceptives. More research is needed to identify possible avenues of incentivizing effective contraception.

Chapter Two

LITERATURE REVIEW

In this section, I explore the existing literature on the use of the more effective contraceptive methods. I evaluate the contributions of several papers, identify their strengths and weaknesses, and highlight the many important lessons derived from them.

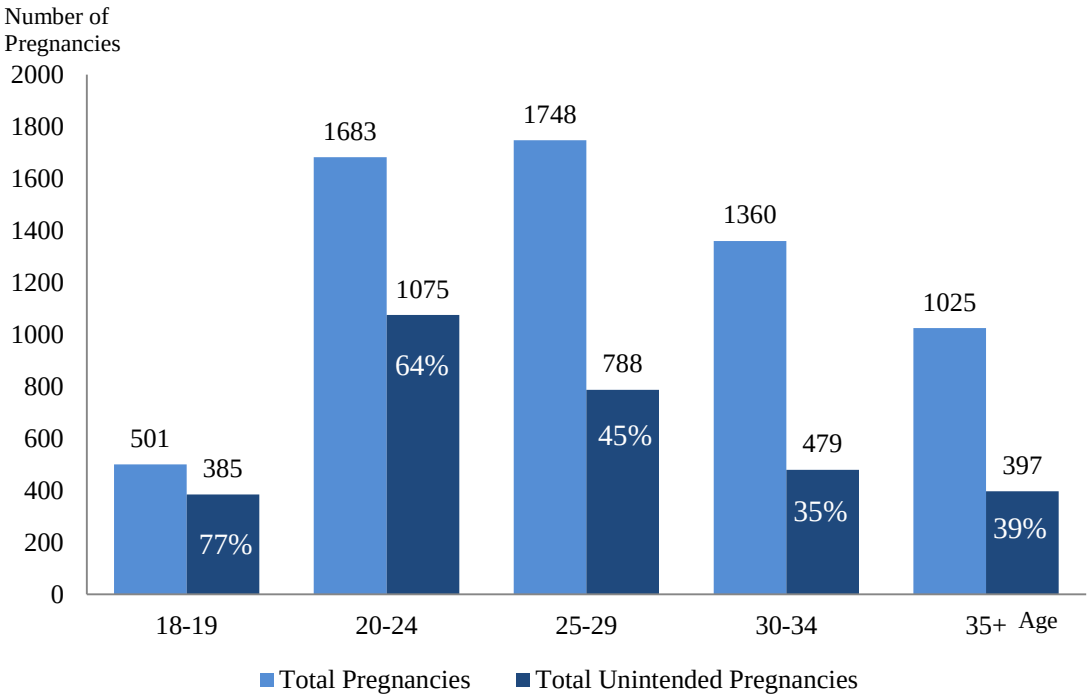
I begin by offering an overview of birth control and contraception methods, their availability, and the various government interventions geared towards increasing availability of the most effective methods. I continue by exploring three general themes that affect the use of prescription contraception: (1) access to health care, (2) socioeconomic factors, and (3) cultural and personal factors. I focus on the first theme and evaluate the literature pertinent to over-the-counter availability, the role of insurance, and the government mandate that requires insurances to cover contraception. I offer a literature review table on Appendix A that summarizes the most relevant studies. I conclude that an increased body of evidence in the role of the mandate that requires insurances to provide coverage of prescription contraception will provide an important background for the evaluation of the new contraceptive policies of the Affordable Care Act after its full implementation.

Unintended Pregnancies and Contraception

The United States leads the industrialized world in unintended pregnancies (Guttmacher, 2015b). In 2008, unintended pregnancies accounted for around 3.5 million pregnancies (54 per 1000 women/year), over 50 percent of overall pregnancies (Guttmacher, 2015b). Sixty percent of unintended pregnancies resulted in a live birth and the remaining 40

percent were miscarriages and abortions (Finer, 2014). In Figure 2.1, I show the magnitude of the issue.

Figure 2.1 Pregnancies in 2008 by Intent (in Thousands)



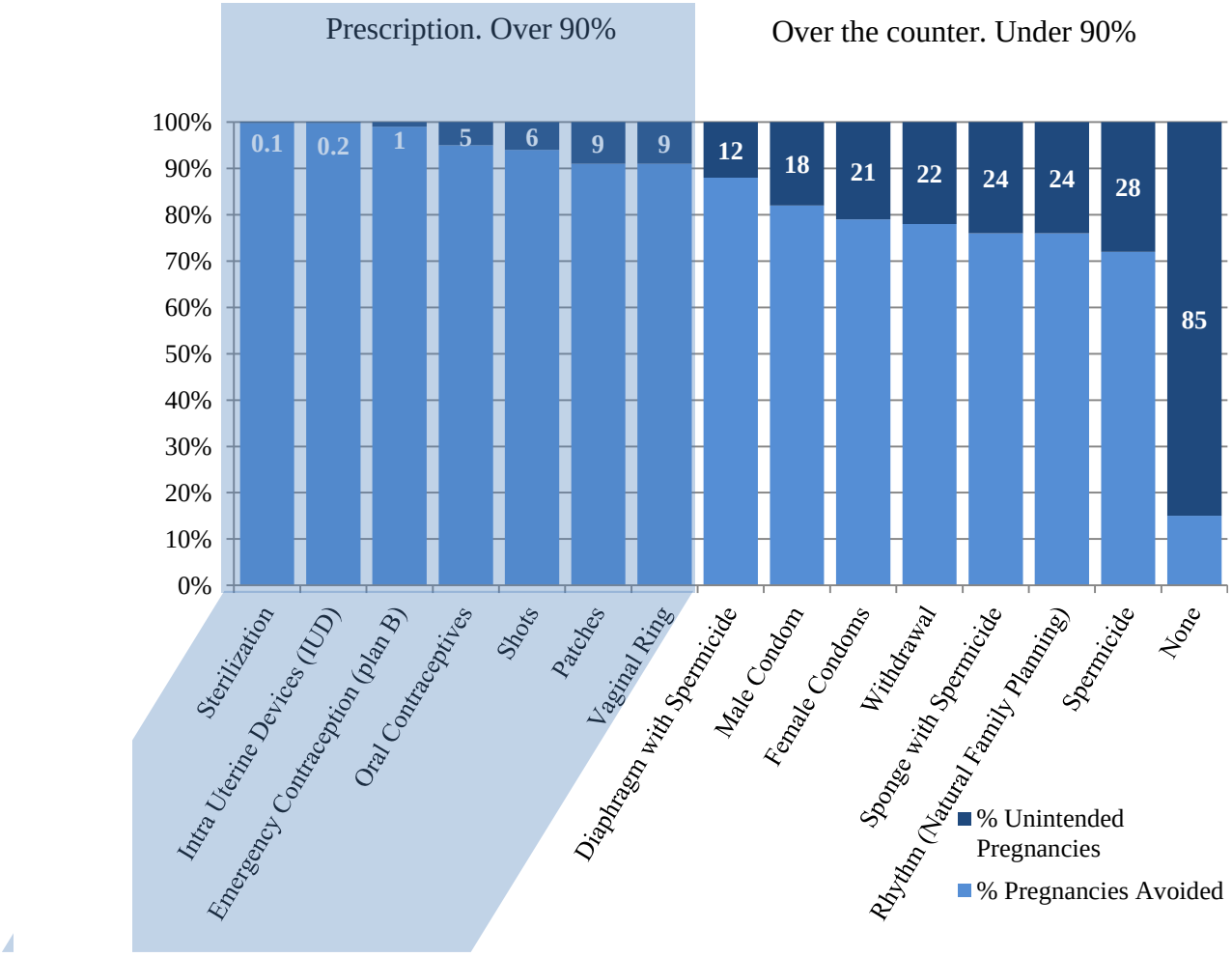
Finer, 2014. Total pregnancy and unintended pregnancies in United States by age in thousands, 2008. Percentages show how many of the pregnancies were unintended, numbers were rounded.

Many benefits result from the use of birth control. Women are able to space their births and have healthier bodies, the number of unwanted and unintended pregnancies are reduced, and the demand for abortion services decreases (Kearney, 2009). Healthcare insurances benefit financially (albeit not immediately) from the reduction in unintended pregnancies. Kearney and Levine (2009) calculated that the provision of contraception for a woman through Medicaid amounted to an average of $188 per year. Ten and a half billion dollars were saved in 2010 as a result of providing contraceptives through Medicaid, resulting in a total savings of 568 percent on investment (Sonfield, 2014).

Avoiding Unwanted Pregnancies: Contraceptive Methods and their Effectiveness

Not all methods of contraception are equally effective in preventing pregnancy. In Figure 2.2, I show the most common contraceptive methods and their effectiveness rate (Eisenberg, 2012; Trussell, 2011; Women's Health, 2011)

Figure 2.2 Efficiency of Contraceptive Methods



Data Source: Trussell, 2011; Women's Health, 2011
The percentage of unintended pregnancies shows how many women (out of 100 users) will be pregnant within a year, in average. Data considers typical use for one year. Effectiveness is higher with perfect use. Sponge use reflects women who have birthed before. Diaphragm shows doctor-fitted results.

The reversible methods available by prescription are: intrauterine devices (over 99% effective), oral contraceptives (95%), shots (94%), patches, and vaginal rings

(91%). The methods available over the counter are: diaphragms with spermicide (88% if fitted by a doctor), male condom (82%), female condom (79%), sponge with spermicide (76%) and spermicide without barrier (72%). The methods available without a purchase are: withdrawal or "pulling out" (78%) and natural family planning in its different versions such as rhythm (76%). In the United States, unlike in most industrialized nations, you require a doctor's prescription to access the most effective methods of birth control (Trussell, 2011; Women's Health, 2011). All the methods that offer over 90% effectiveness are exclusively available with a prescription. Post-coitus emergency contraception (Plan B) allows one pregnancy per 100 women in a year and is sold over the counter; however, plan B cannot be utilized regularly as a prevention method. Studies show that public support for the availability of these methods over the counter has increased in the last few years but the manufacturers who so far have profited from their prescription-only status must initiate the process required to make these methods available over the counter (Grossman, 2013; Burton, 2014).

Government Mandates

Effective contraceptives can be expensive out of pocket. As with other healthcare devices or prescription medications women turn to government sponsored healthcare, direct healthcare insurance or employer provided healthcare insurance coverage to assist covering the expense. A study in 1993 revealed that about half of non-HMO private health insurances did not cover contraceptives; by 2002 about 86% covered at least five prescription contraception methods (Sonfield et al, 2004). Many efforts have been undertaken since to increase the access to prescription contraceptives.

The coverage of contraceptive has increased through two main channels. First, a legal dispute argued that by not providing contraception coverage, employers were discriminating against their employees because of their sex. As a consequence, employers increased the coverage of prescription contraception in the insurance they provide to their employees. Second, some government entities (state and federal governments) have required the coverage of contraceptives, some with explicit exceptions. Sonfield (2002) attributes 30% of the increase between 1993 and 2002 to government mandates.

Table 2.1 shows the progression of government mandates that culminates with the passage of the Affordable Care Act.

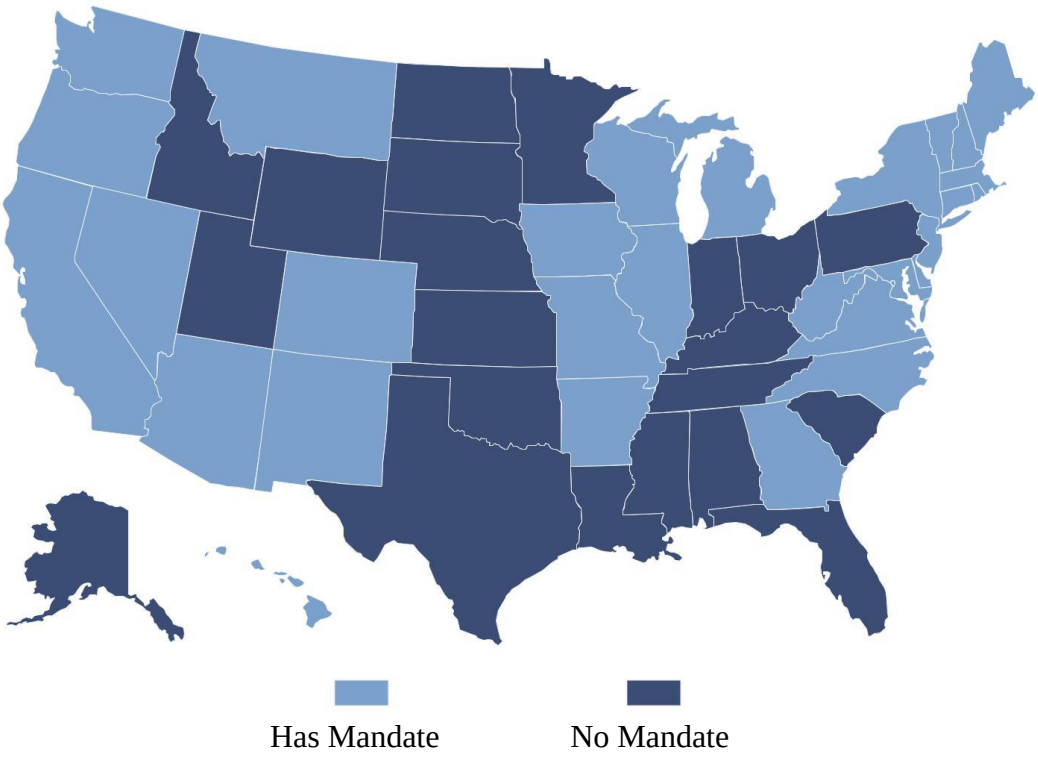
Table 2.1 Adoption of Contraceptive Mandates by Year

1998	Maryland		
1999	California	Connecticut	Georgia
	Hawaii	Maine	Nevada
	New Hampshire	North Carolina	Vermont
2000	Delaware		
	Iowa		
	Rhode Island		
2001	Missouri	New Mexico	
	Texas*	Virginia*	
	Washington		
2002	Arizona		
	Massachusetts		
	New York		
2003	Illinois		
2004			
2005	Arkansas		
	West Virginia		
2006	Michigan**		
	Montana**		
2007	Oregon		
2008			
2009	Wisconsin		
2010	Colorado		
	Affordable Care Act***		

*In these states, insurances must offer an option that covers contraceptives.
**Administrative rule
***Federally mandated coverage
Guttmacher Institute (2015a), National Conference of State Legislatures (2012), National Women's Law Center (2012)

In figure 2.3, I show the states that required insurance companies to cover prescription contraceptives in 2011.

Figure 2.3. States with Contraception Mandates in 2011



Source: Council of State Governments Knowledge Center (2012)

Among the states that have a mandate, the specific requirements vary. In some cases, insurers are required to cover the drugs and devices but not the required outpatient services. Twenty states provide exemptions: some for religious organizations, others include schools with religious affiliation and some charities. Others expand the exclusionary clauses to allow hospitals to be excluded. Arkansas and North Carolina

exclude emergency contraception and West Virginia excludes coverage for minors (Guttmacher, 2015a).

There have been two studies on the effects of mandates on the use of prescription contraception. The study by Sonfield, Benson, Frost and Darroch (2004) surveyed insurers in 2001-2002 to identify what prescription contraception they covered, allowing them to compare their results with a previous study done in 1993. They controlled for the size of the insurance company, environmental changes and changes in the market between insurances, and used complex survey weights. One of their most interesting findings was that about 58% of the plans in states that had no mandate had set their policies nationwide. This finding means that the mandate in one state can have a spillover effect on non-mandate states: since the same policy will be utilized in both states, it must comply with the regulations established in both locations. Other findings included that in non-mandate states, about half of the insurance companies covered the five most common methods and 12% of PPOs (Preferred Provider Organization) did not cover any prescription contraception method. PPOs covered around 40% of enrollees. The researchers concluded that coverage of prescription contraceptives increased from 32%-59% in 1993 to 78-97% in 2002. Around 30% of the increase in coverage on oral contraceptives between 1993 and 2002 was due to the mandates and the increase was larger for other methods like the three-month injectable.

Atkins and Bradford (2014) produced a study that researched the impact of mandates in the use of prescription contraception. They utilized the information from the Behavioral Risk Factor Surveillance System (BRFSS) throughout seven years: 1998,

1999, 2000, 2002, 2004, 2006 and 2010. They selected the states that had undergone a change in their policies, states that were no-mandate states and became mandate states during this period and used a difference-in-difference method to assess the impact of treatment in the selected states. Since the module of the BRFSS that addresses family planning is an optional module, ten states used the module in at least four years. In addition to the states that adopted the mandate, they selected as a control the group of states which did not have the mandate at any point. They selected women who were of childbearing age, sexually active, and neither pregnant nor intending to become pregnant. They also focused on women using the most effective birth control methods in addition to condoms and sterilization. Their explanatory variable was residence in a mandate state and they controlled for race/ethnicity, education, relationship status, income level, insurance status, and whether they smoked. They used logit regression analysis and robust standard errors and showed their results as marginal effects from the means of the samples. They attempted to explain first the use of any method of contraception and then prescription contraception use. They concluded that there was no change amongst the uninsured women (mandate did not change use) and showed an increase of 4% ($p<.01$) use of effective contraception due to mandates. Their results were not significant in all years nor in all states, but Delaware, Iowa and Nebraska showed statistical significance, as did 1999, 2000 and 2002.Their study was limited by the change of methodology of the Behavioral Risk Factor Surveillance System and any exemptions to the mandates.

Access to Health Care

The most effective methods of contraception are dispensed with a health provider's prescription, which means women must have access to healthcare to have access to the best forms for contraception. There are several barriers that can hinder the access to contraception: a doctor's visit must be plausible and affordable, filling the prescriptions must be simple, and the cost of the contraceptives must be affordable. If insurance is used to control costs, it must make affordable the doctor's visit and the contraceptive of choice.

It has been shown that women who have insurance utilize contraceptives more often and select contraceptives that are more effective. There are two main kinds of insurance according to their origins: private insurance and public insurance. Nearns (2009) found that women between 18 and 24 years old who held private health insurance had a higher use of contraceptives when compared to uninsured women. Women insured through Medicaid also had a higher use of prescription contraception, unlike other public insurances. To find this result, he controlled for race, ethnicity, whether women were born abroad, income to poverty ratio, employment status, education level, and housing, marital status, number of children, number of sexual partners and whether the woman had a history of discontinuing contraceptives. Nearns found that women with private insurance coverage were 231% ($p<.0001$) more likely to use prescription contraception when compared to uninsured women. Those who had Medicaid coverage were 208% ($p<.01$) more likely to use prescription contraception. The results for other government plans were not statistically significant.

Culwell and Feinglass (2007b) found increases on the usage of prescription contraceptives and a decrease of over-the-counter contraceptive use for those who held insurance. In drawing this conclusion, Culwell and Feinglass controlled for income, gender and age. However, they could not differentiate the source of the insurance due to the survey they used, the Behavioral Risk Factor Surveillance System, which did not include such information. Insured women used prescription contraception 54% of the time whereas uninsured women used prescription contraception 45% of the time.

In a separate study, Culwell and Feinglass (2007a) used the National Survey of Family Growth to analyze the difference in use of prescription contraception between 1995 and 2002. Using logistic regression they found that the likelihood that a woman with insurance used prescription contraception increased about 5.5% ($p<.002$) from 1995 to 2002. There was a general increase in the use of prescription contraception from 48.9% to 51.9% but once they analyzed the effect by insurance status (insured/not insured), the change was significant only for women with insurance. They also found that women who were not insured were less likely (20%, relative risk 0.78) to use prescription contraception. They theorized that the change could have occurred because of the increase in state mandates during that time. Culwell and Feinglass indicated that insurance companies increased their coverage of the top five birth control methods from 1993 (23%) to 2002 (90% of private insurances).

Kurth, Weave, Lockhard and Bielinski (2004) conducted a different type but still relevant study. They attempted to discover the value that prescription contraception had for various populations. They designed and enacted a telephone survey that included men

and women and did not limit to those in childbearing years; through a bidding game, they informed the participants of an effectiveness rate (either one or two percent risk) and gave them an initial bid (either two or ten dollars). They found out that in 94% of the cases, participants were willing to pay more than the actuarial cost of the prescription contraception. Those in childbearing years valued prescription contraception more (2.12 times more) than older participants. This exercise is very relevant because it showed a difference in behavior with the effectiveness rate communicated. If medical professionals can educate their patients on the effectiveness of prescription contraception, we might see an increase on the use of those methods (Eisenberg, 2012).

Socioeconomic Factors

Most of the studies presented above controlled for socioeconomic factors. Age, employment status, income, whether there are children at home, relationship status, and education have all been linked to the use of prescription contraception (Finer, 2014, Gariepy 2011, Culwell 2007). Older women, more educated women, and higher earning women are less likely to have an unintended pregnancy than their peers due to the use of more effective methods than their peers (Frost, 2008; Nearns, 2008). Women in a stable relationship (such as marriage or cohabitation) are more likely to utilize prescription contraception than never-married women who did not live with a partner (Atkins, 2014). These considerations combine to explain in part the use of prescription contraception.

Personal and Cultural Factors

Encompassed within socioeconomic factors but deserving special attention, Race/ethnicity and religion provide a glimpse into the cultural environment that

determines the likelihood to use prescription contraception. According to Finer (2014) the rate of black women who had unintended pregnancies surpassed the rate of non-Hispanic whites or of Hispanics. Due to this disparity, various studies have sought to identify the impact of ethnicity and religion in the use of contraceptives.

Dehlendorf et al (2011) proposed that the cultural background of individuals influenced their perspective about various contraceptive methods through their information source and cite as an example Black and Hispanic women's mistrust of hormonal methods. The information that men have regarding contraceptives also varies by race/ethnicity and heavily influences the use of contraceptives by the women (Borrero et al, 2013). Dehlendorf et al also found that the perception of a combination of race and income led to differing advice from their medical professional and the subsequent prescription of alternative methods. Beyond information, the desirability of children diverges according to ethnicity, and according to Hayford & Guzzo (2013) women chose birth control methods reflecting those cultural values. All these elements combine to provide a complex interaction between race/ethnicity and the use of contraceptives.

The role of religion on the choice of contraception has been difficult to identify. Religiousness appears to be most relevant for teens. Kramer, Rowland & Gaydos (2006) found that the age in which sexual activity started is heavily influenced by the religious upbringing, as is the use of contraceptives. They also found that religious affiliations do not appear to be as significant for those older than twenty, with two marked exceptions: there is a larger number of Catholics who practice family planning and withdrawal (less

efficient methods), and the use of contraception is lower for Catholics and fundamental Christians when compared to mainstream Christians.

Other elements such as the dislike of particular methods or the side effects experienced while on prescription contraception also determine a woman's choice. Including cultural and personal elements is relevant in the study of contraceptive use.

Conclusion

The literature mentioned above influenced my approach to studying contraceptive and the elements I considered for inclusion in my quantitative model. Prior work also made me aware of opportunities and pitfalls of the analysis of insurance and mandate effects on prescription contraception use. Various authors highlighted the lack of longitudinal data that would help to verify the impact of a policy. As Atkins and Bradford (2014) mention in their conclusion, the Affordable Care Act will provide a wider array of sources of information through which to measure the impact of a policy regarding the coverage of prescription contraception. However, in the short run it is still possible to draw inferences about the effects of contraceptive requirements based on policy differences across states that predated the Affordable Care Act. That is my intention in this thesis. After evaluating and drawing upon approaches taken in prior studies, in the next chapter I propose a new model and research approach.

Chapter Three

METHODOLOGY

In this section, I explain how I built my theoretical model and the results I expected to obtain. I draw from the literature review to select the appropriate sample and the most relevant variables for analysis. I want to know whether there is a difference in the use of prescription contraception between states that have required insurers to cover prescription contraception (mandate) and states that did not have that requirement in 2011 (non-mandate). I use propensity score matching and regression analysis to analyze existing nationwide surveys to answer my question.

Unit of Analysis

My unit of analysis for this study is the individual adult. That is, I am exploring factors that affect whether individuals use or do not use prescription contraception, including information about the presence or absence of an insurance mandate in a person's state of residence.

Source of Data

I obtained all my data (except for the list of states with mandates) from the Behavioral Risk Factor Surveillance System (BRFSS) of 2011. BRFSS is an annual, nationwide survey of American adults administered via telephone by the Centers for Disease Control. It is comprised of a general section and several optional modules that individual states or other entities can request and sponsor. In 2011, the survey consisted of 506,467 individuals interviewed. The survey underwent a major transformation on its 2011 release through a methodological change that included contacting targeted

individuals via cell phones in addition to the accustomed landline system. Due to this change, the information released in 2011 is not comparable to previous data. An analysis through time was not possible using the data from the BRFSS since the Reproductive Health section was not utilized in 2012, 2013 or 2014.

In Table 3.1, I list the questions used in the survey for the variables of interest. I expected the mandate to be positively related with the use of prescription contraception, such that a woman living in a mandate state would be more likely to use prescription contraception than a woman living in a no mandate state due to increased access.

Table 3.1
Variables and Questions
Behavioral Risk Factor Surveillance System, 2011

Variable	Questions in the Survey
Contraception choice (dependent variable)	What did you or your husband/partner do the last time you had sex to keep you from getting pregnant?
Mandate (explanatory variable)	A State that mandates insurance companies to cover prescription contraception
Race and ethnicity	Are you Hispanic or Latino? Which one of the following would you say is your race?
Education	What is the highest grade or year of school you completed?
Income	Is your annual household income from all sources ___
Housing	Do you own or rent your home?
Marital Status	Are you ___?
Children at home	How many children less than 18 years of age live in your household?
Children in the future	How do you feel about having a child now or sometime in the future? Would you say ___?
Insurance Coverage	Do you have any kind of health care coverage, including health insurance, prepaid plans such as HMOs, or government plans such as Medicare, or Indian Health Service?
Didn't see doctor because of cost	Was there a time in the past 12 months when you needed to see a doctor but you could not because of cost?

All variables were captured in dummy variables except for age.
Race was gathered in two questions. I used BFSS combined variable "mrace"
All variables were obtained from the Behavioral Risk Factor Surveillance System (2011) except for mandate. A list with all states with mandates in 2011 was obtained from the Council of State Governments.

The survey section pertinent to prescription contraception is the Reproductive Health section, an optional module. In 2011, three states utilized the Reproductive Health optional module, two of which did not have a mandate for insurances to cover contraceptives (Tennessee and South Carolina) and one of which did have a mandate

(Arizona). I therefore focus on respondents from those three states. It would be preferable to have data from respondents in more states to increase the external validity of the analysis.

Narrowing the Target Population

The first step was to identify who would potentially change the use of contraception type with a government policy. The table 3.2 shows the guidelines I used to find the population of interest. In this particular survey, only women were asked about their contraceptive habits. I selected women with the following characteristics: reproductive age, sexually active with the opposite sex, currently attempting to avoid pregnancy, and fertile. I selected women from 18 to 44 years of age, a range commonly used as childbearing years (Kramer, 2006; Finer, 2006; Atkins, 2014)). I limited the data further by eliminating women who are pregnant and those who have undergone sterilization procedures, such as tubal ligation or hysterectomy, or whose partners have had a vasectomy. I eliminated women who believe they are not fertile, including those who cite breastfeeding, postpartum, or pregnancy as the reason they have not used contraception. There is a possibility that those who believe they are not fertile currently are fertile; however, a change in access to contraceptives would not change their behavior. I narrowed the sample further by selecting only women who had heterosexual sexual activity. I did not include women who are trying to conceive or who want to conceive within a year since a change in the use of contraceptives is likely to be due to their desire to conceive. I did not consider women who did not use contraception. I intend

to pursue the choice of kind of contraceptive given the fact that a woman has the desire to not conceive and the support of her partner to actively avoid pregnancy.

Table 3.2
Groups Filtered from Analysis to Obtain Desired Population Group
Behavioral Risk Factor Surveillance System, 2011

Variable	Categories Eliminated from the Sample
Sex	Male
Pregnant	Pregnant, maybe pregnant
Age	45+
State	All but Arizona, Tennessee and South Carolina[a]
Sexual Orientation	Same sex couples
Contraception	Not sexually active, same sex partner, refused to answer, don't know, no[b]
Kind of contraception	Male or female sterilization (such as tubal ligation, Essure, Adiana, vasectomy), don't know, refuse to answer
Children in the future	Want to have a child less than 12 months from now[c]

[a] These three states requested the Preconception/Family Planning optional module on the Behavioral Risk Factor Surveillance System.

[b] A couple that is not currently attempting to avoid pregnancy is unlikely to change their behavior by assuring insurance coverage of contraceptives. Note that "doing something to avoid pregnancy" can include not-purchased methods such as rhythm, family planning, or withdrawal ("pulling-out").

[c] A couple that is attempting pregnancy will likely modify its contraceptive choice independently of insurance coverage

Dependent Variable Creation

I created the variable "prescription contraception" in a dummy format as my dependent variable. This variable indicates whether women use prescription contraception or other type of contraceptives. Category 1 includes women who used prescription methods the last time they engaged in sexual activity. Category 0 includes women who actively avoided pregnancy through other means, namely over-the-counter methods and not purchased methods such as withdrawal or natural family planning. The BRFSS Reproductive Health survey allowed eighteen distinct responses for the contraceptive method used: female sterilization, male sterilization, implant, hormonal

IUD, copper-bearing IUD, other IUD, shots, birth control pills, patch, ring, male condoms, diaphragm, cervical cap or sponge, female condoms, rhythm or natural family planning, withdrawal and spermicidal such as foam, jelly, film or cream, emergency contraception and other. I was interested in the use of prescription contraceptives, so I grouped the methods accordingly. A zero in the prescription contraceptive variable signifies a response of rhythm or natural planning, or withdrawal. I coded all other responses as one. The diaphragm is considered in the "over the counter" category; however, most diaphragms require a medical professional to "fit" them. Since you can purchase a diaphragm without a prescription, diaphragms remained in the "over the counter" category. Likewise, even though the emergency contraception is a pill, it does not require a prescription and is therefore grouped in the "over the counter" alternative.

The Behavioral Risk Factor Surveillance System does not allow respondents to select more than one contraception method; they must select a single answer. Many people use contraception methods to avoid sexually transmitted infections or diseases and cannot report dual use; it is unclear which one method they would report. This reporting method could alter the results of my analysis; individuals could be miscategorized as not using prescription contraception when they did. Depending on the type of contraception the respondents decided to report, the results could be biased in a positive or negative direction.

Model

I will begin by showing my theoretical model based in the literature reviewed in Chapter two. I will follow with a closer look at each element and a brief explanation of the elements obtained from the BRFSS survey for the analytical model.

I theorize that the use of prescription contraceptives is determined as follows: Use of Prescription Contraceptives= f(Access to Healthcare, Socioeconomic Factors, Personal and Cultural Factors)

- Access to Healthcare= f(Having Insurance, Insurance Covers Contraceptives, Access to a Doctor, Access to Accurate Reproductive Information, Cost of Contraceptives)
- Socioeconomic = f(State of residence, Employment, Income, Children at Home, Children in the Future, Relationship Status, Housing Arrangements, Education)
- Personal and Cultural = f(Race, Ethnicity, Religion, Personal Preferences and Health)

To represent Access to Healthcare, I initially selected whether women had insurance, whether women had one or more primary doctors, whether they had a conversation with their primary about pregnancy and whether women had foregone medical care due to cost. I was attempting to tease out the difference between having a doctor and having access to a doctor they trust. I decided to simplify the model due to the difficulty in obtaining a nuanced answer. Access to Healthcare includes whether women have insurance and whether they did not receive medical care in the last year due to cost.

To represent Socioeconomic factors, I used state of residence, housing arrangements, employment status, income, whether there were children at home, relationship status, whether they wanted children in the future, and level of education. Since the main explanatory variable is whether having a mandate changes the use of prescription contraception, I created a variable that indicates whether the State of residence has a mandate for insurance companies to cover prescription contraceptives (1) or if the State of residence does not have a mandate (0).

To represent personal and cultural factors (a subsection of socioeconomic) I used race and ethnicity. Unfortunately, religion was not a variable available through the survey. The absence of religion could bias my results since followers of various religions have moral objections to the use of some contraceptives, particularly prescription contraceptives). Health and personal preferences ("why didn't you use contraception?" BRFSS, 2011) were only gathered for those who did not utilize contraception. Had the data been available, they would have provided a window to understand why women used the particular contraceptive method and whether access to contraceptives is the reason they opt for over the counter or natural methods rather than for more effective, prescription contraception. I expect a mandate to have more impact in the use of prescription contraception in women that have opted out due to access.

Method of Analysis

To understand the effect of a prescription contraception mandate, I ideally would have analyzed the use of contraception before and after the government mandate for insurances to cover prescription contraception. Since that information is not available, I

attempted to find whether someone living in a mandate state is more likely to use prescription contraception. The analysis will not provide a before and after explanation but would approximate a random experiment due to the methodology I used.

I ran a logistic regression and encountered an endogeneity problem. Endogeneity is present when a variable that was not considered is the true cause of a phenomenon rather than the variable studied. In this case, the only state surveyed that had a mandate for insurance companies to cover prescription contraceptive is Arizona. Any effect found for states with such mandate could be originated not in the mandate itself but rather in a particularity of Arizona. I sought a more complex statistical method that could approximate the conditions of a randomized experiment and minimize any existing endogeneity.

Propensity score matching is a method used to analyze populations that have received certain treatment (such as participating in a government program, in this case a mandate) in a non-randomized environment. Propensity score matching seeks to estimate the treatment effects by creating a control group that shares pre-treatment variables considered important in the group that had a treatment (mandate residents). By creating a control group, it attempts to correct the selection bias inherent to programs that are either self-selective or geographically selected such as a mandate for insurances to cover prescription contraceptives.

A simple matching technique would find individuals identical to the treatment group and compare the desired variable. For a more complex analysis, it is difficult to find identical individuals to create a control group and therefore next neighbor, weights,

and calipers are introduced to find mathematically a group that would reflect the various characteristics considered important in the treatment group. The groups can then be compared and a treatment effect can be better estimated.

I identified the probability of using prescription contraception in the statistical program STATA. In order to find an appropriate control population, I identified the weights for mandate states and for non-mandate states through an inverse equation in which living in a mandate State (weightA) is expressed by:

weightA=1/(1-probability of using prescription contraception)

and living in a non-mandate State (weight B) is expressed by:

weightB=1/(1-probability of using prescription contraception)

I estimated the means of the variables used in both scenarios (mandate and non-mandate) to verify that the group with mandate and the group without mandate had similar characteristics and ran a logistic regression. I found the caliper through the evaluation of the standard deviation, to ensure that both groups have similar control characteristics. The propensity score matching technique is sensitive to the order of the data, in order to avoid bias, I followed by randomizing the results before running the matching commands with no replacement.

At this point, I had created an appropriate control group (non-mandate population) and was ready to run a logistic regression. The results produced the data analysis shown in Chapter four.

Chapter Four

RESULTS

This thesis focuses on the impact of a mandate for health insurances to include prescription contraceptives on the use of prescription contraceptives. In previous chapters, I have highlighted the importance of using more effective contraceptive methods. Additionally, I have identified variables that could impact the use of prescription contraceptives and have developed propensity score matching to find the effect of a government mandate on prescription contraceptive use.

I focused on the use of prescription contraception among users of contraception, expecting to see a positive relationship between a government mandate of prescription contraception and the use of such contraception (versus the use of over the counter, rhythm or withdrawal). Yet as I will detail in more depth in the paragraphs that follow, my findings did not match my expectations. Instead, I found that the relationship between living in a state with mandate and the use of prescription contraception was not statistically significant. I deal with the larger implications of this surprising result in the subsequent chapter.

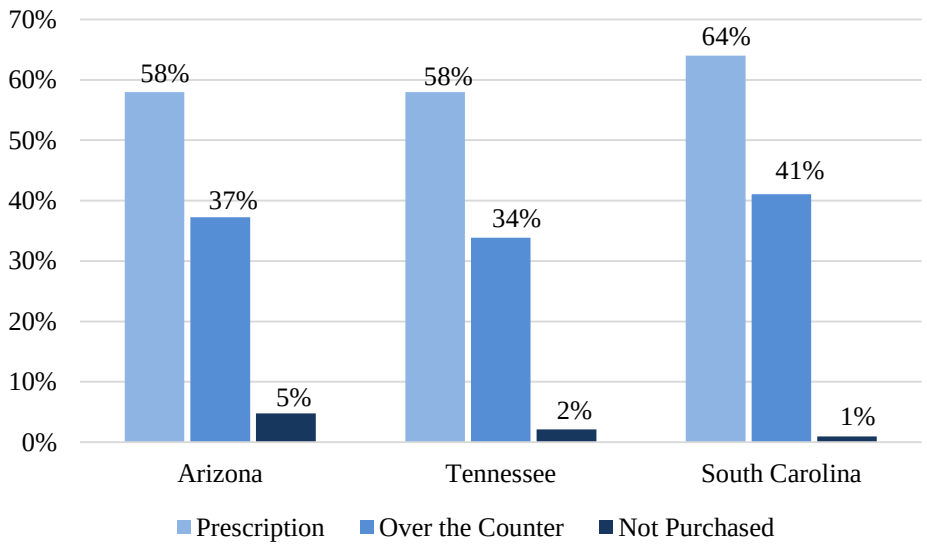
Descriptive Statistics: a First Look at the Data

I began my analysis by looking at the relationship between the presence of a mandate and the use of prescription contraception. In 2011, there were three States who participated in the Reproductive Health section. One State, Arizona, had a mandate for health insurance to cover prescription contraception. South Carolina and Tennessee did

not have a mandate. There were 791 women in the survey who lived in these three states, were of childbearing age, and used contraceptives the last time they had sex. In this section, I analyze descriptive statistics that assess prescription contraception use amongst these women.

Figure 4.1 addresses the prevalence of prescription contraception in each state. To allow comparisons, I show percentages within each state since the number of women that participated in the survey varied per state of residence.

Figure 4.1
Use of Contraception by Type and State of Residence in Percentages
Women between 18-44 Years of Age [x]
Behavioral Risk Factor Surveillance System, 2011



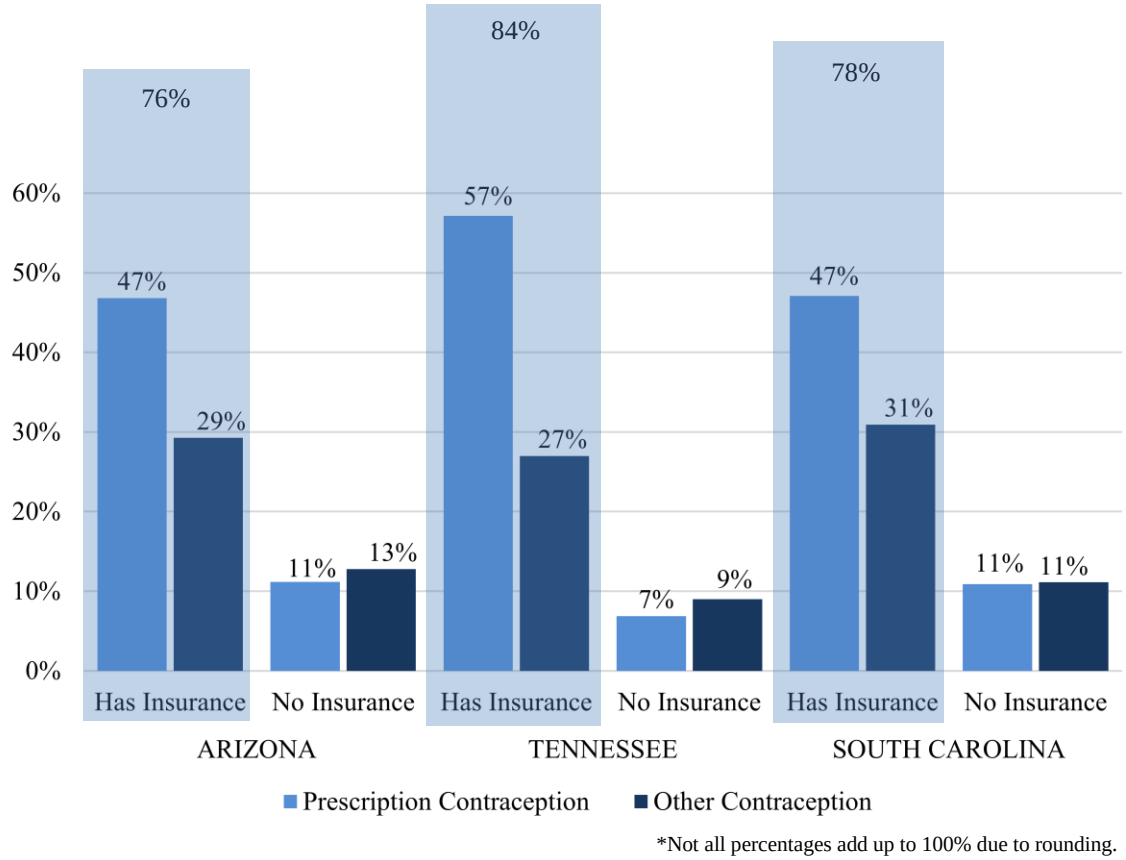
*Considers women who reported using a contraceptive last time they had sex. Prescription Contraception includes implants, IUDs, shots, birth control pills, patch and ring. Over the Counter Contraceptives include male and female condoms, diaphragm, cervical cap, sponge, foam, jelly, film or cream. Non-purchased contraceptives are rhythm, natural family planning or withdrawal.

The percentages of the three states begin to uncover an unclear relationship, if any, between the use of prescription contraception and living in a mandate state. The use of prescription contraceptives is higher in South Carolina (64.02%), followed by Arizona

(57.98%) and finally Tennessee (57.97%). South Carolina (41.06%) leads in over the counter contraceptive users, followed by Arizona (37.23%) and Tennessee (33.86%). Arizona (4.79%) has the highest non-purchased contraceptive use in this sample, followed by Tennessee (2.12%) and South Carolina (0.97%). Without controlling for any variables, a non-mandate state South Carolina would have the highest level of prescription contraception in the survey. This initial discovery is startling—might it suggest that the intervention of the government does not impact significantly the use of prescription contraceptives?

The lower use of prescription contraception in Arizona could be due to the lack of health insurance. A woman without health insurance would not directly reap the benefits of changes in an insurance policy coverage. Figure 4.2 shows the incidence of health insurance in each of the surveyed states. Arizona did show a lower percentage of women with health insurance (76.07%) followed by South Carolina (78.02). Tennessee's health insurance coverage is over 8 percentage points above Arizona, 84.12% and 76.02% respectively. Figure 4.2 also shows the distribution of use of prescription contraception within the insured and uninsured population. Women who are insured favor prescription contraception. The graphic shows a higher variance in percentage use of type of contraceptive within the insured population and a more even percentage distribution between prescription and other contraceptives within the uninsured population.

Figure 4.2
Use of Contraception by Insurance and State of Residence. Percentages Reflect Use within each State.
Women between 18-44 Years of Age [x]
Behavioral Risk Factor Surveillance System, 2011



*Not all percentages add up to 100% due to rounding.

So far, Arizona lagged behind in percentage of women with health insurance, but also in the percentage of women with health insurance that used prescription contraception. My hypothesis of higher use of prescription contraception with a mandate is thus far not supported, and there is even a suggestion that an opposite effect appears to be taken place. Yet it is possible that women in Arizona have characteristics such as lower income or lower education that affects the use of prescription contraception. To assess whether this was in fact the case I turned to multiple regression analysis, allowing

me to control for relevant variables and to single out the effect of a mandate on prescription contraceptive use.

Table 4.1 shows the variables I used, their means and standard deviations. All variables are in a dummy format, and hold the value zero or one.

Table 4.1
Descriptive Statistics for Variables of Women in Arizona, South Carolina and Tennessee
between 18-44 Years of Age [x]
Behavioral Risk Factor Surveillance System, 2011

	Mean	Standard Deviation	Minimum	Maximum
Race/Ethnicity				
Hispanic (d)	0.11	0.32	0	1
White no-Hispanic (d)	0.54	0.50	0	1
Black no-Hispanic (d)	0.28	0.45	0	1
Other Race no-Hispanic (d)	0.05	0.23	0	1
Multi-Race (d)	0.02	0.12	0	1
Education Level				
Less than High School	0.08	0.27	0	1
High School Diploma (d)	0.28	0.45	0	1
Some College (d)	0.30	0.46	0	1
College Diploma (d)	0.35	0.481	0	1
Housing				
Own Home (d)	0.63	0.48	0	1
Rent Home (d)	0.30	0.46	0	1
Other Living Arrangements (d)	0.06	0.24	0	1
Income				
<$25,000	0.33	0.47	0	1
$25,000-$49,999	0.24	0.43	0	1
$50,000-$74,999	0.16	0.36	0	1
$75,000+	0.20	0.40	0	1
Relationship Status				
Married (d)	0.49	0.50	0	1
Never married (d)	0.31	0.46	0	1

Table 4.1 –continued
Descriptive Statistics for Variables of Women in Arizona, South Carolina and Tennessee
between 18-44 Years of Age [x]
Behavioral Risk Factor Surveillance System, 2011

	Mean	Standard Deviation	Minimum	Maximum
Previously married (d)	0.15	0.36	0	1
Children at Home				
No Children at Home	0.25	0.43	0	1
At least one Child at Home (d)	0.75	0.43	0	1
Mandate: Insurance must cover contraception				
State Has Mandate (d)	0.26	0.44	0	1
State does not Have Mandate (d)	0.74	0.44	0	1
Access to Healthcare				
Has Insurance (d)	0.80	0.40	0	1
Avoided Doctor because of Cost	0.22	0.41	0	1
Children in the Future				
Do not Want Children (d)	0.54	0.50	0	1
Want Children in under 5 years (d)	0.28	0.44	0	1
Want Children in over 5 years (d)	0.11	0.31	0	1
Method of Contraception**				
Prescription (d)	0.55	0.50	0	1
Over the Counter (d)	0.38	0.49	0	1
Not purchased	0.02	0.15	0	1

** Over the counter and not purchased were combined into a "not prescription" variable, I show them separately for information purposes.

Multivariate Data Analysis

After performing descriptive statistics, I ran a logit regression to control for the variables shown on table 4.1, the results are on table 4.2. According to this regression, if

you control for all other variables, living in a state that requires insurance companies to cover prescription contraception increases the odds of using no-prescription contraception. This result is counterintuitive and led to further complex statistical analysis. It is possible that the regression had omitted variable bias. To address this issue, I used a propensity score matching method with calipers.

Table 4.2
Logit Regression
Behavioral Risk Factor Surveillance System, 2011

Logistic regression			Number of observations			791
			LR chi²			93.11
			Prob>chi²			0.00
Log likelihood	-487.61		Pseudo R²			0.09
Prescription	Coefficient	St. Error	z	P>|z|	95% Interval	
Mandate	**-0.62**	**0.23**	**-2.77**	**0.01**	**-1.07**	**-0.18**
Insurance	**0.53**	**0.22**	**2.48**	**0.01**	**0.11**	**0.96**
Black	**-0.77**	**0.20**	**-3.89**	**0.00**	**-1.16**	**-0.38**
Asian	-1.67	1.45	-1.15	0.25	-4.51	1.18
Am. Indian/Alaskan	-0.04	0.47	-0.08	0.94	-0.96	0.89
Other	**-1.36**	**0.53**	**-2.57**	**0.01**	**-2.39**	**-0.32**
Hispanic	0.32	0.31	1.02	0.31	-0.29	0.93
Cannot afford doctor	0.04	0.20	0.18	0.85	-0.36	0.44
Single	**-0.54**	**0.19**	**-2.78**	**0.01**	**0.92**	**-0.16**
Cohabitating	0.17	0.39	0.44	0.66	-0.59	0.93
Children at home	**0.38**	**0.19**	**1.98**	**0.04**	**0.00**	**0.75**
Want children < 5 yr.	**0.28**	**0.18**	**1.54**	**0.12**	**-0.08**	**0.63**
Want children > 5 yr.	**0.67**	**0.27**	**2.47**	**0.01**	**0.14**	**1.19**
No High School	-0.25	0.37	-0.68	0.50	-0.96	0.47
High School	**-0.33**	**0.23**	**-1.39**	**0.17**	**-0.78**	**0.13**
Partial College	0.24	0.21	1.1	0.27	-0.18	0.65
Under $15,000	**-0.67**	**0.32**	**-2.05**	**0.04**	**-1.30**	**-0.03**
From $15,000 to $24,999	-0.20	0.28	-0.72	0.47	-0.75	0.34
From $25,000 to $34,999	**-0.78**	**0.29**	**-2.69**	**0.02**	**-1.34**	**-0.21**
From $35,000 to $49,999	-0.19	0.26	-0.75	0.45	-0.69	0.31
No report Income	0.05	0.31	0.16	0.88	-0.56	0.66
Rent Home	**0.36**	**0.20**	**1.81**	**0.07**	**-0.03**	**0.74**
Other Home	-0.17	0.32	-0.54	0.59	-0.79	0.45
Constant	0.32	0.31	1.06	0.29	-0.28	0.93

*All statistically significant results are shown with a bold type.
Omitted variables: no prescription, no-mandate, no insurance, white, can afford doctor, married, do not want children, college, over $50,000, own home

Propensity Score Matching

I decided to use propensity score matching because it is a method that allowed me to estimate the treatment effect, to find out how much of the use of prescription contraception is due to the mandate (treatment). By creating a control group from the data I obtained, I could calculate an approximation to a random experiment and have results that are more accurate. I will describe step by step the process I used to develop weights, to randomize, to obtain a caliper, and to obtain a regression with propensity score matching.

The first step in finding a tailored control group that would simulate a random experiment is to create propensities. For this purpose, I ran a logit regression using the variable Prescription Contraceptive as the independent variable and Mandate as the dependent variable. Appendix C shows the results obtained. I used the command "predict" to create predicted probabilities for the model. I followed by generating propensity weights with the formula: ipweight=1/(1-probability of using prescription contraception) when a woman lives in a mandate state and I replaced the weights for women who lived in a no mandate state: ipweight=1/probability of using prescription contraception.

I continued by comparing the weighted means for both the treatment group (women living in a mandate state) and the control group (women living in a no mandate state) to assure that their means are similar. Appendix D shows the means for the unweighted population, Appendixes E and F show the means for the mandate and the no mandate population after having applied the propensity weights. After comparing the

means and standard errors between the two population groups, I tabulated the probability of mandate when mandate did not exist and when mandate did exist. This theoretical exercise attempts to obtain the treatment effect, i.e., what would have been the result if those who lived in a mandate state lived in a non-mandate state. Table 4.3 reveals the behavior of the variable "probability of mandate".

Table 4.3
Descriptive Statistics for the Probability of Mandate in Mandate and No-Mandate Groups
Behavioral Risk Factor Surveillance System, 2011

	Mean	Standard Error	Min	Max
Probability of Mandate	0.24	0.26	0.00	0.98
Probability of Mandate (when Mandate is present)	0.15	0.17	0.00	0.97
Probability of Mandate (when Mandate is not present)	0.52	0.30	0.01	0.98

For the matching procedure to be successful, the samples must be randomized. To obtain this randomization I used the "set seed" command on STATA. I created a random variable that would show a uniform distribution and sorted the data with it. The result is a randomized order. I set a caliper by using 25% of the standard deviation on the probability of having a mandate. The formula to obtain the caliper is *Caliper=0.25 (or 25%)* x *0.2382763 (standard deviation). Caliper = 0.0595691*

I used the psmatch2 command on STATA using the caliper. Table 4.4 explains how many observations were matched through the psmatch2 command: 115 individuals living in Arizona, the state that has mandate, and 601 individuals living in a no mandate

area. This means that in order for the data to simulate a randomized experiment, a control group from among the non-mandate states must be created by matching similar characteristics and trying to pry out exclusively the effect that the mandate had on the use of prescription contraception.

Table 4.4
Treatment Assignment
Behavioral Risk Factor Surveillance System, 2011

	Off support	On Support	Total
Untreated	0	601	601
Treated	73	115	188
	73	716	789

I display the results of the matching command on Table 4.5, the T-statistic shows that neither the unmatched nor the average treatment effect, ATE (-0.47 and -0.56) are statistically significant. For significance, I looked for a value above 2 or below -2.

Table 4.5
Matching of Mandate and No-Mandate Observations
Behavioral Risk Factor Surveillance System, 2011

Variable	Sample	Treated	Controls	Difference	S.E.	t-stat
Prescription	Unmatched	0.579787	0.599002	-0.01921	0.041077	-0.47
	ATE	0.643478	0.678261	-0.03478	0.062663	-0.56

So far, the results contradict my hypothesis. My simplest analysis found a statistically significant relationship in the opposite direction of what I expected. That opposite direction finding did not hold up in a more sophisticated analysis, but the

results were nevertheless statistically insignificant. Table 4.6 shows the results of a pstest command and considers balancing for the treated.

Table 4.6
Pstest Results
Behavioral Risk Factor Surveillance System, 2011

	Mean			t-test	
	Treated	Control	% bias	t	p>|t|
Prescription	0.64	0.68	-7.1	-0.56	0.58
Insurance	0.77	0.83	-12.6	-0.99	0.33
Black	0.03	0.03	0	-0.0.	1
Asian		Omitted			
Am. Indian/Alaskan	0.02	0.02	0	-0.00	1
Other	0.02	0.02	0	-0.00	1
Hispanic	0.17	0.17	2.4	0.17	0.86
Cannot afford doctor	0.18	0.19	-2.1	-0.17	0.87
Single	0.37	0.33	7.1	0.55	0.58
Cohabitating	0.05	0.05	0	0	1
Children at home	0.79	0.78	2	0.16	0.87
Want children under 5 yr.	0.30	0.37	-15.1	-1.12	0.26
Want children over 5 yr.	0.10	0.08	5.8	0.47	0.64
No High School	0.10	0.07	12.7	0.93	0.35
High School	0.17	0.17	0	-0.00	1
Partial College	0.24	0.26	-3.9	-0.3	0.76
Under $15,000	0.11	0.11	0	-0.00	1
From $15,000 to $24,999	0.17	0.14	9	0.72	0.47
From $25,000 to $34,999	0.09	0.09	0	-0.00	1
From $35,000 to $49,999	0.10	0.15	-12.7	-0.99	0.32
No report Income	0.10	0.07	8.6	0.72	0.48
Rent Home	0.30	0.35	-9.4	-0.7	0.48
Other Home	0.04	0.02	10.8	1.15	0.25

Conclusion

I began this analysis expecting a positive relationship between a state that mandated insurance companies to cover contraceptives and the use of prescription

contraceptives. Descriptive statistics highlighted a reality in which women in non-mandate states, Tennessee and South Carolina had higher levels of use of prescription contraceptives than the mandate state, Arizona. The initial regression suggested that even holding other variables constant, there was no positive relationship between a mandate and prescription contraceptive use. Furthermore, the relationship was possibly negative. Living in a state that did not require insurance companies to cover prescription contraceptives was linked to higher use. The last and most sophisticated analysis-using propensity score matching still negated my hypothesis and showed that any existing relationship between living in a mandate state and using prescription contraceptives was not statistically significant, and therefore, further analysis would be needed to determine if any relationship exists.

Many questions arise from this analysis such as: what were the levels of insurance coverage in either mandate or non-mandate states? Did the levels of use in the mandate state change with the enacting of the law? Are there other access differences between states, such as availability in convenient pharmacies or pricing? In the next chapter I delve more deeply into the meaning and impact of the results presented in this thesis and highlight the need for further research to promote the use of more effective contraceptive methods.

Chapter Five

CONCLUSIONS

In this Chapter I summarize the work presented in the previous chapters, review the limitations of the data and the analysis, and explore possible reasons for the results presented in this thesis. I follow by outlining the implications of my results on policy making and finish by suggesting more avenues of research.

Unwanted pregnancies are a burden on women, their families and government programs. Contraceptives reduce the incidence of unwanted pregnancies and abortions. Among the various methods of contraception, prescription contraceptives are the most effective avoiding pregnancy. I hypothesized that living in a state that mandates insurance companies to cover prescription contraceptives increases the odds of using prescription contraception as opposed to less effective methods such as over the counter contraceptives, natural methods and withdrawal. The rationale behind the hypothesis was based on the increased likelihood that an insurance-holder would use methods that are covered by the health insurance they hold, since insurance coverage tends to decrease the overall cost (Nearns, 2008).

While the above hypothesis was plausible, a more rigorous empirical study was needed to determine if it held up on practice. My thesis aimed to provide such research. I analyzed the data from the 2011 BRFSS and considered fertile women from 18 to 44 years old who engaged in sexual activity with males and used some kind of contraception. Through descriptive statistics, logistic regression and propensity score matching I found evidence that does not support my hypothesis. The evidence provided

by a logistic regression signaled the existence of either a statistically significant negative relationship between living in a mandate state and using prescription contraception. The evidence I found using a more complex propensity score matching method suggested a statistically insignificant relationship.

Limitations

The number of participants, questions, and methodology used by the BRFSS limited my analysis. For example, three states participated in the optional Reproduction Health module; had more states participated, my results would offer stronger external validity. I was unable to introduce variables that would have been beneficial to my analysis such as religion or type of health insurance. It is plausible that the use of prescription contraception varies between private and public insurances due to dissimilar levels of coverage. Regarding methodology, the BFRSS did not allow the respondent to select more than one method of contraception, potentially biasing my results. The specific details of health insurance plans for women were outside of the scope of my research.

Potential Reasons for Results

There are two main reasons I have identified that could explain why I obtained unexpected results: particular characteristics of the states that participated in the survey and the way in which insurance companies set their policies.

Arizona was the only state that participated in the Reproductive Health module and had a mandate. It is possible that a particular characteristic of Arizona introduced bias to my analysis. For example, Arizona residents could have had a lower-than average

use of prescription contraception prior to the mandate; even if the use of prescription contraception increased after the mandate, comparing the use of contraceptives to those of non-mandate states could lead to the belief that the mandate did not change use. An analysis through time would show that use did increase. If that was the case, Arizona would not be the best representation of mandate states. Further research could identify the reasons why Arizona implemented a mandate and whether the access to contraceptives changed with the introduction of Arizona's mandate, including access to a doctor and out of pocket costs for those who held health insurance policies. An analysis through time, not performed with this study, could show whether price and use of contraceptives changed with the introduction of Arizona's mandate.

Another potential reason for my surprising results is the way many multi-state insurance companies set their policies. Sonfield, Benson, Frost and Darroch (2004) found in their insurer-focused research that an umbrella effect could be distorting the impact of mandates. Multi-state insurers tend to set their policies according to the strictest state within their geographical area. In these circumstances, having a mandate would alter the insurance policy terms in non-mandate states. It might appear as though the mandate did not work when in reality it might have spread further than the limits of the mandate state. The year 2011 was immediately after the signing of the ACA in 2010 and preceeded the years in which insurance companies had to implement the new guidelines in 2012-2013. It is possible that foreseeing the impending changes, insurance companies decided to begin coverage of prescription contraception in non-mandate states with the expectative that in 2012 or 2013 they would have to provide

contraceptives without a deductible. These limitations do not invalidate the results presented in this thesis, but rather present additional opportunities for further research.

Implications and Opportunities for More and Better Research

In this study, I was unable to provide evidence to support the hypothesis that there would be higher usage of prescription contraception in a state with a mandate. The literature reviewed in Chapter two agreed on the benefit of avoiding unwanted pregnancies, not only to individuals but also to society in general. My analysis focused exclusively on the usage given a mandate legislation but did not consider other economic, education and accessibility issues; these could provide additional channels for effective government intervention.

Economic Approach

A rounded body of research regarding the use of prescription contraceptives should include the role of economic incentives. We must evaluate the out of pocket cost for prescription contraception before and after a mandate is implemented. Did having a mandate decrease the price of contraceptives for both insured and uninsured women? If so, how much? It is possible that a mandate did not change the economic incentives to use more effective methods. The relative price of supplements (other contraceptive methods) such as condoms or diaphragms in relation to prescription contraception is also an important element that must be researched. Do women change their contraceptive use if over the counter contraceptives increase or decrease in price? For those who utilize public funding, how has the decrease in funding for Title X affected the level of usage of more effective contraceptives? And vice versa, would increasing funding of Title X

increase the number of prescription contraceptive users? And if so, how much? There is relevant research regarding Title X, but with the introduction of ACA, up to date research is needed (Sonfeld, 2014).

Education Approach

Another avenue that could influence the use of effective contraceptives is the information that women have concerning contraception. How aware, are women using non-prescription contraception (or not using contraception) of the possibilities of pregnancy? Are they familiar with the benefits and the downsides of the various methods? Do they feel comfortable asking their primary health providers questions regarding contraceptives? Are their partners informed about the benefits of more effective contraception? A campaign that offers more information and incentivizes men and women to seek personalized advice might offer a large increase on prescription contraceptive use.

Accessibility Approach

Beyond economic and information incentives, we could evaluate the many barriers that can hinder women's access to effective contraception. Many states require a prescription from a physician in order to obtain effective contraception. This requirement may increase the price and the difficulty level to access effective contraceptives. Relevant questions include: do you have access to a doctor? How long does it take you to have a doctor's appointment? Are you willing to pay for (if applicable) and attend doctor's visits with the only objective of obtaining contraceptive refills? How likely are you to visit a doctor to receive prescription refills? Answers to

such questions could show whether the requirement of a physician's visit has a direct impact on the use of more effective contraceptives. Experiments that allow women to acquire contraceptives without a doctor's note have been done along the border with Mexico, where many effective contraceptives are available without a prescription (Potter, White et al, 2010). Performing similar experiments in a more convenient location could elucidate if the process of obtaining prescriptions is a deterrent.

These three approaches could provide a larger picture to understand women's use of prescription contraceptives. It would also help to introduce additional variables in nationwide surveys such as religion, the role of religious belief in contraceptive use, capturing the information on multiple contraception method users. It would also be desirable to ask women why they selected the method they use and, if they have changed method, the reasoning behind it.

The Affordable Care Act

The ACA has taken a stance on prescription contraceptives, not only requiring that insurance companies cover them but making contraceptives available without an out of pocket expense. This legislation will provide many opportunities to research the impact of government intervention on contraceptive issues. The ACA's mandate goes further than previous state mandates that did not require contraceptives be provided without a copay, so a comparison even in mandate states would show whether removing the financial element results in a change in prescription contraception use.

Conclusion

The analysis I performed revealed evidence contradicting my hypothesis.

According to my study, no clear relationship exists between living in a state that mandates insurance companies to cover contraceptives and the use of prescription contraceptives. Yet I was able to identify potential reasons for this surprising result that are in need of further study. My results are a valuable contribution to the literature on government interventions in contraception. However, more research is needed to understand how government's actions can influence women to use more efficient methods of birth control. Reducing unwanted pregnancies and abortions are a worthwhile cause and can bring about benefits for all of society.

Appendix A

Studies on the Relationship between Insurance and the Use of Prescription Contraceptives

	Culwell & Feinglass (2007)	Nearns (2009)	Culwell & Feinglass (2007b)	Kurth, Weave, Lockhard & Bielinski (2004)
Sample Size	4767 (1995) 3569 (2002)	1049	26,674	659
Source of Data	National Survey of Family Growth	National Survey of Family Growth	Behavioral Risk Factor Surveillance System	Random Digit Dialing Survey
Year(s) of Data	1995, 2002	2002	2002	2000
Partici-pants	Women at risk of unintended pregnancy	Women 18-24 years old, not pregnant or trying to get pregnant, vaginal heterosexual intercourse in the last 3 months, not sterile, partners not sterile, not under 6 week postpartum	Women, not pregnant or trying to get pregnant, sexually active with a man, not sterilized by a procedure	Adults, male and female, all ages
Location	Nationwide	Nationwide	Nationwide	Washington State
Dep. Variable	Use of prescription contraception	Use of prescription contraception	Use of prescription contraception	Monetary value of prescription contraception
Metho-dology	Multiple regression analysis. Logistic regression. Survey module, weighting, x^2 tests, odds ratio converted to relative risks	Multivariate logistic regression, cross sectional design. Multistage, stratified and cluster sampling	Multiple logistic regression, survey sample design, chi square tests for association	Multiple logistic regression. Tobit regression with robust variance estimators. Tested ratio between two willingness to pay amounts rather than between absolute differences. Initial data obtained in a bidding game format

Appendix A -continued

Studies on the Relationship between Insurance and the Use of Prescription Contraceptives

	Culwell & Feinglass (2007a)	Nearns (2009)	Culwell & Feinglass (2007b)	Kurth, Weave, Lockhard & Bielinski (2004)
Controls	Age, race/ethnicity, education level, employment status, number of children in household, marital status, self-reported health, household income (% of poverty), religion	Race/ethnicity, foreign birth, income to poverty ratio, employment status, education level, lives with parents, marital status, number of children, number of sexual partners, history of discontinuing contraceptives	Income, gender, age	Gender, income, age, education level, race/ethnicity, contraceptive effectiveness scenario, bi-starting point, gender by income interaction
Relevant Details	Included	Missing data excluded, evaluated use amongst uninsured/private insurance/public insurance, and consistent vs. inconsistent insurance	Some independent variables not described. Three validity tests: unit framing, scale and starting point biases. No differentiation between kinds of insurances	Participants were given two "effectiveness rates" (one or two percent risk)and an initial bid (two or ten dollars)
Results	Contraceptive use increased 3 percent, no use of contraception increased from 11.6 percent to 16.1 percent. Over the counter contraception decreased. Only significant among privately insured women, potentially reflecting state mandates	Twenty percent of women uninsured, 30 percent insured inconsistently. Young women with private insurance or Medicaid more likely to use prescription than uninsured. No significant differences between other public insurances or between consistent and inconsistent insurance coverage	Higher percentage use of prescription contraception on insured women (54 percent) as compared to uninsured women (45 percent). Uninsured women were more likely to use over the counter contraception or to use no method when compared with insured women	Eighty-five percent support insurance coverage of contraception. Willingness to pay was higher than actuarial cost on 94 percent of participants. Higher value for more effectiveness. Cost benefit ratio was 4.97. Individuals in reproductive age were willing to pay 2.12 times the amount that older people expressed

Appendix B
Studies on the Relationship between Insurance Mandates and the Use of Prescription Contraceptives

	Atkins & Bradford (2014)	Sonfield, Benson, Frost & Darroch (2004)
Sample Size	20,256	205
Source of Data	Behavioral Risk Factor Surveillance System (BRFSS)	Mailed questionnaires
Year(s) of Data	Seven iterations: 1998, 1999, 2000, 2002, 2004, 2006, 2010	2001-2002
Participants	Women of childbearing age (18-44), sexually active, who were not pregnant, didn't want to be pregnant	Insurers who provided employment-based coverage. Included large insurers(over 100,000 enrollees) and smaller insurers (under 100,000 enrollees) at a 1:4 proportion
Location	Delaware, Iowa, Kentucky, Nebraska, and South Dakota	Nationwide (except Minnesota and Oklahoma which were in transition)
Methodology	Logit regression analysis, robust Huber-White standard errors (heteroskedasticity) Difference-in-difference estimator. Before and after a mandate was implemented and a control group that did not have a mandate Marginal effects (calculated at the means of the samples)	Survey commands, t tests, percentage of insurers that reported covering a service. Sensitivity. Comparison of data to a previous 1993 study
Controls	State of residence, survey year, race or ethnicity, education level, relationship status, age, employment status, income level, smoking habits and insurance status	Environmental changes (national level policy and court decisions, increase of general prescription coverage), changes in market share between types of insurance plans (1993-2002)
Relevant Details	Included sterilized women	58 % of plans in states with no-mandate had policies set nationwide
Results	States with mandates had a 5% increase in use of prescription contraception	Locally-determined insurance policies in non-mandate states half covered the 5 leading methods, 12 percent covered none. 30% of the increase in use between 1993 and 2002 was due to mandates

Appendix C
Logit Regression to Create Propensities
Behavioral Risk Factor Surveillance System, 2011

		LR chi²	291.77
		Prob>chi²	0
Log likelihood	-287.26694	Pseudo R²	0.3369

Mandate	Coefficient	St. Error	z	P>|z|	95% Interval	
Prescription	-0.60	0.23	-2.67	0.01	-1.05	-0.16
Insurance	-0.03	0.32	-0.1	0.92	-0.65	0.59
Black	-2.88	0.54	-5.32	0	-3.94	-1.82
Asian	(ommitted)					
Am. Indian/Alaskan	4.08	0.81	5.06	0	2.50	5.66
Other	-0.52	0.69	-0.75	0.46	-1.87	0.84
Hispanic	2.97	0.36	8.15	0	2.25	3.68
Cannot afford doctor	0.13	0.30	0.43	0.67	-0.46	0.72
Single	-0.01	0.27	-0.03	0.97	-0.54	0.52
Cohabitating	0.34	0.47	0.73	0.47	-0.58	1.27
Children at home	0.81	0.28	2.88	0.00	0.26	1.36
Want children under 5 yr.	0.34	0.24	1.41	0.16	-0.13	0.82
Want children over 5 yr.	0.03	0.40	0.07	0.95	-0.76	0.82
No High School	-1.70	0.52	-2.7	0.01	-2.41	-0.38
High School	-1.17	0.35	-3.32	0.00	-1.87	-0.48
Partial College	-0.39	0.28	-1.39	0.16	-0.93	0.16
Under $15,000	-0.52	0.46	-1.12	0.27	-1.42	0.39
From $15,000 to $24,999	-0.52	0.41	-1.27	0.20	-1.31	0.28
From $25,000 to $34,999	-0.15	0.40	-0.39	0.70	-0.93	0.62
From $35,000 to $49,999	-0.28	0.35	-0.81	0.42	-0.96	0.40
No report Income	-0.45	0.46	-0.99	0.32	-1.34	0.44
Rent Home	0.90	0.27	3.36	0.00	0.38	1.43
Other Home	-0.16	0.51	-0.33	0.74	-1.16	0.83
Constant	-1.30	0.45	-2.93	0.00	-2.17	-0.43

Appendix D
Descriptive Statistics for Unweighted Population
Behavioral Risk Factor Surveillance System, 2011

	Mean	Standard Error	[95% Conf.	Interval]
Mandate	0.24	0.02	0.21	0.27
Prescription	0.59	0.02	0.56	0.63
Insurance	0.79	0.01	0.76	0.82
Black	0.27	0.02	0.24	0.30
Asian	0.00	0.00	-0.00	0.01
Am. Indian/Alaskan	0.03	0.01	0.02	0.04
Other	0.02	0.01	0.01	0.03
Hispanic	0.10	0.01	0.08	0.13
Cannot afford doctor	0.22	0.01	0.19	0.25
Single	0.48	0.02	0.44	0.51
Cohabitating	0.05	0.01	0.03	0.06
Children at home	0.76	0.02	0.73	0.79
Want children under 5 yr.	0.29	0.02	0.26	0.32
Want children over 5 yr.	0.11	0.01	0.09	0.13
No High School	0.07	0.01	0.05	0.09
High School	0.26	0.02	0.23	0.29
Partial College	0.29	0.02	0.25	0.32
Under $15,000	0.12	0.01	0.10	0.15
From $15,000 to $24,999	0.18	0.01	0.15	0.20
From $25,000 to $34,999	0.11	0.01	0.09	0.13
From $35,000 to $49,999	0.14	0.01	0.12	0.17
No report Income	0.12	0.01	0.09	0.14
Rent Home	0.29	0.02	0.26	0.33
Other Home	0.07	0.01	0.05	0.09

Appendix E
Descriptive Statistics for the Weighted No-Mandate Population
Behavioral Risk Factor Surveillance System, 2011

	Mean	St. Error	[95% Conf.	Interval]
Prescription	0.60	0.03	0.54	0.66
Insurance	0.76	0.03	0.69	0.83
Black	0.27	0.02	0.23	0.31
Asian		omitted		
Am. Indian/Alaskan	0.02	0.01	-0.01	0.04
Other	0.02	0.01	0.01	0.03
Hispanic	0.13	0.04	0.06	0.21
Cannot afford doctor	0.25	0.03	0.18	0.31
Single	0.47	0.03	0.42	0.53
Cohabitating	0.05	0.01	0.02	0.07
Children at home	0.75	0.02	0.71	0.79
Want children under 5 yr.	0.32	0.03	0.26	0.39
Want children over 5 yr.	0.11	0.02	0.08	0.14
No High School	0.08	0.02	0.05	0.11
High School	0.24	0.02	0.20	0.29
Partial College	0.28	0.02	0.23	0.32
Under $15,000	0.13	0.02	0.09	0.16
From $15,000 to $24,999	0.20	0.03	0.14	0.27
From $25,000 to $34,999	0.09	0.01	0.07	0.11
From $35,000 to $49,999	0.13	0.01	0.10	0.16
No report Income	0.11	0.01	0.08	0.14
Rent Home	0.33	0.03	0.26	0.39
Other Home	0.07	0.01	0.05	0.09

Appendix F
Descriptive Statistics for the Weighted Mandate Population with Weights
Behavioral Risk Factor Surveillance System, 2011

	Mean	Standard Error	[95% Conf.	Interval]
Prescription	0.70	0.07	0.57	0.83
Insurance	0.74	0.10	0.54	0.94
Black	0.29	0.12	0.06	0.51
Asian		omitted		
Am. Indian/Alaskan	0.03	0.01	0.01	0.05
Other	0.01	0.01	0.00	0.03
Hispanic	0.11	0.02	0.06	0.15
Cannot afford doctor	0.25	0.10	0.05	0.46
Single	0.48	0.09	0.30	0.65
Cohabitating	0.03	0.01	0.01	0.05
Children at home	0.71	0.10	0.51	0.91
Want children under 5 yr.	0.26	0.06	0.14	0.39
Want children over 5 yr.	0.06	0.02	0.02	0.10
No High School	0.07	0.03	0.02	0.12
High School	0.15	0.04	0.07	0.24
Partial College	0.45	0.09	0.27	0.63
Under $15,000	0.08	0.03	0.03	0.14
From $15,000 to $24,999	0.09	0.02	0.04	0.13
From $25,000 to $34,999	0.06	0.02	0.03	0.10
From $35,000 to $49,999	0.22	0.08	0.07	0.37
No report Income	0.19	0.11	-0.02	0.41
Rent Home	0.42	0.09	0.23	0.61
Other Home	0.03	0.01	0.00	0.05

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