State-level Factors that Affect

Post-partum Contraceptive Use

Among Low Income Women

BY

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THESIS

Submitted as partial fulfillment of the requirements
for the degree of Doctor of Philosophy in Public Health Sciences
in the Graduate College of the
University of Illinois at Chicago, 2017

Chicago, Illinois

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ACKNOWLEDGEMENTS

I am grateful to many for their assistance with this work. First and foremost I thank my adviser Dr. Arden Handler, whose encouragement, energy and patience were endless. And, I thank the rest of my committee (Drs. Janet Bronstein, Tim Johnson, Nadine Peacock, and Kristin Rankin) for picking up where Arden left off in pushing me to learn new things and think differently, as well as providing much appreciated, complementary assistance. I am very grateful to Janet for asking detailed questions and making me think through my methodology and interpretations, Tim for pushing me to better understand the details of the surveys, Nadine for smoothing the way to get data from the Guttmacher Institute, and Kristin for all her many consultations on methodological issues and good questions.

In these disconcerting times, I especially want to acknowledge the assistance of many civil servants at the state and national level – dedicated public health professionals I did not know prior to contacting them for assistance with this work, but who graciously provided their knowledge and time. To my former colleagues – Hepatitis B coordinators across the country - I am extremely grateful for the delivery hospital information. And, I so appreciated those on rotation for email questions regarding PRAMS (RH, CDC) and the NSFG (NCHS, CDC), who provided every last detail I needed in a very timely manner. Lastly, I want to acknowledge the ongoing efforts of the PRAMS Working Group, a contingent of federal and state employees dedicated to assuring the availability of quality pregnancy-related data.

In closing, I also want to thank Dr. Sharon Telleen for her scholarship support to me, as well as her enthusiastic support of the MCH program and its mission. And, I conclude by acknowledging the many contributions of other UIC friends and colleagues not named here.

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LIST OF ABBREVIATIONS

Any Method PP Use	Use of any contraceptive method, excluding emergency contraception, at the time of the postpartum use measurement
BC	Birth control
BCM	Birth control method
BRFSS	Behavioral Risk Factor Surveillance System
CDC	Centers for Disease Control and Prevention
CMS	Centers for Medicaid and Medicare Services
Effective Method PP Use	Use of a contraceptive methods with a first year typical failure rate of less than 10% at the time of the postpartum use measurement
EC	Emergency contraception
FAM	Fertility Awareness-based Methods
FPL	Federal Poverty Level
FQHC	Federally Qualified Health Center
IOM	Institute of Medicine
IUD	Intrauterine device
LARC	Long-acting reversible contraception (IUDs and implants)
MC	The NSFG's monthly contraceptive method calendar
NCHS	National Center for Health Statistics
NSFG	National Survey of Family Growth
OR	Odds Ratio
PNC	Prenatal Care
PP	Postpartum
PP use	Postpartum contraceptive use
PPV	Postpartum visit
PRAMS	Pregnancy Risk Assessment Monitoring System
RH	Reproductive health
SAS	Statistical Analysis Software
SUDAAN	Statistical software for weighting, imputing and analyzing data
Title V	Title V of the Social Security Act – provides the state Maternal and Child Health Block Grants
Title X	Title X of the Public Health Act – provides state family planning services grants
Title XX	Title XX of the Social Security Act – provides the state Social Services Block Grants
WBV	Well-baby Visit
WIC	Special Supplementary Nutrition Program for Women, Infants, and Children (Department of Agriculture)
WINSS	Women in Need of Subsidized Services (for family planning)

SUMMARY

This research focused on postpartum contraceptive use among low-income, sexually active women 20-44 years old at both the national and state levels. The 2006-2010 National Survey of Family Growth (NSFG) was the source of data at the national level and the 2005-2007 Pregnancy Risk Assessment Monitoring System (PRAMS) surveys from twelve states were the source of data at the state level. All analyses were conducted using two measures of postpartum contraceptive use (PP use). *Effective* Method PP use included only those contraceptive methods that had a first year typical use failure rate of less than 10%, while *Any* Method PP use encompassed all contraceptive methods, including withdrawal, and fertility awareness-based methods. The research was divided into three parts.

In Part One, the NSFG data were used to estimate postpartum contraceptive use prevalence and identify maternal characteristics associated with PP use at the national level using unadjusted and multivariable logistic regression. Part Two used the PRAMS data and the same methods to provide corresponding information on PP use prevalence and association at the state-level, including variation in prevalence across the twelve states. The multivariable modeling results of Part Two were used in the third and most novel part of this research, a multilevel analysis of PP use conducted to identify state-level factors that affect individual-level PP use. For Part Three, the PRAMS data supplied the individual-level information on PP use, as well as the maternal characteristics associated with PP use that needed to be controlled for in order to assess the role of state-level factors. The state-level information came from various sources and focused on factors identified as potential barriers to or facilitators of PP use, which included structural, financial and personal aspects of a state's public family planning system and its general reproductive health climate.

This study found a much lower prevalence of both *Any* and *Effective* Method PP use at the national than the state-level. Among NSFG respondents *Any* Method PP use was 79% and *Effective* Method PP use was 55%. Among PRAMS respondents *Any* Method PP use was 91% and *Effective* Method PP use was 72%. Across the twelve states *Any* Method PP use ranged from 88% (Florida) to 94% (Mississippi); *Effective* Method PP use ranged from 65% (Florida) to 83% (Mississippi).

The maternal characteristics associated with PP use in multivariable modeling varied by survey and method effectiveness. At the national level *Any* Method PP use was associated with education and pregnancy intention, while at the state level it was associated with a prenatal care (PNC) discussion of PP use and pregnancy intention. At the national level *Effective* Method PP use was associated with PNC initiation and pregnancy intention, while at the state level it was associated with ethnicity/race, marital status, pregnancy intention and a PNC discussion of PP contraception. In a sensitivity analysis using six PRAMS states, receipt of a postpartum visit was the characteristic/experience most strongly associated with PP use, with an OR of 2.6 for *Any* Method PP use and 3.1 for *Effective* Method PP use.

In Part Three the analysis identified more state-level factors associated with *Effective* Method than *Any* Method PP use. The research indicated that three factors, all of which seemed to represent the general "reproductive health climate" of a state, were associated at a relatively low level (ORs: 1.23) with *Any* Method PP use, including two indices of reproductive health-friendly policies and increased expenditures on family planning services per women in need of subsidized services (WINSS). Having a smaller proportion of delivery hospitals that are Catholic in a state was associated with a higher odds of *Effective* Method PP use (OR: 1.36), as was more public FP clinics per WINSS (OR: 1.26).

1. INTRODUCTION

1.1 Background

From a social justice point of view, all women of reproductive age should have the knowledge of how, as well as the means, to choose if and when they become pregnant. From a personal health point of view, all women of reproductive age should be aware of how their emotional and physical health at the time of conception, as well as the intendedness of the pregnancy, can affect their own health, as well as fetal development, and a newborn's health and development. From a public health point of view, all women should want, and be able, to plan a pregnancy for when their emotional and physical health, as well as life circumstances are optimal, and have the knowledge of and access to contraceptive options that allow them to do so.

For centuries women had no reliable means to control their fertility, and many women had more pregnancies and children than they wanted. In the 20th century, with the help of crusaders such as Margaret Sanger, birth control information and methods became more widely available, birth control clinics were founded, and some doctors began to provide information and distribute birth control methods (CDC, 1999). In the early 1960s, oral contraceptives and intrauterine devices (IUD) became available, revolutionizing a woman's ability to control her fertility and sexual activity. Despite some hurdles, including states that were slow to repeal laws prohibiting the distribution of birth control methods (Connecticut was the last to do so after the 1965 Supreme Court decision, Griswold vs. Connecticut, which found state laws that forbade access to family planning unconstitutional), the use of contraceptives became culturally and morally acceptable and widely available. Because their cost was prohibitive for many,

and non-profit birth control clinics could not begin to meet the increased interest on their own, the women's movement pushed for federal and state funds that would help make affordable family planning services available to all, which did happen in the 1970s as described below. This steady march to widespread acceptance, availability and use of contraceptives led to the Centers for Disease Control and Prevention's (CDC) recognition of family planning as one of the ten greatest public health achievements of the twentieth century (CDC, 1999).

1.1.1 Federal Support for Family Planning Services

The first federal government funds to support family planning services came during the Johnson administration from the Office of Economic Opportunity (Daillard, 2001). In 1970, President Nixon signed into law Title X of the U.S. Public Health Service Act, which designated federal funds exclusively for the delivery of family planning services via a grant to each state. Through awards to delegate agencies, each state's grantee (either a state agency or non-profit organization) created a network of public family planning clinics that were required to provide free services to those living in poverty, and services on a sliding fee scale for all others. Although eclipsed by Medicaid as the lead provider of funds for family planning services by the mid-80s (Sonfield et al., 2008a), Title X remains the backbone of the public family planning service system.

Medicaid, the federal-state partnership that provides those living in or near poverty with health insurance, did not require coverage of family planning services when it began in 1965; however, seven years later, in 1972, new rules required coverage of family planning services for female enrollees (CDC, 1999). To encourage states to

provide the services, Medicaid set a 90% reimbursement rate for family planning services, compared with a 50% to 70% rate for all other services.

Over the years Medicaid's role in the funding and provision of family planning services has grown and evolved. When the Health Care Financing Agency, now the Centers for Medicaid and Medicare Services (CMS), required states to expand Medicaid coverage for pregnancy and postpartum (60 days) care up to 133% of the federal poverty level in the mid-1990s, this expanded access to postpartum family planning services to many more low-income women. In the late 1990s when states began to mandate enrollment in managed care, continued access to family planning clinics was advocated and an exception for access to family planning services outside of managed care networks was "carved out."

Following the example set by the Medicaid pregnancy expansions, some states similarly wanted to expand Medicaid coverage for family planning services. Without a change in Medicaid rules, states interested in expanding coverage for family planning services needed a waiver from standard Medicaid policy. A research and demonstration waiver, also known as an 1115 waiver, allowed a state to offer expanded services to a specific population, for a specific period of time (3-5 years), and required states to show the benefit of the services through an evaluation, and apply for, and justify, any request for renewal of the waiver. Medicaid waivers for family planning services (FP waiver), first approved in 1994, became the largest expansion of access to family planning services under Medicaid before the Affordable Health Care Act increased access to Medicaid for all services.

States have four other potential sources of federal funds for family planning services (Gold and Sonfield, 1999). States can allocate funds from two federal block

grants that support public family planning services – the Maternal and Child Health (MCH) Block Grant (Title V of the Social Security Act) and the Social Services Block Grant (SSBG - Title XX of the Social Security Act). And, since the late 1990s, states have had access to additional federal support for family planning services through the optional allocation of funds from the Temporary Assistance for Needy Families (TANF) program, created in 1996 to replace Aid for Families with Dependent Children (AFDC), and payment for services provided to low- income teens and young adults insured through the Children's Health Insurance Program (CHIP), created in 1997 for low-income children up to 19 years of age who don't qualify for Medicaid.

1.1.2 State Variation in Outputs and Outcomes of Publicly-funded Family Planning Services

Despite federal support for publicly-funded family planning services being more or less equally available to all 50 states, the outputs and outcomes of subsidized family planning services vary across the states. In the 2000s both the proximate and distal measures of the success of subsidized family planning services – proportion of women in need of subsidized contraceptive services served, contraceptive use prevalence (overall as well as postpartum use), and rates of planned pregnancies and spaced births –varied from state to state. The Guttmacher Institute estimated that in 2008 41% of all women they defined as in need of subsidized family planning services were served (Frost et al., 2010). This varied from 22% in Arizona to 90% in Alaska (Frost et al., 2010). Among all women at risk of pregnancy in 2002, Hawaii had the lowest contraceptive use prevalence (75.2%), and at 88.2%, Idaho had the highest (Bensyl et al., 2005), while in 2004-2006 Florida had the lowest prevalence of postpartum contraceptive use (87.0%)

and South Carolina the highest proportion (93.4%) of women using postpartum contraception (CDC, 2009). In 2003 the proportion of unintended births among all births varied from 33.5% in Maine to 51.9% in Louisiana (Suellentrop, 2006), while in 2006 the estimated rate (per 1000 women 15-44 years of age) of unintended pregnancy ranged from 37 in Maine to 69 in Mississippi (Finer and Kost, 2011).

1.1.3 State Influences on Publicly-funded Family Planning Services and Contraceptive Use

Although the bulk of funds for publicly-funded family planning services come from federal sources, public family planning programs vary considerably from state to state. States can contribute their own funds, and many do. In addition to allocating their own funds and other optional federal funds for family planning services, states and their family planning advocates have other ways to shape their family planning programs. Title X has minimum requirements, but much of the design of the program, and to some extent the budget allocation, is left up to the state grantee. Medicaid has specific policies that all states must follow, but because Medicaid programs are a federal-state partnership, each state has crafted its own Medicaid program. And states have found many different ways to design and implement their Medicaid FP waivers (Sonfield et al., 2008b). These variations in publicly-funded state family planning programs may result in differential access to and use of the services, and ultimately differential contraceptive use by low-income women.

However, other state-specific factors, including state policies related to reproductive health in general, and other health and social service programs, as well as the state's health care infrastructure (i.e., health care professionals and organizations,

role of health departments), may affect the proportion of low-income women who access family planning services and use contraception. State-level policies regarding comprehensive sex education, insurance coverage of birth control methods, minor consent for contraceptive services, restrictions in state funding for family planning agencies that also perform abortions, as well as religious refusals for health care providers and institutions may directly affect access to, and use of, contraceptive services, and do vary across the states. State policies regarding abortion, and emergency contraception vary considerably, and although they may not directly affect low-income women's access to family planning services for postpartum contraceptive use, they are part of a state's overall reproductive health environment, which may indirectly affect access to and use of family planning services.

Other public health programs may also affect use of publicly-funded family planning services, especially postpartum. A state's Title V program may direct some of its program funds and/or efforts to promote interconception care and birth spacing, and home visiting programs such as Healthy Start should emphasize the importance of postpartum contraception, although efforts probably vary in intensity across the states.

Structural factors in the health care delivery system beyond the control of state governments may also affect access to publicly-funded family planning service and contraceptive use. If a state has a disproportionate number of health care providers who refuse to provide comprehensive contraceptive information or services, or are limited by their employer from doing so, low-income women's ability to access these services may be reduced. This may be especially true for accessing postpartum birth control information and methods when prenatal care, delivery or postpartum care are at a religiously-affiliated institution that does not support the use of birth control.

Professional and advocacy groups may also contribute to a reproductive health friendly environment and/or directly promote pregnancy planning and birth spacing. A state's American College of Obstetrics and Gynecology (ACOG) affiliate may focus some of its efforts on promoting counseling regarding postpartum contraceptive use among its members, or a March of Dimes affiliate might choose to promote birth spacing. A state might also have a coalition of maternal and child health and/or perinatal health professionals and advocates who, for advancement of their own goals, promote pregnancy planning and access to publicly funded family planning services through policy advocacy and/or public health promotion efforts.

1.2 **Problem Statement**

To prevent a mistimed or unwanted pregnancy, a woman who has recently given birth must use contraception. Although the timing of initiation will vary with her method choice, and her method choices will be affected by her breastfeeding status, because ovulation can return as early as 25 days postpartum, a woman who does not want to get pregnant again right away, or ever, must begin contracepting in the early postpartum period.

Postpartum contraceptive use prevalence varies across the United States, as does contraceptive use prevalence generally and other reproductive outcomes. Because contraceptive use varies by demographics, such as age and race/ethnicity, as well as a woman's income, education and the type of relationship, some of the variation in postpartum contraceptive use prevalence between states may be due to variation in the states' population composition. However, some of the difference in postpartum contraceptive use prevalence between states may be due to variation in state factors that

directly, or indirectly, encourage use of postpartum contraception, and make access to comprehensive birth control information and methods easy, affordable and timely.

For a pregnant woman or new mother, making the decision to use postpartum contraception, choosing a method and getting started with that method, require knowledge, motivation, and effort. Although her individual characteristics, and personal situation may play a significant role in her knowledge, motivation and follow-through, the health care system (for prenatal, delivery, postpartum and contraceptive care) and infrastructure she encounters, as well as her past experience and the broader environment, may increase or decrease her motivation, and may support or thwart her efforts to begin and continue to use a birth control method. For postpartum contraceptive use in particular, women may be more motivated if they understand their risk of another pregnancy, know their birth control method options, especially if breastfeeding, and are aware of the importance of birth spacing. If motivated, to take action a woman must also have easy, affordable, and timely access to information and her chosen method, which requires health care that is accommodating and supportive, and shares the costs (insurance or publicly-funded services).

For low-income women who rely on publicly-funded care, the health care system they encounter (for prenatal, delivery, postpartum, and contraceptive care), as well as their past experiences and the broader environment, are defined, or at least very strongly influenced, by state programs as well as policies. As such, a state's programs and policies may have a major impact on a low-income woman's motivation, efforts, and success in obtaining and using postpartum contraception.

A state with policies that promote reproductive health such as subsidized family planning care, and comprehensive sexuality education may create an environment

among providers and consumers more supportive of planned pregnancies and contraceptive use than other states. On the other hand, a state with policies that restrict information or access to comprehensive reproductive health services, support religious refusals, or allocate no state funds for publicly-funded family planning services, may create a negative environment. Some or all of a state's health and social service programs for low-income women may contribute to an infrastructure that makes access to postpartum contraception easier and more affordable than in other states. These programs may include a Medicaid family planning waiver (or also under the 2010 Affordable Care Act a State Plan Amendment), a strong state Title X family planning program (i.e., geographic spread, type of providers, number served), a Title V program (Maternal and Child Health) that promotes preconception and interconception care, a Healthy Start or other mother/child home visiting initiative, and/or a Title XX (TANF) program that provides support for family planning counseling or services. The absence of some or all of these programs in a state may create an infrastructure that makes postpartum contraception less accessible and/or less affordable than in other states.

In addition, the broader infrastructure of a state's health care system may affect the information a woman gets about postpartum contraception and her actual access to a method. If the health care system (i.e., institutions and its providers) does not support contraceptive use, women may not receive postpartum contraceptive counseling, whether delivered prenatally, at the time of delivery, or at a postpartum visit, and may be required to go outside of the system to access a contraceptive method.

It is important to identify state programs, policies, or elements of the health care infrastructure, if any, that increase postpartum contraceptive use through a family planning friendly environment and easy, affordable and timely access to a wide variety

of birth control methods. Information on state-level factors, both positive and negative, related to the likelihood of low-income women using postpartum contraception can provide an evidence base for policy makers and family planning and maternal and child health supporters to advocate for positive changes.

2. CONCEPTUAL FRAMEWORK AND LITERATURE REVIEW

2.1 Conceptual Framework

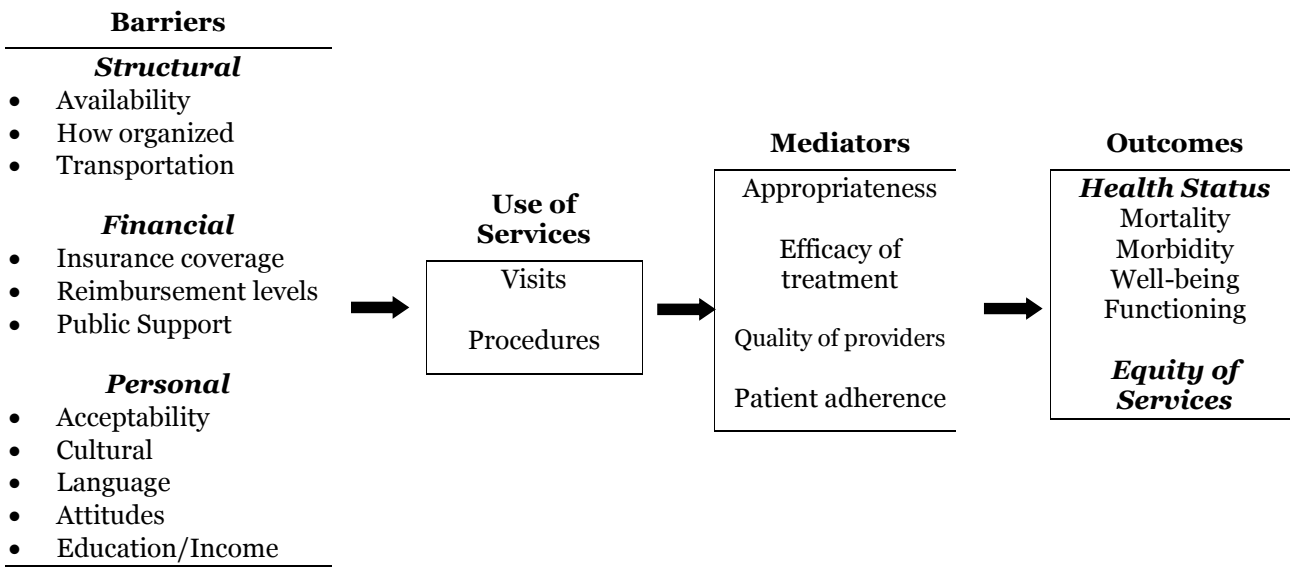
Because most contraceptive methods require a prescription, for low-income women access to publicly-funded family planning services is the most likely pathway to contraceptive use. And, because non-prescription methods may be covered by Medicaid or may be provided free (condoms), or at cost, by publicly-funded clinics, the path to use of over-the-counter methods for low-income women may also involve access to publicly-funded services.

If low-income women who have access to publicly-funded contraceptive services are more likely to use postpartum contraception than those who don't have access, then variation in access across the states may account for some of the variation in postpartum contraceptive use across the states. With this in mind, we chose to use as a conceptual framework the "Model of Access to Personal Health Care Services" created by the Institute of Medicine's Committee on Monitoring Access to Personal Health Care Services. This model for monitoring access, as depicted in Figure 1, was published in the Committee's 1993 report (IOM, 1993). Klerman et al. (2007) used this model as the framework for their research that compared structural and organizational factors related to access to family planning services in four states.

As seen in Figure 1, this model identifies three categories of *barriers to access* to personal health care services: structural, financial and personal (IOM, 1993). Structural barriers are identified as availability (number, type, concentration, location), how organized, and transportation. Financial barriers include insurance coverage, reimbursement levels, and public support. And, within the category of personal barriers

the Committee identified five sub-categories: acceptability, cultural, language, attitudes, and education/income. Most of the potential state-level factors related to postpartum contraceptive use we will consider are structural or financial barriers; however, we will also consider state policies related to reproductive health that could potentially affect personal barriers to access, such as acceptability and attitudes. To identify the state-level barriers that are related to postpartum contraceptive use, it will be important to identify and control for the personal barriers to access that might vary in composition across the states. This brief introduction to the IOM's model used their terminology of barriers to access, however from this point forward we will consider the potential positive, as well as the negative effects of these access factors, and thus refer to both *access facilitators and barriers*.

Figure 1: The Institute of Medicine's model of access to personal health care services.[a]



[a] Reprinted with permission from *Access to Health Care in America,* 1993 by the National Academy of Sciences, Courtesy of the National Academies Press, Washington, D.C. (IOM, 1993; page 35).

In addition to the facilitators and barriers to access, this model identifies "mediators" of use of services that might affect outcomes. These *mediators* – appropriateness, efficacy of treatment, quality of providers, and patient adherence – may be especially important for the outcome of postpartum contraceptive use. For this research we consider appropriateness of care to mean that a client receives an explanation of her contraceptive options, was able to discuss them in terms of her current reproductive plan, her lifestyle, and past experiences, especially with method side effects, and success or failure in prior use, and was subsequently able to obtain the method of her choice; and efficacy of treatment to be the proper match of a contraceptive method with a woman's reproductive plan, her lifestyle and past experiences so as to avoid method discontinuation or method failure. For family planning services efficacy of treatment – proper match of method and woman – has a strong impact on another mediator, patient adherence, which is often compromised by an improper match of method and woman. In our review of the literature, we will explore state-level factors that may mediate between use of publicly-funded family planning services and the outcome of postpartum contraceptive use, in particular factors related to appropriateness, efficacy of treatment, as well as quality of providers.

For the literature review that follows, we used this model of access to personal health services as our framework. We focused on identifying and further examining potential factors – *access barriers and facilitators* as well as *mediators* of use of services – related to differences in postpartum contraceptive use among low-income women across the states. We also reviewed the descriptive and analytic data available regarding potential state-level and individual-level factors that may be associated with postpartum contraception. Based on this review, we developed a research plan to assess

the significance of state-level factors that affect postpartum contraceptive use among low-income women, while controlling for individual-level factors generally accepted as risk or protective factors for contraceptive use/postpartum contraceptive use.

We begin the literature review with a more detailed examination of the problem – differences in postpartum contraceptive use across the states. This is followed by an exploration of variation in contraceptive use by personal characteristics. Because states vary in their population composition, it is important to identify personal factors that might account for some or all of the differences in the postpartum contraceptive use prevalence across the states. Next we review individual-level interventions that might increase postpartum contraceptive use if more widespread in one state than another.

Because our primary interest is in state-level factors that may account for some of the difference in postpartum contraceptive use among low-income women across the states, the last two sections initially summarize the descriptive data available about state-level differences in publicly-funded family planning services, reproductive health policies, programs, and the health care infrastructure, and subsequently discuss the level of variation across the states and then explore any analytic evidence that these differences might affect postpartum contraceptive use.

2.2 Literature Part 1: National Contraceptive Use Trends and Variation across the States

National surveys that gather information on contraceptive use have been conducted since 1955 (Mosher, 1982). However, the first seven surveys only included currently married or ever-married women. It was not until 1982, the third cycle of the National Survey of Family Growth (NSFG), that never-married women were included in

a national fertility survey (Mosher, 1982). Since then the NSFG, conducted by the CDC's National Center for Health Statistics (NCHS), has continued to document national trends in contraceptive use among all women, and the characteristics of users and non-users.

More recently, state-level data on contraceptive use has become available. All states participate in the CDC's Behavioral Risk Factor Surveillance System (BRFSS), which sponsors a state-level telephone (random-digit-dialed) survey of non-institutionalized adults (18 and older), and has an optional module on current contraceptive use which, in 2002, all states used. Many states also participate in the CDC-designed and sponsored Pregnancy Risk Assessment Monitoring System (PRAMS), which uses a mixed-mode survey (initial mailing with follow-up for non-response by phone) to collect information from women (of all ages) who have recently had a live birth. Included in the survey are questions regarding contraceptive use; both method use just prior to the pregnancy (if unintended), and method use at the time the questionnaire is completed (three to nine months postpartum).

2.2.1 National Contraceptive Use Trends

With the introduction of the pill and the IUD in 1960, options for effective contraception expanded exponentially. Westoff (1976) called the large increase in the proportion of married women who used an effective method in the late 1960s and early 1970s a revolution. By 1982 when the NSFG included all women (15-44 years of age), use of contraception was ubiquitous: 94.8% of women who had ever had sexual intercourse had used a contraceptive method ("ever use"), and this percent continued to

increase (98.2 in 1995 and 2002). By 2006-2008 *ever use* had increased to 99.1% (Mosher and Jones, 2010).

Among women (15-44 years of age) at risk of unintended pregnancy (sexually active in past three months and not pregnant or trying to get pregnant), 88% reported they were currently using contraception ("current use") in 1982, and 90% reported *current use* in 1988 (Mosher and Pratt, 1990). Two decades later, this proportion remained essentially the same at 89% in 2002 (Mosher et al., 2004), and again in 2006-2008 (Mosher and Jones, 2010).

Although *current use* includes postpartum women, it represents the broad spectrum of women in need of contraception, including those who have never been pregnant, and those who are done with their childbearing. Therefore, to understand contraceptive use among women who have recently given birth we need a postpartum-specific measure.

2.2.2 **Contraceptive Use in the States**

Because the NSFG is not designed for state-level analysis, it cannot provide comparable state information on *ever use* or *current use*. However the BRFSS can provide *current use* data among adult women (18-44 years of age) in every state. In a comparison of the NSFG and BRFSS findings, Santelli and colleagues (2008) found that the surveys' findings were similar, although they concluded that lower-income women were not fully represented in the BRFSS' telephone survey.

The PRAMS surveys provide state-level data on postpartum contraceptive use (PP use) among teens and adults who have had a live birth. The structure and methods of PRAMS surveys (initial mailing of questionnaires two to four months postpartum

with non-response follow-up by phone up to nine months postpartum) results in a broad time span for PP use: contraceptive use at the time the survey is completed, which may be as early as two months after birth, and as late as nine months after birth, depending on when the woman completes the questionnaire. Although the extended time frame is not ideal, it is at least consistent across the states. Because not all states participate in PRAMS, PP use data are not available for every state. But in the last decade, for participating states that met the response rate criteria, CDC has published several compilations of the prevalence of PP use by state (CDC, 2009; D'Angelo et al., 2007; Williams et al., 2006; Williams et al., 2003).

2.2.3 **State Variation in Current Contraceptive Use**

In 2005, for the first time, CDC published *current use* prevalence for every state from the BRFSS (Bensyl et al., 2005), allowing comparison across the states. As seen in Table I, among adult women at risk of pregnancy, *current use* varied from 75.2% in Hawaii to 88.2% in Idaho. (Note: The BRFSS prevalence is not the same as the NSFG prevalence discussed above, as the BRFSS does not exclude those seeking pregnancy from the denominator. The state prevalence from the BRFSS is *current use* among those "at risk of pregnancy" while the national prevalence from the NSFG is *current use* among those "at risk of *unintended* pregnancy.")

2.2.4 **State Variation in Postpartum Contraceptive Use**

In 2000, among the 19 PRAMS states with at least a 70% response rate, PP use among all women was between 80% and 90% in all but one state, Hawaii, whose PP use prevalence was 77.9% (Williams et al., 2003). In 2002, PP use prevalence among all

TABLE I
CURRENT AND POSTPARTUM CONTRACEPTIVE USE PREVALENCE
BY SURVEY BY STATE
UNITED STATES, 2002 AND 2004-2006

	Contraceptive Use Type, Survey and Years			
	Current Use 18-44 year olds BRFSS 2002[a]	Postpartum Use 15-44 year olds PRAMS 2004-2006[b]		Postpartum Use 20-34 year olds PRAMS 2004[c]
State	**Percent *Any*[d] Method**	**Percent *Any*[d] Method**	**Percent *Effective*[e] Method**	**Percent *Any*[d] Method**
Alabama	87.6			
Alaska	82.9			84.5
Arizona	78.9			
Arkansas	86.5	92.0	70.5	90.0
California	85.9			
Colorado	87.8			88.5
Connecticut	79.4			
Delaware	82.2			
Florida	79.4	87.0	60.6	85.5
Georgia	83.7			85.5
Hawai'i	75.2			79.4
Idaho	88.2			
Illinois	79.2			86.8
Indiana	84.4			
Iowa	84.6			
Kansas	84.7			
Kentucky	81.5			
Louisiana	79.8	91.7	72.6	88.1
Maine	87.7			89.3
Maryland	79.0			80.1
Massachusetts	84.7			
Michigan	83.6	88.5	60.4	85.0
Minnesota	85.1			85.2
Mississippi	85.4	92.3	79.3	89.7
Missouri	80.8			
Montana	85.1			
Nebraska	83.1	90.8	63.2	87.9
Nevada	87.3			
New Hampshire	84.3			
New Jersey	79.5			78.7
New Mexico	85.6			86.0
New York	83.9	87.1[f]	55.1[f]	
North Carolina	83.1	90.2	71.6	87.3
North Dakota	86.0			
Ohio	81.9			
Oklahoma	85.0			88.5
Oregon	87.9	91.8	64.4	87.9
Pennsylvania	83.8			

TABLE I (continued)
CURRENT AND POSTPARTUM CONTRACEPTIVE USE PREVALENCE
BY SURVEY BY STATE
UNITED STATES, 2002 AND 2004-2006

	Contraceptive Use Type, Survey and Years			
	Current Use 18-44 year olds BRFSS 2002[a]	Postpartum Use 15-44 year olds PRAMS 2004-2006[b]		Postpartum Use 20-34 year olds PRAMS 2004[c]
State	**Percent *Any*[d] Method**	**Percent *Any*[d] Method**	**Percent *Effective*[e] Method**	**Percent *Any*[d] Method**
Rhode Island	83.1	89.8	63.9	86.1
South Carolina	85.0	93.4	73.7	90.2
South Dakota	84.3			
Tennessee	86.6			
Texas	85.5			
Utah	85.2			89.7
Vermont	86.1			90.6
Virginia	87.3			
Washington	84.1			86.6
West Virginia	81.6	88.4	67.3	80.9
Wisconsin	83.9			
Wyoming	85.4			
Total		**88.0**[f]	**61.7**[f]	**85.8**[g]

[a] Bensyl et al., 2005.
[b] CDC, 2009.
[c] D'Angelo, et al, 2007.
[d] *Any* Method contraceptive use includes all methods reported.
[e] *Effective* Method contraceptive use includes methods with a first year typical use unintended pregnancy rate of less than 10% (Trussell, 2011).
[f] New York does not include New York City, which conducts its own PRAMS survey, however the New York City prevalence is included in the total population prevalence calculations.
[g] The prevalence for New York City (77.5%), which conducts its own PRAMS survey, is not shown in this listing, but was included in this total population prevalence calculation.

women was below 80% in two states (Hawaii at 76.1% and New Jersey at (78.6%), while prevalence for the rest of the states (25) ranged from 80% to 89%, and the aggregate prevalence was 85.2% (Williams et al., 2006). And, when stratified by age group, differences in PP use prevalence across the states remained, as it did when stratified by race, ethnicity, education and Medicaid status (yes or no).

In 2004 the prevalence of PP use among all women was again lowest in Hawaii and New Jersey (78.4 and 78.7% respectively), and ranged from 80% to 89% in the other 23 states. Table I shows the 2004 prevalence of PP use in the same 25 states among women 20-34 years of age (D'Angelo et al., 2007). As with all women, the prevalence for this age group varied from state to state, was below 80% in Hawaii and New Jersey, and ranged from 80% to 90% (in Arkansas, South Carolina and Washington). In this analysis, the researchers also found variation across the states when the data were stratified by race/ethnicity, insurance status (private, Medicaid, or other), and pregnancy intention (D'Angelo et al., 2007).

Also included in Table I are the results of a more detailed analysis of combined 2004-2006 PRAMS data from 12 states and New York City (CDC, 2009) that reported on "*Any* Method" postpartum use (use of at least one method) and postpartum use by method effectiveness – effective (sterilization, IUD, implant, shot, pill, patch, ring), moderately effective (condoms), and less effective (diaphragm, cervical cap, sponge, rhythm, withdrawal). In this analysis seven states had an *Any* Method PP use prevalence over 90%, while the other five states had *Any* Method PP use between 87% and 90%. The prevalence of PP use among those using *Effective* methods (*Effective* Method PP use) was considerably lower, ranging from 55.1% in New York (excluding New York City) to 79.3% in Mississippi.

2.2.5 State Variation in "Outcomes" of Contraceptive Use

Women using contraception have fewer mistimed and unwanted pregnancies. Thus an important population outcome of contraceptive use is intended pregnancy. If states vary in their contraceptive use prevalence, we would also expect their intended (or unintended) pregnancy rates to vary. If this is not the case, we would need to question and further investigate state differences in contraceptive use. The other population outcome we might expect to vary with contraceptive use is pregnancy spacing.

Although PRAMS has provided data on "unintended births" in participating states for many years, it cannot provide data on unintended pregnancies since the surveys only include women who have had a live birth. To complement these data, the Guttmacher Institute recently published estimates of unintended pregnancy rates and the proportion of pregnancies that were unintended by state (Finer and Kost, 2011).

For 2002 the CDC published unintended birth data for 26 PRAMS states -- participating states with the required response rate (Williams et al., 2006). As seen in Table II, among these states the percent of live births that were unintended ranged from 33.3% in Maine to 54.3% in Louisiana. The aggregate percentage of unintended live births for these states was 42.6%.

Using state survey data along with data from their own survey of abortion providers and well-documented estimation techniques, Guttmacher Institute researchers (Finer and Kost, 2011) documented differences in unintended pregnancy percentages (unintended as percentage of all pregnancies) and unintended pregnancy rates (unintended pregnancies per 1000 women aged 15-44) across all 50 states. The proportion unintended and the unintended rate for each state are also shown in Table II. The estimation for the proportion of pregnancies that were unintended ranged from

TABLLE II
UNINTENDED PREGNANCY PROPORTION AND RATE AND PROPORTION OF LIVE BIRTHS UNINTENDED BY STATE UNITED STATES, 2006 AND 2002

State	Proportion (%) of Pregnancies Unintended 2006[a]	Unintended Pregnancy Rate[b] 2006[a]	Proportion (%) of Live Births Unintended 2002[c]
Alabama	55	51	47.8
Alaska	53	55	45.3
Arizona	51	59	
Arkansas	56	54	50.0
California	56	66	
Colorado	48	48	
Connecticut	51	53	
Delaware	60	66	
Florida	59	64	46.3
Georgia	57	60	
Hawai'i	59	66	43.2
Idaho	41	43	
Illinois	53	53	43.0
Indiana	48	45	
Iowa	44	42	
Kansas	48	49	
Kentucky	45	40	
Louisiana	58	55	54.3
Maine	50	37	33.3
Maryland	56	63	43.8
Massachusetts	47	43	
Michigan	53	51	43.1
Minnesota	44	44	33.8
Mississippi	65	69	
Missouri	53	51	
Montana	53	48	44.0
Nebraska	46	44	42.8
Nevada	52	66	
New Hampshire	43	36	
New Jersey	55	63	35.4
New Mexico	56	59	44.2
New York	56	65	34.7[d]
North Carolina	56	58	40.6
North Dakota	45	37	36.1
Ohio	54	51	43.8
Oklahoma	53	55	51.5
Oregon	49	47	
Pennsylvania	55	49	

TABLLE II (continued)
UNINTENDED PREGNANCY PROPORTION AND RATE AND PROPORTION OF LIVE BIRTHS UNINTENDED BY STATE UNITED STATES, 2006 AND 2002

State	Proportion (%) of Pregnancies Unintended 2006[a]	Unintended Pregnancy Rate[b] 2006[a]	Proportion (%) of Live Births Unintended 2002[c]
Rhode Island	50	45	35.6
South Carolina	58	58	47.5
South Dakota	47	48	
Tennessee	58	55	
Texas	53	62	
Utah	38	45	32.5
Vermont	50	38	35.9
Virginia	52	53	
Washington	49	48	39.7
West Virginia	50	39	41.7
Wisconsin	45	40	
Wyoming	45	54	
Total			**42.6**[d]

[a] As estimated by Finer and Kost (2011).
[b] Rate per 1000 women aged 15-44.
[c] From 2002 PRAMS surveys: Williams et al., 2006.
[d] Excludes New York City.

38% in Idaho to 65% in Mississippi, while the estimated unintended pregnancy rate (per 1000 women aged 15-44) was lowest in New Hampshire (39) and highest in Mississippi (69). Although we might expect a state's unintended pregnancy rate to vary from the mean in the same direction and magnitude as its contraceptive use prevalence, differences in the contraceptive effectiveness mix may alter this expected relationship.

Comprehensive state-level data on pregnancy or birth spacing is not readily available. Although we might find these data in individual state PRAMS reports, for the purposes of this study, we did not examine these, partly because it is not clear that a norm for pregnancy spacing is widespread, despite the recent emphasis on interconception care. And, without a norm the association between postpartum contraceptive use and pregnancy or birth spacing is difficult to assess.

2.2.6 **Summary and Implications for Research**

Using well-respected state-level (BRFSS and PRAMS) surveys, researchers have documented differences in the prevalence of *current use* and PP use across the states, including when limited to women 20-34 years of age (Table I). And, there remain differences in PP use between the states in PRAMS analyses when stratified by age group, as well as other socio-demographic factors. In addition, when analyzing postpartum contraceptive use by method effectiveness, for both *Any* and *Effective* Method PP use (Table I) there were differences across the states.

Multi-state PRAMS analyses have also provided documentation of state differences in unintended births. More recently, Guttmacher researchers have documented wide variation in unintended pregnancy rates from state to state.

This review provided consistent documentation of differences in PP contraceptive use across the states, including in stratified analyses, and analysis by method effectiveness, along with similar differences between the states in the related outcomes of unintended births and pregnancies. These findings affirm the need to identify the factors related to the differences between states as suggested in the Problem Statement.

This literature review also identified two additional research needs related to postpartum contraceptive use as noted below.

- National prevalence of postpartum contraceptive use -- The multi-state PRAMS analyses reviewed above present an aggregate PP use prevalence of the states in the analyses. However, because which states are included, and the number of states varies from analysis to analysis, the aggregate prevalence of one analysis is not comparable to another. Documenting the prevalence of postpartum contraceptive use at the national level, in a time frame similar to PRAMS, is warranted and necessary as a benchmark to further understand differences in PP use prevalence across the states.
- State postpartum contraceptive use prevalence adjusted for multiple socio-demographic characteristics -- Although there were analyses stratified by age group and other socio-demographic factors, there were no estimates of PP use that showed differences across the states while accounting for more than one socio-demographic factor simultaneously, which limits state comparisons.

The other noteworthy finding of this review was a list of personal factors related to PP use identified through the stratified analyses of PRAMS data, including age, education, ethnicity/race, insurance status, and pregnancy intention. These factors will

need to be considered in our analysis of postpartum contraceptive use, and are further explored in the next section.

2.3 Literature Part 2: Characteristics of Contraceptive Users and Non-Users

When considering differences between the states that might account for differences in contraceptive use, socio-demographics would be a top candidate. Not only because states differ in their socio-demographic composition, but also because population differences in health behaviors are often related to socio-demographics.

Many studies have documented differences in contraceptive use by socio-demographics, as well as other personal factors. Using published government reports and peer-reviewed literature, we identify and describe below the socio-demographic factors and other individual characteristics related to contraceptive use, both *current use* and PP use.

2.3.1 Current Contraceptive Use: Demographic Differences

Contraceptive use among adult women varies by many characteristics. Using the most recent data available from the NSFG (2006-2008), Mosher and Jones (2010) analyzed *current use* by demographics. Among all women 15-44 years of age, *current use* was 89.4%. *Current use* increased for each age group through 34 years of age (from 81.3% for 15-19 year olds to 93.0% among 30-34 year olds), but then among the oldest women (35-39 and 40-44) *current use* decreased to a level between that of 30-34 year olds and 25-29 year olds. Among women not cohabiting (formerly married and never married), *current use* (84.3% and 81.9% respectively) was much lower than those

currently married (93.4%) and those cohabiting (91.1%). When comparing educational levels, those without a high school diploma or GED were least likely to use contraception (89.1% *current use*), while those with a bachelor's degree or higher were the most likely to use contraception (91.8%). *Current use* among those living in poverty (0% to 149% of the federal poverty level) was lower (87.7%) than those with higher incomes (89.7% to 92.1%). *Current use* among Hispanics, non-Hispanic whites, and non-Hispanic Asians was similar (91.0%, 90.6%, and 91.5% respectively), while *current use* among blacks (83.7%) was considerably lower. *Current use* was similar for women who had not given birth or had only one birth (86.0% and 84.4% respectively), but increased considerably with higher parity (92.9% for two births and 93.6% for three or more births).

When comparing nonusers to consistent users in a multivariate analysis of the 2002 NSFG, Wu et al. (2008) found that being over 40, black and less educated were all significantly associated with nonuse of contraception. And, using data from a Guttmacher telephone survey, Frost et al. (2007a) found a similar relationship.

2.3.2 Current Contraceptive Use: Beyond Demographics – Association with Other Individual Characteristics

Using data from the 2002 NSFG, Nearns (2009) found that young women who had private insurance or Medicaid were more likely to use contraception, which was in agreement with findings from a 2002 BRFSS analysis (Culwell and Feinglass, 2007) that 54% of adult women with insurance were using prescription contraception compared with only 45% of women without insurance. When controlling for other factors, Culwell and Feinglass (2007) found that uninsured adult women were 30% less likely to use prescription contraception than adult women with public or private insurance. Using

data from the NSFG, Wu et al. (2008) found that nonusers were more likely to be uninsured or on Medicaid compared to consistent users.

Analysis of a 2004 nationally representative survey of women 18-44 years of age at risk for unintended pregnancy (Frost et al., 2007a) found that ambivalence about pregnancy was strongly associated with contraceptive nonuse in the past year, as was a fatalistic attitude towards pregnancy and birth control. Women who had infrequent intercourse (<= once per month), more than one partner in the last year, were dissatisfied with their method, and did not feel they had a provider they could call with a method-related questions were more likely to not use a method sometime in the past year (Frost et al., 2007a). Many of these same factors were found to be associated with a woman's method choice, inconsistent method use, and gaps in method use (Frost and Darroch, 2008; Frost et al., 2007b).

2.3.3 **Postpartum Contraceptive Use**

Although similar in many ways, the motivation and action required for postpartum contraceptive use may differ from that of contraceptive use at other times: the risk of pregnancy postpartum may not be well understood; breastfeeding may affect both understanding of risk, and method options; and, with all the responsibilities of caring for an infant, a woman's focus may be different than prior to delivery. Therefore, to study postpartum contraceptive use, it is essential to identify characteristics related specifically to postpartum contraceptive use. Although some of the characteristics related to *current use* may also be related to PP use, there may be differences in the association, or additional characteristics, reflective of the uniqueness of the postpartum

period. PRAMS has gathered data on variation in *postpartum use* by socio-demographic characteristics, and maternal behaviors and experience.

2.3.4 **Postpartum Contraceptive Use: Demographic Differences**

CDC surveillance reports using 2002 and 2004 PRAMS data (with 27 and 25 states, respectively) documented several socio-demographic factors related to postpartum contraceptive use (Williams et al., 2006; D'Angelo et al., 2007). In both 2002 and 2004, women 35 years of age and over were less likely to use postpartum contraception than younger women, as were women of other races when compared to black and white women. The 2002 multi-state report also documented that women who did not graduate from high school were less likely to use contraception postpartum. In a logistic regression analysis of 1999 New Mexico PRAMS data, DePiñeres et al. (2005) found that when controlling for socio-demographics and personal characteristics that were related to *Any* Method PP use in bivariate analyses, age (< 35 years old), education (high school or more), and marital status (married) remained associated with an increase in the odds of *Any* Method PP use in a multivariable analysis.

A CDC analysis of 2004-2006 PRAMS surveys focused on 12 states and New York City (CDC, 2009) that gathered data on the specific contraceptive method being used postpartum and calculated *Any* Method PP use, including withdrawal and fertility awareness-based methods (FAM), and *Effective* Method PP use (sterilization, IUD, shot, pill, patch and ring) prevalence. We discuss below the findings of both outcomes.

Analysis of the 2004-2006 data found that *Any* Method PP use varied by age and race, as did *Effective* Method PP use (CDC, 2009). For both *Any* Method and *Effective* Method PP use, the highest prevalence was among women < 20 years old (*Any*: 90.1%;

Effective: 72.9%) and the lowest prevalence was among those 35+ years old (*Any*: 83.2%; *Effective*: 53.0%). The prevalence also varied by race: *Any* Method PP use ranged from 82.8% (Asian/Pacific Islander) to 89.8% (black); while *Effective* Method PP use ranged from 35.3% among Asian/Pacific Islanders to 71.5% among American Indian/Alaskan Natives, with Black just slightly lower at 71.3%. In this multi-state analysis (CDC, 2009) married women were less likely than other women to use *Any* Method and less likely to use an *Effective* method. Although women who at least finished high school were more likely to use *Any* Method, they were less likely to use an *Effective* Method. Women who already had one or more children were more likely to use an *Effective* Method than those for whom the PRAMS infant was the first.

2.3.5 **Postpartum Contraceptive Use: Beyond Demographics – Association with Other Individual Characteristics**

Although the 2002 CDC PRAMS report (Williams et al., 2006) did not find any difference in *Any* Method PP use by Medicaid status (yes/no), the 2004 report (D'Angelo et al., 2007) found that those who had neither Medicaid or private insurance at delivery were less likely to report using contraception at the time of the PRAMS survey than those whose delivery was covered by Medicaid or private insurance. The method-specific analysis of the 2004-2006 PRAMS data (CDC, 2009) found that women enrolled in Medicaid prior to pregnancy were more likely to use an *Effective* Method than those not enrolled prior to pregnancy.

CDC's 2004 surveillance report (D'Angelo et al., 2007) documented that women who reported their pregnancy was unintended were more likely to be using contraception than those with an intended pregnancy; while in the 2004-2006 detailed

PRAMS analysis (CDC, 2009) women with an unintended pregnancy were more likely to be using *Any* Method and *Effective* Methods.

Among the CDC reports, only the detailed 2004-2006 multi-state analysis reported on differences by prenatal care (CDC, 2009). Women who had no prenatal care were less likely to use *Any* Method and less likely to use an *Effective* Method than those with prenatal care. Although no difference was found between those with early (first trimester) versus late (second or third trimester) entry into prenatal care for *Any* Method there was an increased use of an *Effective* Method among those with early prenatal care compared to those with late prenatal care. Analysis of Florida PRAMS data (Hernandez et al., 2011) found that women who reported prenatal counseling about postpartum contraception were more likely to use *Effective* Methods or condoms postpartum. However, in New Mexico, DePiñeres et al. (2005) found that when controlling for socio-demographics and personal characteristics, women who had prenatal contraceptive counseling and those who had a postpartum visit were more likely to use *Any* Method, while there was no association with prenatal care generally. But, they did find that women who had breastfed for less than two months were more likely to use postpartum contraception. And, although it is important for women with chronic conditions to have planned pregnancies, an analysis of Florida PRAMS data found no difference in *Any* Method postpartum contraceptive use among those with and without a chronic medical condition (Chor et al., 2011). On the other hand, Chin et al. (2009) found that obese women were less likely than non-obese women to use *Effective* contraception postpartum.

2.3.6 **Prenatal Planning and Actual Postpartum Contraceptive Use**

A life-changing event occurs between antenatal planning for, and actual use of, contraception postpartum, and research has demonstrated that what is planned does not always happen. Among Medicaid-eligible women who provided information on what birth control method they planned to use postpartum, Miller and colleagues (2000) found that many subsequently reported that they did not actually use that method: 69% of those planning to use Depo-Provera actually used it, while only 55% of those planning to use oral contraceptive actually used them. Among women who delivered at a New Mexico hospital who reported plans for an IUD insertion at discharge (193) and for whom researchers could locate a medical record (114), only 60% (69) actually had gotten an IUD when their records were reviewed (Ogburn et al., 2005). For the 45 women who did not obtain an IUD, the reasons included: chose an alternate method (62%); already pregnant (16%); provider counseled against it (16%); and financial issues (2%). As with postpartum IUD insertion, many women who request a postpartum tubal ligation (PPTL) do not actually get one. In a study of low-income minority women, Zite et al. (2005) found that 46% percent did not undergo the procedure. These women were more likely to be young (21-25) and African American, and have had a vaginal delivery and requested the PPTL during the second trimester. Further study of these women (Zite et al., 2006) identified their reasons for not having a PPTL. While 32% changed their minds, another 37% did not get the procedure due to lack of a Medicaid sterilization consent form, and others had medical contraindications (14.5%), or no operating room was available (6.5%). In a Texas study of women planning a PPTL, 31% did not have the procedure (Thurman and Janecek, 2010).

Consequently, at a one-year follow-up, 46.7% of these women were pregnant, while only 22.3% of the women in a control group were pregnant.

2.3.7 **Summary and Implications for Research**

Using government reports and peer-reviewed literature we have identified socio-demographic variation in *current use* and PP use. Age, education, marital status (married/cohabiting vs. not cohabiting), and race were all important predictors of contraceptive use at any time. While income was associated with *current use*, no comparison was found for PP use.

As to other personal characteristics, both *current use* and PP use varied with parity and insurance coverage (Medicaid and private insurance). Pregnancy intention (of recent birth) was also associated with PP use. Peer reviewed literature also identified prenatal contraceptive counseling and postpartum care as increasing the likelihood of PP use. Other predictors of decreased *current use* included ambivalence about pregnancy, infrequent intercourse and more than one partner in the past year. These factors have not been studied in PP use.

Any analysis of postpartum contraceptive use, either to confirm risk/protective factors/markers or identify new ones, should take into account these socio-demographic factors, personal characteristics, and behaviors related to PP use. Since we know that states differ in their socio-demographic composition, the socio-demographic factors related to PP use (age, education, marital status, and race) should be controlled for in any analysis seeking to identify state-level factors that are related to differences in postpartum contraceptive use across the states. In addition, other personal characteristics (*e.g.*, insurance coverage, parity, pregnancy intention) and behaviors

(*e.g.*, use of prenatal and postpartum care) should also be controlled for when possible. How they are controlled for (at the individual level, or in the aggregate) would depend on the data available and the type of analysis.

Ambivalence towards pregnancy decreases the odds of *current use*, and probably is also related to PP use, but the latter has not been studied. This is also true for frequency of intercourse and number of sexual partners. However, lacking information to control for these factors may not be crucial, as we have no reason to think they differ systematically across the states.

Although many of the socio-demographic factors and other individual characteristics and behaviors identified above probably play a substantial role in the differences in PP use across the states, it is important to know if there are any individual interventions that provide the opportunity for obtaining a contraceptive method, in extensive use in some states and not in others, that might account for some of the differences in PP use across the states. In the next chapter we review the research on individual interventions to increase *current use* and postpartum contraceptive use.

2.4 **Literature Part 3: Interventions at the Individual Level to Increase Contraceptive Use**

In the previous two sections we have documented that postpartum contraceptive use varies across the states, and that there are individual characteristics (*e.g.,* demographic and others) that might account for some, or all, of the variation, especially demographics, since we know that states vary in their demographic composition. Another source of variation across the states could be differences in how and what information women receive regarding contraception at the individual level. If there is

an individual intervention that has a more positive impact on knowledge, attitudes and practices regarding contraceptive use than others, and its use is more widespread in some states than others, then it could account for some of the variation in PP use across the states. In this chapter we describe the peer-reviewed literature, both individual studies and comprehensive reviews, that document the success of individual contraceptive interventions.

2.4.1 Individual Interventions to Promote Contraceptive Use

One of the most common ways to provide information and encourage contraceptive use is the provision of counseling in a clinical setting. Moos et al. (2003) reviewed research published between 1985 and 2000 to ascertain the effectiveness, and any benefits, or harms, of clinical counseling to prevent unintended pregnancies. Moos found that the four studies of contraceptive counseling that measured changes in knowledge, skills and attitudes about contraception and pregnancy provided no definitive guidance on what works best. One study measured the effect of knowledge on use and adherence and found that accurate knowledge of contraceptive methods may lead to more appropriate use. Otherwise, Moos concluded that the studies did not provide definitive information on what interventions might influence contraceptive use and adherence. Moos found no studies that assessed harm or cost effectiveness.

Beyond standard clinical counseling, other more specific interventions may be used to promote contraceptive use. The Cochrane Collaborative sponsored a review of studies published through 2010 that tested theory-based interventions to improve contraceptive use (Lopez et al., 2011). Fourteen randomized controlled trials met the review criteria, which included examination of at least one of three outcomes: birth

control method use, pregnancy, or birth as an outcome. Most of the theory-based interventions (13 out of 14) had multiple sessions/contacts. Seven of the interventions were found to be effective. Three of the five studies that used Social Cognitive Theory had positive results; two others, based on other social cognition theories, also had positive results. Four of the interventions used Motivational Interviewing, of which two had favorable outcomes. Only two of the ten studies that used pregnancy or birth as an outcome had positive results (i.e., fewer pregnancies or births among those receiving the intervention); four of ten that used contraceptive measures had positive results (i.e., increased contraceptive use among those who had the intervention). Among the seven effective interventions, five focused on adolescents (four of which had group sessions).

Kirby (2008) reviewed published experimental and quasi-experimental studies of policies and programs designed to increase contraceptive use among adult women. Between 1990 and 2005, he found only 11 studies that met his requirements for design criteria, sample size (50 or more), and age (median 20), all of which were studies of programs, not policies. One of these studies was also included in the Lopez review (Lopez et al., 2011). These studies assessed programs that: provided counseling to prevent pregnancy and sexually transmitted infections (STI) using Motivational Interviewing (1 study); initiated contraception in alternative settings (one STI clinic and one correctional facility) (2 studies); provided a quick start of contraception (2 studies); provided advanced provision of emergency contraception (4 studies); and, used a reminder system for Depo-Provera shots (2 studies). The two programs in alternate settings, one quick start program, and one reminder system program significantly increased method use, although only in the short term. None of the studies reduced pregnancy rates.

The Cochrane Collaborative also sponsored a review of research on adherence and acceptability of hormonal methods of contraception (Halpern et al., 2011), specifically comparing method adherence and continuation among those receiving routine family planning counseling and other types of client –provider interactions. They found very few (8) randomized controlled trials that met their criteria. Only one intervention -- repeated, structured information about Depo-Provera -- showed a significant difference in method continuation. This study also found that the intervention women were less likely to discontinue use due to menstrual disturbances than the control group. One other study found a significant difference in discontinuation due to dissatisfaction with the method, but overall continuation was not changed. One of these studies was also included in the Kirby review (Kirby, 2008).

2.4.2 **Individual Interventions to Promote Postpartum Contraceptive Use**

As noted in sub-section 2.3.5, analysis of PRAMS data indicate a positive association between pregnancy-related care (prenatal and postpartum) and postpartum contraceptive use. This relationship is similar for prenatal contraceptive counseling (Hernandez et al., 2011; DePiñeres et al., 2005).

Researchers have used clinical trials to explore the timing, delivery method, and contents of interventions that might increase postpartum contraceptive use. In a multi-country (Scotland, China, South Africa) study, Smith et al. (2002) randomized women attending prenatal clinics to either receive expert contraceptive advice, or the standard advice usually provided in that clinic. The researchers found that although the women generally found the expert counseling helpful, at one year there were no significant differences in postpartum contraceptive use, or in pregnancy rates. A Cochrane review

(Lopez et al., 2010) of education regarding contraception for women after delivery (within one month) found relatively few (8) randomized controlled trials (at the individual level), and even fewer (6) with sufficient data or participants. The two short-term interventions (both implemented in the hospital after delivery) found that women receiving education were more likely to use contraception. Of the four studies that were longer or more complex interventions outside of the hospital (multiple sessions/home visits), three focused on teenagers and found better outcomes among those who received the intervention than those who did not: one found fewer repeat pregnancies at 18 months; one found fewer repeat births at two years; and, one found increased contraceptive use at 6 months. The one multi-visit study among adults found no difference in contraceptive use or pregnancy at four months (Lopez et al., 2010).

2.4.3 **Summary and Implications for Research**

Although some experimental studies have found specific individual interventions to be effective in increasing contraceptive use, including PP use, or decreasing pregnancies or births, none have been replicated sufficiently to be identified as a best practice, or become widely adopted. Thus, counseling in the clinical setting continues to be standard practice for the education and promotion of contraceptive use, including PP use. These findings allow us to exclude individual interventions from any list of individual-level factors related to PP use that might result in differences in PP contraceptive use prevalence across the states. However, given the association found between PP use and pregnancy-related care, we will want to control for the individual experience of receipt of prenatal and postpartum care.

Having identified socio-demographic factors, personal characteristics and behaviors related to postpartum contraceptive use, and not found any evidence of individual interventions that might be related to PP use, we have now completed our review of individual-level factors that might affect PP use. In the next two sections we focus our review on state-level factors, including programs, policies and infrastructure that might affect postpartum contraceptive use.

2.5 Literature Part 4: State Variation in Publicly-funded Family Planning Services

Having reviewed individual-level factors that affect *current use* and PP use, which may differ across the states, the next step is to identify state-level factors that might affect contraceptive use. In this section, we focus on the publicly-funded family planning system, explaining and then highlighting similarities and differences in their organization, funding and access across the states.

2.5.1 State Variation in Publicly-funded Family Planning: Organization and Funding Sources

No two states' publicly-funded family planning systems look alike. Although they may be alike in some ways, they inevitably differ in other ways. The design and operation of Title X, the mainstay of the publicly-funded family planning clinic system, varies from state to state. And the importance of non-Title X publicly-funded clinics (*non-Title-X* clinic) in providing subsidized family planning services varies from state to state. The largest funder of subsidized family planning services, Medicaid, likewise varies in its implementation from state to state, in both who is eligible when and what

family planning services are covered. And, while all states rely on Medicaid and Title X funds to provide the bulk of the funding for subsidized family planning services, many states, but not all, contribute their own funds, and/or allocate other federal funds to family planning services.

2.5.1.1 **Title X**

Congress allocates funds to Title X via appropriations to the U.S. Public Health Service, which are subsequently allocated to each of the ten Public Health Service regions. Through a competitive process, regional offices award grants to one (34 states in 2007/08) or more (16 states in 2007/08) agencies in each state (OPA, 2007). In 2007-08, the state health (or human services) department was the only Title X grantee (OPA, 2007) in 27 states; while in another 11 states the state health (or human services) department was one of the state grantees. In the 12 states without a state agency grantee, seven states had a family planning/health council grantee and four states had a Planned Parenthood grantee, while one state (Massachusetts) had five other types of non-profit grantees. Although the main purpose of Title X is to provide direct family planning services, Title X is the backbone of the publicly funded family planning system because its funds can also be used to cover administrative costs, fund education and outreach, as well as provide infrastructure support.

Title X grantees must fund a system of family planning clinics (clinical sites) that offers family planning services free for those living in poverty, and at a reduced rate for other low-income women. A *Title X* clinic can be a self-standing clinical site (*e.g.,* a Planned Parenthood clinic) or be part of a larger clinical site (*e.g.,* health department or hospital). To provide services, *Title X* clinics do not rely solely on their Title X grants.

Other sources of income include: Medicaid, other grants (discussed elsewhere), and patient fees based on a sliding scale. When *Title X* clinics provide services to women enrolled in Medicaid, like any Medicaid provider, they file for reimbursement. As Medicaid coverage for family planning services has expanded over the years, the amount of Medicaid funds coming to *Title X* clinics has increased considerably. In 2004, for the first time, Title X project revenue from Medicaid exceeded that of the Title X grants themselves (Fowler et al., 2009).

In states with only one Title X grant, the grantee is responsible for a state-wide system, whereas in the states with more than one grantee, each grantee has specific geographic boundaries. Within their geographic boundaries, grantees may operate *Title X* clinics themselves (*e.g.*, regional Planned Parenthoods), but in most cases grantees appoint and provide funding to "delegate agencies" to actually operate *Title X* clinics in their already established clinical sites *(e.g.,* a state health department grantee appoints all of their local health departments as *delegate agencies* responsible for operating *Title X* clinics in their clinical sites, or a state Family Planning Council grantee designates a variety of agencies -- a community health agency, a county health department, a non-profit hospital and a Planned Parenthood clinic -- to operate *Title X* clinics in one or more of their clinical sites). In many states a large proportion of the delegate agencies are local health departments who create *Title X* clinics at their established clinical sites, whereas in other states most of the delegate agencies are non-profit organizations, including agencies that focus exclusively on reproductive health services, such as Planned Parenthood.

With the ability to choose delegate agencies and approve their clinical sites, grantees ultimately determine the number and location of all *Title X* clinics in their state

(or region of a state), which in 2006 ranged from five clinics in Alaska to 291 clinics in California (Guttmacher, 2009). In 2008, 70% of all Title X clients had an income less than or equal to 100% FPL, but the proportion of clients living in poverty ranged from 34% in Connecticut to 91% in Louisiana (Fowler et al., 2009).

Although federal Title X rules and regulations set medical standards, including informed consent and comprehensive pregnancy options counseling, and require provision of a range of contraceptive methods directly or by referral (Cohen, 2011), not all methods are available at all sites. In a 2009-10 survey CDC found (CDC, 2011) injectable Depo-Provera (depot medroxyprogesterone acetate) and oral contraceptives were almost universally available on site (97% and 92%, respectively), but many fewer *Title X* clinics provided on-site access to the newer and more expensive hormonal methods – the Ortho Evra patch (57%) and the NuvaRing vaginal ring (58%). And, among the long-acting reversible contraceptive methods (LARCs), the older copper IUD (ParaGard) was available in 60% of sites, but the newer levonorgestrel-releasing intrauterine device (LNG-IUD, Mirena) was only available in 47% of sites, and the implant (Implanon) in even fewer sites (36%).

2.5.1.2 **Other Sources of Publicly-funded Family Planning Services**

In addition to *Title X* clinics, there are two other sources of publicly-funded family planning services: 1) other public clinics that do not receive Title X funds ("non-Title X" clinics); and, 2) individual health care providers and groups of providers not associated with a public clinic ("private providers") enrolled in Medicaid. And, although *private providers* may play an especially important role in the provision of postpartum contraception, as discussed below, we know little about their relative significance at the

state level. On the other hand, we do have information about how the role of *non-Title X* clinics differs across the states.

In all but one state there are *non-Title X* clinics that provide family planning services to low-income women. These clinics, along with the *Title X* clinics, form the "system" of publicly-funded family planning clinics (or centers) which, under the Guttmacher definition (Frost et al., 2010), offer family planning services to the general public and use public funds -- Medicaid reimbursement and/or federal or state funds – to provide the services free or at a reduced rate to at least some of their clients. Guttmacher has classified the operators of both *non-Title X* and *Title X* clinics into five organizational categories (Frost et al., 2010): local health department (LHD); Planned Parenthood affiliate (PP); hospital; community health center (CHC), often federally qualified health centers (FQHCs); or, other independent organizations ("other").

How much of a role the *non-Title-X* clinics play varies considerably from state to state. Guttmacher has occasionally tracked the number of *Title X* and *non-Title-X* clinics, as well as estimated the number of women in need of subsidized contraceptive services (WINSS) and reported on the number of these women served at both the *Title X* and *non-Title-X* clinics. As defined by Guttmacher, women 20 -44 years old are considered in need of publicly-funded family planning services if they are in need of contraception (*i.e.,* sexually active, fecund, not pregnant or trying to get pregnant) and have an income below 250% FPL, while teenagers (< 20 years) are always considered in need of publicly-funded services (Frost et al., 2010).

In its report on publicly-funded clinics in 2006 (Guttmacher, 2009), Guttmacher provided information on both the number of *non-Title X* clinics and women served in these clinics by state. In 2006, on average across the states, 55% of publicly-funded

clinics were *non-Title X* clinics and 32% of all WINSS served were served at *non-Title X* clinics. The extremes were exemplified in Alaska and Hawaii. In 2006, Hawaii did not have any *non-Title X* clinics, whereas, in Alaska 95.4% of its publicly-funded clinics did not have Title X funding and, these *non-Title X* clinics provided services to 80% of those WINSS who received services. Geography may play a role in these extremes. When focusing on the 48 contiguous states, in 2006 Delaware and West Virginia had proportionately the fewest *non-Title-X* clinics (7.1% and 7.4% of clinics respectively), while Minnesota and Wisconsin had the most (84.9% and 82.0% of clinics respectively). Among all WINSS who received services in a state, the proportion served by a *non-Title X* clinic was lowest in Delaware and West Virginia (4.1% and 5.0% respectively, matching their rank in clinics), while within the 48 contiguous states, the proportion was highest in Vermont and Colorado (69.9% and 63.9% respectively). Alaska had the highest proportion.

Guttmacher's 2010 report on contraceptive needs and services (Frost et al., 2010) did not provide information on the proportion of *non-Title X* clinics, but it did provide an update for 2008 on the proportion of all WINSS served (denominator), who received those services in a *non-Title X* clinic. As in 2006, in 2008 the proportion varied by state, and those states at the extremes stayed the same. Again Hawaii had the lowest proportion (0%) and Alaska had the highest proportion (79.6%), while in the 48 contiguous states, the proportion of WINSS who obtained services and received them in a *non-Title X* clinic ranged from 4.1% `in Delaware to 69.9% in Vermont (Frost et al., 2010).

As already noted above, *private providers* can also provide publicly-funded family planning care. The *private provider* may be especially important for postpartum

contraceptive use, both as provider of the postpartum care covered by Medicaid, as well as the provider of family planning services for all women in FP waiver states where participation of *private providers* has been promoted. However, although Guttmacher estimated the proportion of WINSS served by private providers via Medicaid (12.6%) at the national level in 2006 (Guttmacher, 2009), due to differences in state coding of provider type in the Medicaid billing system, they were not able to do so at the state level. Thus, although there are surely differences in the proportion of women who received publicly-funded family planning services from publicly-funded clinics versus *private providers,* no data that document and quantify the differences are available.

2.5.1.3 Distribution of Funds for Publicly-funded Family Planning Services by Source

To provide publicly-funded family planning services, in addition to Title X and Medicaid funding, states may opt to use their own funds, as well as allocate funds from three other federal sources: the Maternal and Child Health (MCH) block grant, the Social Services block grant (SSBG), and the Temporary Assistance for Needy Families (TANF) block grant. Although in almost all states the bulk of funds are from Medicaid and Title X, some states do allocate a not insignificant amount of other federal or their own funds. Guttmacher has occasionally tracked the proportionate use of these funds across the states. The two most relevant years for which data are available are 2006 (Sonfield et al., 2008a) and 2010 (Sonfield and Gold, 2012). For each state, Table III documents the 2010 percent distribution of the funding sources for all subsidized family planning client services (excluding sterilizations), including the proportions that are

TABLE III

MEDICAID WAIVER STATUS AND PERCENT DISTRIBUTION OF PUBLIC FAMILY PLANNING CLIENT SERVICES EXPENDITURES BY FUND SOURCE UNITED STATES, 2010[a]

State	Waiver in 2010[c]	Percent Distribution of Expenditures by Source (Row Total = 100%)[a,b] % Medicaid	% Title X	% MCH Block Grant	% TANF[d] + SSBG[e]	% State Funds
Alabama	Yes	72.8	12.5	0	2.1	12.5
Alaska		38.7	34.7	0.6	0.9	25.1
Arizona	Yes	90.4	8.1	1.4	0.0	0.1
Arkansas	Yes	85.0	13.9	0.0	0.0	1.1
California	Yes	85.7	3.0	0.0	0.0	11.3
Colorado		46.4	11.8	0.0	u	41.9
Connecticut		66.3	16.7	0.1	8.7	8.2
Delaware		77.8	12.6	0.0	0.0	9.6
Florida	Yes	64.0	11.1	0.0	0.0	24.8
Georgia		85.3	5.2	0.0	9.2	0.3
Hawai'i		71.9	17.1	0.0	0.0	10.9
Idaho		39.7	22.1	7.6	0.0	30.6
Illinois	Yes	71.4	13.6	0.0	8.2	6.7
Indiana		65.1	19.9	2.8	8.5	3.8
Iowa	Yes	82.7	16.1	0.0	0.0	1.2
Kansas		24.2	23.3	0.0	0.0	52.5
Kentucky		70.5	9.8	2.4	0.0	17.3
Louisiana	Yes	87.8	8.2	0.2	3.8	0.0
Maine		57.8	28.0	4.1	1.5	8.6
Maryland	Yes	81.0	6.3	0.0	0.0	12.7
Massachusetts		79.8	12.8	0.0	0.0	7.3
Michigan	Yes	72.1	12.7	3.4	0.6	11.2
Minnesota	Yes	61.7	10.1	22.9	5.3	0.0
Mississippi	Yes	79.5	20.5	nr	nr	nr
Missouri	Yes	88.0	11.2	0.0	0.0	0.8
Montana		34.0	54.8	0.2	0.0	11.0
Nebraska		76.0	24.0	0.0	0.0	nr
Nevada		57.1	37.3	1.5	3.4	0.6
New Hampshire		45.2	34.1	0.0	0.6	20.2
New Jersey		56.6	24.7	1.4	4.6	12.6
New Mexico	Yes	83.5	4.5	0.0	0.0	12.0
New York[d]	Yes	65.1	9.1	2.5	0.3	23.1
North Carolina	Yes	41.1	9.8	9.3	1.3	38.5
North Dakota		31.1	45.6	2.4	0.0	20.9
Ohio		74.4	21.8	1.1	0.0	2.6
Oklahoma	Yes	71.5	9.2	0.0	0.0	19.2
Oregon	Yes	86.6	6.2	2.1	0.0	5.1
Pennsylvania		84.6	10.4	nr	2.2	2.8
Rhode Island	Yes	58.3	35.4	3.3	0.0	3.0
South Carolina	Yes	74.2	20.9	0.2	0.0	4.8

TABLE III (continued)
MEDICAID WAIVER STATUS AND PERCENT DISTRIBUTION OF PUBLIC FAMILY PLANNING CLIENT SERVICES EXPENDITURES BY FUND SOURCE
UNITED STATES, 2010[a]

State	Waiver in 2010[c]	Percent Distribution of Expenditures by Source (Row Total = 100%)[a,b] % Medicaid	% Title X	% MCH Block Grant	% TANF[d] + SSBG[e]	% State Funds
South Dakota		61.5	38.5	nr	nr	nr
Tennessee		76.7	12.0	1.0	0.0	10.3
Texas		62.1	9.4	0.0	15.3	13.2
Utah		66.5	25.6	2.7	0.0	5.2
Vermont		80.3	16.0	0.0	3.6	0.1
Virginia	Yes	86.6	13.4	0.0	0.0	nr
Washington	Yes	62.0	5.8	0.0	0.0	32.2
West Virginia		48.9	19.9	9.7	15.9	5.7
Wisconsin	Yes	64.1	6.8	6.9	0.0	22.3
Wyoming		62.6	33.1	4.3	0.0	nr
Total All States		**74.7**	**9.6**	**1.2**	**2.1**	**12.4**

[a] Calculated from information in: Sonfield and Gold, 2012.
[b] No information due to: nr = No response or u = unavailable.
[c] Medicaid FP Waiver status from: Guttmacher, 2012e.
[d] TANF: Temporary Assistance for Needy Families.
[e] SSBG: Social Services block grant.

Medicaid and Title X, as well as the proportions allocated from other federal sources (MCH and TANF/SSBG) and state funds (Sonfield and Gold, 2012). Because a Medicaid FP waiver (see below) may have a considerable effect on the amount of a state's Medicaid spending for family planning services, column 1 of Table III shows the FP waiver status of the state in 2010.

In 2010, state funds used to provide subsidized family planning services accounted for 12.4% of all family planning services funds across the U.S. (Sonfield and Gold, 2012), just slightly less than the 13.1% in 2006 (Sonfield et al., 2008a). As seen in Table III, in 2010 among the 43 states that allocated their own funds to family planning services, the state contribution ranged from less than 1% of the total family planning client services funds (5 states) to more than 50% (Kansas at 52.5%), very similar to the range in 2006 (Sonfield et al., 2008a), but almost half of the states (20) contributed less than 10% of the total family planning service funds from their own revenues, as was the case in 2006 (Sonfield et al., 2008a). Seven states did not report any allocation of their own resources (two states reported no funds, and five states provided no response, or said the information was not available).

As seen in Table III, in 2010, 25 states allocated MCH funds to family planning client services (Sonfield and Gold, 2012). Nationally, only 1.2% of family planning client services funds were from the MCH block grant. At the state level, the proportion of the total family planning service funds that were MCH funds ranged from 0.1% to 22.9% (Minnesota), but with the exception of Minnesota, all were below 10% (Table III).

In 2010, far fewer states (16) reported using TANF or SSBG funds for family planning client services than MCH funds (Table III). Nationally these funds accounted for 2.1% of family planning client services funds (Sonfield and Gold, 2012).

TANF/SSBG funds accounted for 15% of family planning service funds in just two states, and between 5% and 10% in four states (Table III).

2.5.1.4 **Medicaid Eligibility**

Since the early 1970s federal law has required Medicaid to cover family planning services for any reproductive-aged female enrollee. However, which women are eligible for what type of Medicaid coverage when, varies from state to state. Income cutoffs for both non-pregnancy-related adult coverage (*parent/continuous*) and pregnancy coverage (including postpartum care) are not the same in every state, while since the mid-1990s, with a research and demonstration waiver of federal rules (under Section 1115 of the Social Security Act), 28 states (Sonfield and Gold, 2011) designed and implemented a FP waiver demonstration program that offered coverage for family planning services only to low-income non-pregnant women who would otherwise not qualify for Medicaid. These differences in Medicaid eligibility by state are summarized in Table IV, and discussed in more detail below.

Federal law requires states to extend pregnancy coverage through 60 days postpartum. Therefore, a woman with pregnancy-only coverage has access to birth control in the immediate postpartum period based on her state's pregnancy eligibility. The federal minimum eligibility for Medicaid enrollment during pregnancy is 133% of the federal poverty level (FPL), but most states extend coverage well beyond this (Table IV). According to the Kaiser Family Foundation, as of January 2012 nine states used the federal minimum as their income cutoff for coverage during pregnancy, while another six states used an eligibility of 150 or 175 % of the FPL (KFF, 2012). Among the other 35

TABLE IV
INCOME ELIGIBITLY LIMITS FOR MEDICAID ENROLLMENT
AS PERCENT OF FEDERAL POVERTY LEVEL[a]
BY TYPE OF MEDICAID COVERAGE BY STATE
UNITED STATES, 2012

	Percent of Federal Poverty Level[a] for Type of Medicaid Coverage		
State	Parent/ Continuous[b]	Pregnancy[b]	Family Planning[c]
Alabama	24	133	133
Alaska	81	175	
Arizona	106	150	2 years PP
Arkansas	17	162	200
California	106	200	200
Colorado	106	133	
Connecticut	191	250	
Delaware	119	200	2 years Any
Florida	58	185	2 years Any
Georgia	49	200	200
Hawai'i	100	185	
Idaho	39	133	
Illinois	191	200	200
Indiana	24	200	
Iowa	82	300	200
Kansas	32	150	
Kentucky	59	185	
Louisiana	25	200	200
Maine	200	200	
Maryland	116	250	200
Massachusetts	133	200	
Michigan	63	185	185
Minnesota	215	275	200
Mississippi	44	185	185
Missouri	36	185	185
Montana	55	150	
Nebraska	57	185	
Nevada	87	133	
New Hampshire	49	185	
New Jersey	200[d]	185	
New Mexico	85	235	185
New York*	150	200	200
North Carolina	49	185	185
North Dakota	59	133	
Ohio	90	200	
Oklahoma	53	185	185
Oregon	40	185	185
Pennsylvania	46	185	185
Rhode Island	181	185	
South Carolina	91	185	185

TABLE IV (continued)
INCOME ELIGIBITLY LIMIT FOR MEDICAID ENROLLMENT
AS PERCENT OF FEDERAL POVERTY LEVEL[a]
BY TYPE OF MEDICAID COVERAGE BY STATE
UNITED STATES, 2012

	Percent of Federal Poverty Level[a] for Type of Medicaid Coverage		
State	Parent/ Continuous[b]	Pregnancy[b]	Family Planning[c]
South Dakota	52	133	
Tennessee	126	185	
Texas	26	185	185
Utah	44	133	
Vermont	185	200	
Virginia	31	133	200
Washington	73	185	200
West Virginia	32	150	
Wisconsin	200	300	300
Wyoming	51	133	PP, no limit

[a] Federal Poverty Level: as set by the U.S. Department of Health and Human Services.
[b] From: KFF, 2012.
[c] From: Guttmacher, 2012e.
[d] Closed above 133%

states, a cutoff of 185% or 200% of the FPL is the most common (29 states), but six extend their eligibility beyond 200% of the FPL (KFF, 2012).

Federal law requires states to extend pregnancy coverage through 60 days postpartum. Therefore, a woman with pregnancy-only coverage has access to birth control in the immediate postpartum period based on her state's pregnancy eligibility. The federal minimum eligibility for Medicaid enrollment during pregnancy is 133% of the federal poverty level (FPL), but most states extend coverage well beyond this as shown in Table IV. According to the Kaiser Family Foundation, as of January 2012 nine states used the federal minimum as their income cutoff for coverage during pregnancy, while another six states used an eligibility of 150 or 175 % of the FPL (KFF, 2012). Among the other 35 states, a cutoff of 185% or 200% of the FPL is the most common (29 states), but six extend their eligibility beyond 200% of the FPL (KFF, 2012).

At the end of the six-week postpartum period, many low-income women lose their Medicaid coverage. As seen in Table IV, in most states the decline in the income eligibility cutoff from pregnancy to parent/continuous coverage is steep. Only 18 states have a cutoff at or above poverty (100% of FPL), while another 17 have a cutoff below 50% of FPL, with the other 15 states in between. Of those states with a cutoff at or above poverty, ten actually have a cutoff that is equal to or above the lowest cutoff for a *FP waiver* (133% FPL), which means these states continue to cover comprehensive health care services to postpartum women, including family planning services and supplies after the six week postpartum period.

2.5.1.5 Medicaid Family Planning Waivers

States have implemented two different types of Medicaid FP Waivers: those based on a woman's family income (*income-based waiver)*; and those that cover women who have been on Medicaid and would otherwise lose their Medicaid coverage (*limited waiver)* either any type, or pregnancy coverage. Most states have chosen *income-based waivers*. Among those with *limited waivers,* coverage for women who will lose eligibility postpartum has been most common. Passage of the ACA provided states with another option to expand family planning eligibility. Instead of a temporary *FP waiver* that required a lengthy renewal process, states could ask for a state plan amendment (*SPA*) that would make family planning eligibility a permanent part of its Medicaid program. According to the Guttmacher Institute (Sonfield and Gold, 2011), as of November 2011, 28 states had one of the three types of FP eligibility expansions: six states had a *SPA* in place (all of whom had previously had an *income-based waiver);* 16 states had an *income-based waiver;* and six states had a *limited waiver*. All but two of the states with an *income-based waiver* or *SPA* had an income cutoff of 185% (10 states) or 200% (11 states) of FPL; while Alabama had a much lower eligibility (133% of FPL) and Wisconsin a much higher (300% of FPL) eligibility (Sonfield and Gold, 2011).

2.5.1.6 Medicaid Coverage of and Access to Family Planning Services

Although federal law requires Medicaid to provide "family planning services," it does not specify what services and methods must be covered (Ranji et al., 2009). For those services and supplies classified as family planning services, states receive an enhanced (90%) federal match (Federal Medical Assistance Percentage), but in return are not allowed to require a co-pay from beneficiaries.

The 2007-08 Kaiser Family Foundation (KFF) and George Washington University (GWU) survey of state Medicaid agencies regarding their coverage of reproductive health services (Ranji et al., 2009) found considerable differences in family planning coverage across the states as discussed below. Of the 43 states who responded to the KFF/GWU reproductive health survey, 32 reported they always cover all prescription methods (*i.e.*, oral contraceptives, IUDs, implants, injectables, diaphragms) as a family planning service (Ranji et al., 2009). Kentucky allowed classification of most methods as a family planning service depending on the context of the visit, while Utah only considered birth control pills and the diaphragm "family planning services," and never considered other prescription contraceptive methods as "family planning services." A few states didn't cover removal of long-term methods (IUDs, implants). Four states do not always consider a tubal ligation a family planning method, while Massachusetts and West Virginia never consider it a family planning method, and Oregon does not cover tubal ligation at all. Over-the-counter birth control methods (*e.g.*, condoms, spermicide, sponges, emergency contraception) are less likely to be covered. Only 24 out of 43 states reported they cover all three barrier (condoms, spermicide, and sponges) methods, and three states never cover any of them. States also vary in the visit "procedures" for which they will reimburse: thirty states covered "contraceptive counseling" as a family planning service, while only 20 states covered "reproductive health education" and still fewer states (seven) covered "preconception counseling" as a family planning service (Ranji et al., 2009).

As more states mandated managed care enrollment in the 1980's, Congress' initial efforts to require, and encourage, coverage of family planning services, and assure easy access to those services were threatened. To address the concerns regarding access

to family planning services for Medicaid enrollees as well as reimbursement for family planning clinics under managed care, in 1986 Congress voted to require states to allow women to choose any Medicaid-approved provider for their family planning care – often referred to as "freedom of choice" (or "freedom to choose" or "right to choose"). This provision simultaneously guaranteed women the right to obtain family planning services outside of their managed care network if they needed (in the case of provider refusal) or wanted to, and it assured family planning clinics that they would get reimbursement for the Medicaid enrollees to whom they provided care (Gold and Richards, 1996).

As required, in 2009 all states that had either mandatory or voluntary Medicaid managed care reported they provided "freedom of choice" of Medicaid-certified providers for family planning services (Ranji et al., 2009). However, how, and by whom, women are informed of their "freedom to choose" a family planning provider varies from state to state (Ranji et al., 2009). Those responsible for informing beneficiaries include the Medicaid agency, the health plan, or a broker. Media used to inform women may include newsletters, eligibility workers, brochures, counseling and the Medicaid Handbook, which is the only source of information for eight states (Ranji et al., 2009). Guttmacher has estimated that only 10% of women request the "freedom to choose" option.

As already noted, since the mid-1990's, the Centers for Medicare and Medicaid Services (CMS) has allowed 28 states to develop and implement a FP waiver that extends Medicaid eligibility for family planning services to women who otherwise would not qualify for Medicaid benefits unless pregnant. Because the waivers are "research and demonstration" projects, each state designs its own comprehensive program and is

required to plan for its evaluation. Inevitably, these programs have been tailored to a state's needs and interests, and therefore have not been the same from state to state.

In fact, Guttmacher researchers have noted considerable variation in the design and implementation of the FP waivers. In their 2008 report (Sonfield et al., 2008b), Guttmacher described differences and innovations in outreach, enrollment and service delivery. States with FP waivers have conducted outreach to both potential clients (through websites, other public assistance agencies, etc.) and health care providers. Some states reported having a specific goal to increase the number of private providers participating. Enrollment innovations included automatic enrollment, use of data bases to confirm personal information (including citizenship), and point of service enrollment. Most of the FP waiver programs have made an effort to include a variety of services, with states often using their own funds for some coverage (Sonfield et al., 2008b).

2.5.1.7 **Distribution of Publicly-funded Family Planning Clinics by Organization Type**

As noted above, publicly-funded family planning clinics (*Title X* and *non-Title X)* can be classified into five different types of organizations: local health department (LHD); Planned Parenthood affiliate (PP); hospital; community health center (CHC); and, "other" independent organization. As documented by Guttmacher (Guttmacher, 2009), the 2006 proportionate distribution of publicly-funded clinics by organizational type varied considerably from state to state (Table V). While the distribution in some states was skewed toward one or two types of organizations, other states included a more even distribution of clinics across the organizational types. For some states the distribution of organizations may be closely related to the Title X grantee, but in other

TABLE V

PERCENT DISTRIBUTION OF ALL[a] PUBLICLY-FUNDED FAMILY PLANNING CLINICS BY ORGANIZATION TYPE BY STATE UNITED STATES, 2006[b]

State	Clinic Percent Distribution by Organization Type[c] (State Total = 100%)					Total # of Clinics
	Hospital	LHD	PP	CHC	Other	
Alabama	1.8	50.0	2.4	45.2	0.6	166
Alaska	1.8	13.8	3.7	8.3	72.5	109
Arizona	14.1	21.4	10.9	34.4	19.3	192
Arkansas	0.0	67.4	1.4	30.6	0.7	144
California	16.3	16.1	9.7	24.9	33.0	1008
Colorado	12.9	29.0	16.1	37.4	4.5	155
Connecticut	15.7	0.0	27.1	47.1	10.0	70
Delaware	0.0	28.6	17.9	17.9	35.7	28
Florida	4.4	57.0	7.8	27.4	3.4	321
Georgia	1.9	78.8	1.6	16.3	1.3	312
Hawai'i	5.1	12.8	7.7	46.2	28.2	39
Idaho	6.4	52.6	2.6	29.5	9.0	78
Illinois	7.9	28.3	9.4	42.1	12.2	254
Indiana	12.0	8.7	41.3	23.9	14.1	92
Iowa	13.2	11.0	27.5	8.8	39.6	91
Kansas	0.9	80.6	3.7	9.3	5.6	108
Kentucky	2.0	77.0	2.6	13.3	5.1	196
Louisiana	5.3	72.6	2.1	15.8	4.2	95
Maine	3.8	0.0	5.0	42.5	48.8	80
Maryland	5.1	44.2	7.2	29.7	13.8	138
Massachusetts	17.7	0.0	2.8	31.2	48.2	141
Michigan	11.6	40.7	13.7	24.9	9.1	241
Minnesota	8.6	12.5	15.8	13.8	49.3	152
Mississippi	1.2	56.4	0.6	39.0	2.9	172
Missouri	4.3	20.0	10.8	30.8	34.1	185
Montana	1.5	35.8	9.0	10.4	43.3	67
Nebraska	22.5	0.0	12.5	10.0	55.0	40
Nevada	5.1	40.7	8.5	16.9	28.8	59
New Hampshire	8.6	2.9	20.0	37.1	31.4	35
New Jersey	18.4	5.1	30.6	32.7	13.3	98
New Mexico	3.0	26.5	3.0	40.5	27.0	200
New York*	28.3	11.8	19.7	30.9	9.4	417
North Carolina	3.3	63.0	4.4	23.2	6.1	181
North Dakota	2.9	47.1	0.0	14.7	35.3	34
Ohio	13.7	21.6	20.5	30.5	13.7	190
Oklahoma	2.5	55.9	5.0	3.1	33.5	161
Oregon	5.1	63.2	11.8	13.2	6.6	136
Pennsylvania	24.7	3.0	14.9	28.0	29.4	296
Rhode Island	6.3	0.0	3.1	40.6	50.0	32
South Carolina	1.4	51.8	0.7	44.7	1.4	141
South Dakota	3.6	34.5	2.4	29.8	29.8	84
Tennessee	4.1	64.9	1.5	21.1	8.2	194

TABLE V (continued)
PERCENT DISTRIBUTION OF ALL[a] PUBLICLY-FUNDED
FAMILY PLANNING CLINICS BY ORGANIZATION TYPE BY STATE
UNITED STATES, 2006[b]

State	Clinic Percent Distribution by Organization Type[c] (State Total = 100%)					Total # of Clinics
	Hospital	LHD	PP	CHC	Other	
Texas	8.2	23.7	19.5	22.3	26.3	426
Utah	7.2	40.6	10.1	20.3	21.7	69
Vermont	3.2	0.0	58.1	22.6	16.1	31
Virginia	1.6	70.3	4.9	19.8	3.3	182
Washington	4.7	14.4	21.9	41.4	17.7	215
West Virginia	5.4	33.1	0.7	37.2	23.6	148
Wisconsin	2.5	14.8	24.6	22.1	36.1	122
Wyoming	0.0	28.2	2.6	15.4	53.8	39
Total All States	9.2	33.6	10.6	26.8	19.8	

[a] All clinics includes both Title X and non-Title X clinics.
[b] Guttmacher, 2009.
[c] Organization types are: LHD = Local Health Department; PP = Planned Parenthood; CHC = Community Health Center.

states, where there is a large percentage of *non-Title*-X clinics, the proportionate distribution may be less reflective of the Title X system.

As seen in Table V, across all states, LHDs had the strongest representation among clinics (34%), while CHCs followed closely representing 27% of all clinics. The diverse group of independent organizations categorized as "Other" came next at 20%, while PP and hospital clinics each represented about 10% of all publicly-funded family planning clinics in the United States. However, across the states the distribution of organizational type varied considerably from these averages. Representation of LHDs ranged from 0% (no clinics) in five states to 81% of clinics in Kansas, with the median at 28%. Oklahoma had the lowest percentage of CHC clinics (3.1%), while Connecticut had the highest percentage at 47, with a median of 26%. Alabama had very few "Other" clinics (0.6%), while 73% of Alaska's clinics were "Other", but the median was only 18.5%. North Dakota had no Planned Parenthood clinics, while in Vermont 58% of the publicly-funded clinics were Planned Parenthood clinics, but the median was a relatively low 8.5%. Hospitals had the lowest mean and median (5%), which reflects the tight range of 0% in three states (Arkansas, Delaware and Wyoming) to 28% in New York.

2.5.2 **State Variation in Publicly-funded Family Planning: Geographic and Financial Access**

With the many differences in the organization and funding of subsidized family planning services, as might be expected the inputs and outputs vary also. Described below are five state indicators of geographic and financial access for which comprehensive data are occasionally available.

These indicators are a result of the data gathering and compilation efforts of the Guttmacher Institute. The two geographic indicators make use of the information on the location of publicly-funded clinics to look at access at both the county and state level. The other three indicators use Guttmacher's estimates of WINSS, and either information Guttmacher has gathered on WINSS served at publicly-funded clinics, or state expenditure data Guttmacher has collected from multiple governmental and non-governmental agencies in each state. The two most recent years for which data on WINSS served are available are 2006 (Guttmacher, 2009) and 2008 (Frost et al., 2010). The two most recent years for which finance information is available are 2006 (Sonfield et al., 2008a) and 2010 (Sonfield and Gold, 2012).

2.5.2.1 Number of Publicly-funded Family Planning Clinics per WINSS

A broad measure of geographic access by state is the number of publicly-funded clinics per 10,000 WINSS in a state. As already mentioned, publicly-funded family planning clinics include both *Title X* and *non-Title-X* clinics. In 2006, the most recent year for which this information was available, Guttmacher (2009) reported that the number of clinics per 10,000 women ranged from 2.5 in New Jersey to 28.3 in Alaska; although all states but Alaska were below 20 clinics per 10,000 women. The median was 5.6, and the mean was 6.2 clinics per 10,000 women.

2.5.2.2 Geographic Distribution of Publicly-funded Family Planning Clinics

Using county-level data collected by Guttmacher, we can measure geographic access by calculating the proportion of counties in a state that do not have a public clinic. This has been done in the past by Guttmacher, and they found considerable

variation across the states (Guttmacher, 2006a). More recent raw data has been provided by Guttmacher, and will be used for this study.

2.5.2.3 **Dollars Spent for Family Planning Services per WINSS**

As noted above, the most recent Guttmacher tabulations of public expenditures for family planning services are for 2006 (Sonfield et al., 2008a) and 2010 (Sonfield and Gold, 2012), while the most recent tabulations of WINSS are for 2006 (Guttmacher, 2009) and 2008 (Frost et al., 2010). Therefore, Table VI shows, for each state, the funds expended per WINSS in 2006, the most recent year for which WINSS and spending data are both available. (Note: This is not women served, but women in need of services, and thus is considered an indicator of a state's interest in providing funds to serve those in need.) The 2006 expenditures data included separate tabulations for family planning client services, family planning outreach and education activities, as well as sterilizations. Using the Guttmacher data, we have calculated expenditures per WINSS for family planning client services (excluding sterilizations), and for family planning clients services and outreach and education activities combined. Because the cost of sterilizations is considerably more than other family planning services, and in most states those costs are almost exclusively Medicaid reimbursements, we have not included sterilization expenditures in our comparisons.

In 2006, the family planning client services expenditures per WINSS varied considerably by state (Table VI), both without and with outreach expenditures. In 2006, Oregon spent the most per WINSS ($279/WINSS), while Hawaii spent the least ($20/WINSS). Although for a few states outreach expenditures were considerable, for most states these expenditures are not significant relative to client services.

TABLE VI

PERCENT OF WOMEN IN NEED OF SUBSIDIZED FAMILY PLANNING SERVICES (WINSS)[a] WHO RECEIVED SERVICES IN A PUBLICLY-FUNDED CLINIC[b], AND FUNDS SPENT PER WINSS[c] AND WINSS SERVED[d] IN A PUBLICLY-FUNDED FAMILY PLANNING CLINIC, BY STATE AND MEDICAID WAIVER STATUS[e] UNITED STATES, 2006 AND 2008

State	FP Waiver 2006 or 2008[e]	Proportion of WINSS *Served*		Funds Spent ($) per WINSS 2006[h]		Funds Spent ($) per WINSS *Served* 2006[i]
		2008[f]	2006[g]	Client Services Only	Client Services plus Outreach	
Alabama	Yes	50.0	30.8	116.0	116.2	377.0
Alaska		89.9	97.3	49.9	51.2	51.3
Arizona	Yes*	22.4	31.9	94.2	94.2	295.5
Arkansas	Yes	45.9	65.2	112.4	113.5	172.3
California	Yes	64.5	54.8	162.5	164.8	296.5
Colorado		46.6	51	34.0	34.0	66.7
Connecticut		50.4	50.5	106.6	107.1	211.0
Delaware	Yes*	53.3	56.5	115.6	115.6	204.7
Florida	Yes*	32.5	35.6	66.2	66.5	186.1
Georgia		30.2	34	32.7	32.7	96.1
Hawai'i		30.2	22.1	20.3	84.2	91.8
Idaho		35.2	42.7	73.7	76.6	172.6
Illinois	2008	29.9	32.6	72.6	72.6	222.9
Indiana		30.9	40.4	28.0	28.3	69.3
Iowa	Yes	50.8	58.9	83.3	83.3	141.3
Kansas		29.8	32.5	95.0	95.3	291.9
Kentucky		46.0	52.9	262.9	262.9	497.3
Louisiana	Yes	24.5	22.2	68.6	91.5	309.0
Maine		46.7	50.2	98.9	108.6	197.0
Maryland	Yes	37.5	39.7	155.6	155.6	392.2
Massachusetts		39.3	46.3	94.4	95.7	204.1
Michigan	Yes	27.1	40.6	69.3	69.6	170.6
Minnesota	Yes	36.8	40.9	42.0	42.7	102.8
Mississippi	Yes	40.4	42.6	67.3	69.1	158.2
Missouri	Yes	28.6	33.4	86.5	86.5	258.9
Montana		57.2	56.1	55.0	55.0	98.0
Nebraska		23.3	39.5	51.1	52.6	129.1
Nevada		31.6	30.5	41.8	42.8	137.1
New Hampshire		48.6	50.4	43.0	47.5	85.3
New Jersey		37.6	38.1	143.9	143.9	377.2
New Mexico	Yes	53.2	68.3	85.6	86.7	125.2
New York*	Yes	40.7	38.7	126.4	134.6	326.9
North Carolina	Yes	31.2	34.8	111.3	111.3	320.1
North Dakota		48.9	52.6	55.6	55.6	105.7
Ohio		24.9	30.0	49.9	56.5	166.5
Oklahoma	Yes	57.8	46.2	136.7	151.0	296.0
Oregon	Yes	60.3	61.9	278.9	279.7	450.7

TABLE VI (continued)
PERCENT OF WOMEN IN NEED OF SUBSIDIZED FAMILY PLANNING SERVICES (WINSS)[a] WHO RECEIVED SERVICES IN A PUBLICLY-FUNDED CLINIC[b], AND FUNDS SPENT PER WINSS[c] AND WINSS SERVED[d] IN A PUBLICLY-FUNDED FAMILY PLANNING CLINIC, BY STATE AND MEDICAID WAIVER STATUS[e]
UNITED STATES, 2006 AND 2008

State	FP Waiver 2006 or 2008[e]	Proportion of WINSS *Served* 2008[f]	Proportion of WINSS *Served* 2006[g]	Funds Spent ($) per WINSS 2006[h]: Client Services Only	Funds Spent ($) per WINSS 2006[h]: Client Services plus Outreach	Funds Spent ($) per WINSS *Served* 2006[i]
Pennsylvania		47.6	41.7	117.9	118.9	282.9
Rhode Island	Yes	44.5	32.0	58.1	58.1	181.6
South Carolina	Yes	44.4	44.4	121.2	131.0	272.7
South Dakota		51.8	64.0	42.3	42.3	66.0
Tennessee		42.7	26.6	161.0	161.0	605.8
Texas		32.5	32.2	59.3	59.3	184.3
Utah		24.6	25.9	24.6	26.6	94.8
Vermont		70.8	72.8	93.4	114.4	128.4
Virginia	Yes	25.8	26.6	131.7	131.7	495.7
Washington	Yes	49.4	60.9	240.7	242.2	394.9
West Virginia		51.9	48.1	93.2	93.9	193.9
Wisconsin	2006	41.4	41.9	133.5	134.7	319.0
Wyoming	Late 08	48.8	58.0	236.4	238.7	407.5

[a] Women in Need of Subsidized Family Planning Services (WINSS) as defined by the Guttmacher Institute (Henshaw and Frost, 2009).

[b] Publicly-funded clinics as defined by the Guttmacher Institute includes Title X and non-Title X clinics.

[c] Proportion of WINSS served as reported by various agencies, but excluding private providers.

[d] Funds(S) spent per WINSS calculated using Guttmacher figures on spending for client services and outreach and education activities per WINSS as calculated by the Guttmacher Institute (Sonfield et al., 2008a).

[e] Waiver status from: Guttmacher, 2012e.

[f] Guttmacher calculation in: Frost et al., 2010.

[g] Guttmacher calculation in: Guttmacher, 2009.

[h] Guttmacher calculation in: Sonfield et al., 2008a.

[i] Guttmacher calculation in: Sonfield et al., 2008a.

2.5.2.4 **Need Met by Publicly-Funded Clinics**

As seen in Table VI, the proportion of WINSS who got family planning services from publicly-funded clinics varied from state to state, and from year to year. In 2006 the proportion of need met by all publicly-funded clinics (*Title X* and *non-Title X*) ranged from 22% in Hawaii and Louisiana to 97% in Alaska (Guttmacher, 2009). And in 2006, more than 50% of the need was met in 18 states, while 16 states met less than 35% of their need in public clinics (Guttmacher, 2009). In 2008, the lowest proportion of need met was 22% (in Arizona) and the highest proportion was again in Alaska, but 7 percentage points lower at 90% (Frost et al., 2010). While in 2008 more than 50% of the need was met in fewer states (12 vs. 18 states), just one more state (17 vs. 16) met less than 35% of their need in public clinics, leaving more states (21) meeting just 35% to 50% of the need in 2008 (Frost et al., 2010) than in 2006 when 16 states met 35% to 50% of the need (Guttmacher, 2009).

Private providers serving Medicaid clients may be an especially important source of family planning services for women postpartum (obtaining contraception at a postpartum visit), especially in states with Medicaid expansions that have encouraged the participation of *private providers*. Unfortunately, estimating the need met for publicly-funded family planning services by *private providers* (participating in Medicaid) has not been possible at the state level (Frost et al., 2010).

2.5.2.5 **Dollars Spent for Family Planning Services per WINSS Served**

Using the same 2006 expenditure figures as above and the 2006 Guttmacher estimation of the number of women served in publicly-funded clinics (Guttmacher, 2009), Table VI also shows the costs to each state of each woman served in a public

clinic. Because women enrolled in Medicaid served by *private providers* are not included in the count of those served, but the funding figures include costs for all WINSS served, those states with proportionally more women who obtain family planning services from a *private provider* may have an inflated cost per woman served in a public clinic. This figure may also be substantially affected by the contraceptive methods offered, as well as the funds available and the amount spent on infrastructure and outreach. Differences in health care costs from state to state might also account for some of the variation. Just as the amount spent per WINSS varied from state to state, the amount spent per WINSS served varied across the states (Table VI), ranging from $51 (Alaska) to $606 (Tennessee). Higher amounts may reflect any of the above.

2.5.3 **Evidence of Impact of Differences in Publicly-funded Family Planning on Contraceptive Use**

Since 1972 researchers focusing on family planning programs in developing countries have developed and used a "program effort index" (Ross and Stover, 2011; Ross and Smith, 2001) to assess current program status (effort or strength), as well as measure improvement over time. This index uses measures of policies, service, evaluation and access. Improvement in the index has been linked to improvements in contraceptive use (Ross and Stover, 2001; Ross and Smith, 2011). Unfortunately, the US has no such index, despite much variation in the subsidized family planning "system" across the states. And, although researchers have made efforts to assess the quality of family planning services in the U.S., a recent review of the literature on this topic found very diverse studies that had no consistent measures for comparison and often weak designs (Becker et al., 2007). In particular, the studies of the relationship

between the quality of services and contraceptive behavior were found to be inconsistent. None of the 29 studies on the quality of family planning services assessed quality at a system level and the relationship between outcomes and level of quality.

Without any source of a systematic comparison of publicly-funded family planning systems across the states, we are left to describe the differences in subsidized family planning services, assess the level of variation, and present any analytic evidence as to the significance of the differences across the states. In the previous sections, we described the state variation in publicly-funded family planning services. Below we discuss the level of variation in organization and funding, as well as geographic and financial access, and its potential to make a difference in use of subsidized family planning services across the states, and provide any analytic evidence regarding the significance of the differences for PP contraceptive use.

2.5.3.1 State Variation in Publicly-funded Family Planning: Organization and Funding Sources

The *Title X* program aggregates their grantee reports of the number of clients served, the income level of clients, as well as the contraceptive method(s) provided (Fowler et al., 2009). At the national level, *Title X* has a research program (Title X Service Delivery Improvement Research program); however, in a report that summarized an outside review of the program, Sonenstein et al. (2004) noted there was no systematic research that would allow for comparisons of quality and outcomes across *Title X* programs. Guttmacher researchers have noted differences in provision of services between *Title X* and *non-Title X* clinics of the same type (Frost et al., 2012a).

Our review of *Other Sources of Publicly-funded Family Planning Services* (see 2.5.1.2) documented considerable variation in the proportion of *non-Title X* vs. *Title X* clinics across the states, as well as the percent of WINSS served by *Title X* vs. *non-Title X* clinics. Perhaps the most important inference from this finding is the dilution of the importance of any differences in Title X across the states, relative to differences in all publicly-funded clinics especially since, in some states, Title X is actually the minority provider of subsidized services in a clinic setting. Therefore, any structural or financial barriers to access should reflect *all* publicly-funded clinics in a state.

Not having information on the proportion of subsidized family planning services provided by *private providers* (via Medicaid reimbursement) limits our ability to thoroughly understand the variation in publicly-funded family planning services across the states. There is evidence that the contraceptive methods made available by *private providers* are different than those provided by *Title X* clinics (CDC, 2011) and other differences have been noted (Frost, 2001; Landry et al., 2008). These types of differences (in the services provided by *private providers)* may have an impact on postpartum contraceptive use in states where the proportion of subsidized services provided by *private providers* is relatively high. The lack of information on the relative role of *private providers* in subsidized family planning services precludes any comparisons across states.

The *Distribution of Funds for Subsidized Family Planning Services* for publicly-funded family planning services does vary across the states (Table III). States with waivers and a few other states without waivers rely much more on Medicaid funds than those without waivers. Although there are a few states that did not allocate any of their own funds to family planning services, when considering the allocation of other federal

funds at the discretion of the state, almost all states allocate either state or federal funds (MCH, TANF, or SSBG). In addition some of those states that allocated relatively little of their own funds or other federal funds to FP services actually are those who instead have shown strong support for family planning services by obtaining a FP waiver. Because of this ability to substitute one source for another, we think the total amount of funds allocated to family planning services is more likely to affect access to postpartum contraception than which funding sources are used.

We documented considerable variation in *Medicaid Eligibility* limits (Table IV) for parent/continuous (non-pregnant adult), pregnancy, and family planning-only coverage (*FP waiver*). Although we do not have good information about the actual source, or timing of receipt, of contraceptive methods for postpartum use (*i.e.,* prenatal prescription, delivery hospital, postpartum prescription/provision, or family planning clinic or *private provider* after postpartum period*),* in our review of individual characteristics, we found evidence that both prenatal care and postpartum care increase the likelihood of PP use. Whether the mechanism for this difference is actually obtaining the method through the care, or receiving information about method options and the importance of postpartum contraception, it is reasonable to hypothesize that states with higher eligibility limits (as percent of FPL) for both pregnancy-only eligibility and *parent/continuous* eligibility coverage would result in more low-income women using postpartum contraception. Therefore any assessment of financial barriers should consider Medicaid eligibility for pregnancy care, as well as parent/continuous care. For the few states who have *parent/continuous* coverage that extends to at least the same income level as some states' *FP waiver*, we plan to consider these high income levels for parent/continuous Medicaid equal to that of a *FP waiver*.

By virtue of being research and demonstration projects, considerable evidence of the positive effect of *FP waivers* on access to family planning services has been generated, although very little specifically for PP use. CMS contracted for a national evaluation (Edwards et al., 2003) of the *FP waivers* in six states (Alabama, Arkansas, California, New Mexico, Oregon, South Carolina). This evaluation documented that the waivers were: budget neutral (by estimating the births averted among waiver participants and then comparing the potential costs of these births with the actual costs of providing the family planning services) in all six states; and, resulted in considerable costs savings for both the federal government and the states.

In addition to the national evaluation, each waiver state has been required to develop its own evaluation plan, and as part of the waiver renewal process, submit to CMS the results of that evaluation. Guttmacher has reviewed most of the state reports and published an overview of the results (Sonfield and Gold, 2011). They noted that states have documented an increase in clients obtaining family planning services, and providers participating in Medicaid, both in number and geographic spread. As to actual contraceptive use, states have found increased use, and use of more effective methods as well as increased continuity of use. Using several different methodologies, states have documented a decrease in the birth rate among waiver participants, and a few have documented a decrease in unintended pregnancy. Lastly, and perhaps most important is evidence of the effect of a *FP waiver* on PP use, as a few states have documented an increase in birth spacing. Under a *limited waiver (2 years postpartum),* over a ten-year period, Rhode Island noted a decrease (41% to 28%) in the proportion of Medicaid-funded births with an interval less than 18 months.

Outside the context of CMS requirements, policy researchers have conducted other evaluations with a focus on one or more states. Using Medicaid data, Kearney and Levine (2008) noted a two to three times increase in women receiving family planning services with *income-based waivers,* but not with *limited waivers.* Both Kearney and Levine (2008) and Lindrooth and McCullough (2007) found lower birth rates after the implementation of *income-based waivers.* Although Lindrooth and McCullough (2007) found no significant decrease in birth rates for *limited waivers,* they noted that excluding one state (Arizona) would have resulted in a significant difference, and that their study may have not had significant power. Lindrooth and McCullough (2007) found significant maternal and infant health care costs offsets with *income-based waivers,* reduced net program costs except in California (which had a much broader program), and for the states, considerable Medicaid cost savings since the federal reimbursement rates for family planning services are considerably greater than those for prenatal care and deliveries. At an estimated cost of $6800 to avoid one birth, Kearney and Levine (2008) concluded that family planning waivers were cost-effective relative to other programs to reduce teen and unwanted pregnancies. However, in a 2012 study by Kost, Finer and Singh (2012) of unintended pregnancy variation across the states, having a *FP waiver* was modeled, but was not found to contribute significantly to the variation in unintended pregnancy across the states.

Although there are some differences in *Medicaid Coverage of and Access to Family Planning Services,* there was not consistent variation across the states. The most far-reaching difference in method coverage is the lack of coverage for sterilization, but there is not sufficient variation (only the case in a couple of states). There is also some evidence that a few states make only minimal efforts (*e.g.*, Medicaid booklet) to

inform Medicaid clients of their option to go out of network to obtain family planning services which might not be offered by their providers. There is no analytic evidence for the importance of these differences.

The variation we found in the *Distribution of Subsidized Family Planning Clinics by Organization Type* may be an important structural difference across the states, but is only important if we have evidence that access, quality of care, or services provided might vary by organization type. In a comparison of family planning clinic organization types Klerman et al. (2007) found that FQHCs were less likely to offer emergency contraception (EC) and have all contraceptive methods, while health departments had less flexible hours. Frost et al. (2012a) found differences between clinics with a reproductive focus and those with a primary care focus. Differences in method availability might especially affect postpartum use.

2.5.3.2 State Variation in Publicly-funded Family Planning: Geographic and Financial Access

In a study of the effect of Medicaid funding restrictions on reproductive choice (Hass-Wilson, 1997), the *Number of Publicly-supported Family Planning Clinics per WINSS* was used, but was not found to be significant. However, it is a measure that should be considered given the extent of the variation across the states.

As to the *Geographic Distribution of Publicly-supported Family Planning Clinics,* the recent study of unintended pregnancy variation across the states tested the proportion of counties without a clinic and found it to be significantly related to unintended pregnancy (Kost et al., 2012), but in the opposite direction than would be expected. Although a smaller study (Goodman et al., 2007) did not find a relationship

between unintended pregnancy among teens and geographic proximity measured by travel time and actual distance, given that the unintended pregnancy study was at the state-level as this study will be, we would propose to include this measure in our analysis.

The *Dollars Spent for Family Planning Services per WINSS* also varied considerably. Unlike the *Need Met* measure, this funding figure includes services provided by private providers. And, it only shows the potential number of women, not the actual number of women served as above, so it is not biased by the lack of information on *private providers*. This measure does have the limitation that the amount expended per WINSS who received services may be heavily influenced by the type of methods for which access is easy, and it has not been adjusted for the cost of health care in the state. An adjusted version of this measure was used by Kost, Finer and Singh (2012) in their regression analysis of unintended pregnancy and was not found to be significant.

In looking at the *Need Met by Publicly-Funded Clinics* we found a considerable range in the amount of need met by publicly-funded clinics. However, the usefulness of this information is limited due to the lack of information on WINSS receiving services from *private providers*, which may vary across the states, especially in states with *FP waivers*. This measure was used in the recent Kost, Finer and Singh (2012) regression analysis of variation in unintended pregnancies across the states, and was not found to be significant.

Although there was considerable variation in the *Dollars Spent for Family Planning Services per WINSS <u>Served</u> in a Public Clinic* this variation may be partly due to the differences in cost of health care across the states for which it has not been

adjusted. In addition this measure shows the total number of dollars, but not the total number of women served, since it doesn't include those who were served by a *private provider*. The third limitation of this figure is that it may be heavily affected by what services are needed and provided, including the mix of methods offered, which does vary across the states.

2.5.4 **Summary and Implications for Research**

This chapter has described the many differences in the structure and financing of subsidized family planning services across the states. And subsequently we discussed the level of variation across the states and the potential importance of the differences. In addition we have provided, when available, any analytic evidence that these differences might be associated with postpartum contraceptive use.

There was very little analytic evidence of the importance of these structural and financial differences in subsidized family planning services, but given the paucity of direct study of these barriers or facilitators of access to publicly-funded family planning services this is not surprising. Therefore, we would conclude that despite the paucity of analytic evidence, it is important to explore the state differences that have the most variation, and from a big picture point of view we think could possibly have an impact on postpartum contraceptive use. With these criteria in mind, rather than actual evidence of their relationship to postpartum contraceptive use, we planned to explore the association of the following structural and financial barriers or facilitators of access to postpartum contraception to variation in PP use across the states: 1) differences in Medicaid eligibility for coverage during pregnancy; 2) FP waiver status; 3) proportion of publicly-funded clinics that are in health departments; 4) number of publicly-funded

family planning clinics per WINSS; 5) geographic distribution of publicly-funded family planning clinics per WINSS; and 6) dollars spent for family planning services per WINSS. Which we actually used depended on the variation across the study states.

2.6. Literature Part 5: State Variation in Reproductive-Health-Related Policies and Other State-level Influences on Promotion of, and Access to, Postpartum Contraception

In the previous section we detailed differences across the states in subsidized family planning services, and based on our findings we proposed analyzing the association between three state-level organizational and funding factors, as well as three geographic and financial access factors, and postpartum contraceptive use. In this section we consider additional state-level factors that might be associated with PP use. We describe below state policies related to reproductive health that contribute to, or detract from, a positive family planning environment as well as other state-level influences on promotion of and access to postpartum contraception.

2.6.1 State Policies

Just as subsidized family planning services vary across the states, so do state policies specific to services that low-income women are able to receive, and reproductive health policies that apply to all women in a state. Although some program-specific policies may be put in place by administrators of those programs, most of the general reproductive health policies are either legislated, or put into place by an elected official or her/his political appointee. Policies may directly affect access to services or methods, or indirectly affect use through education or a state's general attitude towards

reproductive health and rights. We describe below the relevant reproductive health-related policies as well as how they differ across the states.

2.6.1.1 **Religious Refusals**

Shortly after the 1973 Roe vs. Wade decision, the United States Congress passed the Church Amendment (named for its author Senator Frank Church, Democrat of Idaho), allowing religious institutions and individuals to refuse to provide abortions and sterilization procedures and still receive federal funds, including Medicaid and Medicare payments. Since then Congress has passed additional laws that, at the federal level, have broadened the right to refuse, and forbid discrimination against employees who refuse to provide services, including reproductive health services, based on their religious beliefs (Guttmacher, 2012f).

After passage of the Church amendment, states followed suite and passed refusal laws and employee anti-discrimination laws, protecting both individual providers and institutions. Often going beyond the federal laws, some states allow refusals for the provision of contraceptive services, as well as abortion and sterilization procedures. Laws allowing refusal to perform abortions are almost universal among the states (Guttmacher, 2012f); only four states do not have such laws (Alabama, New Hampshire, Vermont, West Virginia). Sterilization refusal laws are the next most common, but there are fewer of these. At the start of 2012, only 17 states had a law allowing individual providers to refuse to provide sterilization services, and only 16 states had a law allowing institutions to refuse sterilizations, four of which limit the refusal to private institutions. For the most part, the same states permit individual and institutional refusals; only three states allow one or the other.

Contraceptive refusal laws are even less common than sterilization refusal laws, but expand refusals to pharmacists. Ten states allow individual providers to refuse to provide contraceptive services, while six allow refusals by pharmacists and another five states laws are written broadly enough to apply to pharmacists. As with sterilization refusals, institutional refusals of contraceptive services may be limited to private institutions. Overall, nine states allow institutions to refuse to provide contraceptive services, five of which apply to private institutions only (Guttmacher, 2012f). Most states (8 of 10) that have individual refusal laws also allow institutional refusals.

2.6.1.2 Limitations on Use of State Funds for Publicly-funded Family Planning Services

Some states have tried in various ways to restrict the use of federal funds for family planning services, as well as their own funds (Guttmacher, 2012h). As of 2012, four states have a policy that prohibits state funds from being used for abortion counseling or referral. Three states do not allow entities that provide abortions to receive family planning funds. And three states give priority to non-abortion providers when awarding their own state family planning funds.

2.6.1.3 Sex Education Policies

State policies regarding sex education can be both broad and their specific. States have put into place policies that address three different aspects of sex education: a general mandate to provide sex education and/or HIV education; a requirement that when provided, sex education must meet certain standards; and laws associated with parental involvement in sex education and HIV education (Guttmacher, 2012g). As of

January 2012, less than half of all states (21) mandated sex education, and all but one of these states included HIV education in their mandate. General state requirements for sex education, when provided, include medical accuracy and age appropriate content. Only three states require parental consent, while the large majority (35) require that parents be given an opt out opportunity

Content requirements when sex education is provided focus on both information and life skills (Guttmacher, 2012g). Only 18 states require contraception be covered, and among these states only 12 have a sex education mandate; the others require contraceptive information *if* sex education is offered. In Mississippi contraception can only be covered with approval of the state education department. A large majority of states (37) mandate discussion of abstinence, either covering it (11) or stressing it (26). Just over half of states require some life skills development, which may include avoiding coercion, health decision-making and/or family communication.

2.6.1.4 **Other Reproductive Health-Related Policies**

States have enacted many other policies that either promote or restrict information or access to reproductive health services. Abortion has received the most attention. Most policies enacted by state legislatures since the 1973 Roe vs. Wade decision seek to reduce access to abortions or dictate how the services are provided (Guttmacher, 2012a).

States have also passed many laws regarding consent for reproductive health services to minors (Guttmacher, 2012b). While all states allow all minors to consent to treatment for a sexually transmitted infection, and 20 states allow all minors to consent to contraceptive services, another 26 states allow only some categories of minors to

consent (4 have no law). A majority of states (32) allow minors to consent for prenatal care, although some allow (but do not require) a physician to inform the parents of the minor. Only two states allow minors to consent to abortion; most require parental notification or consent.

States have implemented policies regarding emergency contraception (EC) that either expand access or restrict access (Guttmacher, 2012c). States have expanded access by mandating provision of information (16 states) and/or dispensing it (12 states) in emergency rooms for sexual assault. Other policies that expand access include pharmacists dispensing EC without a prescription, and requiring a pharmacy (four states) or pharmacist (1 state) to fill a prescription. On the other hand, some states have enacted policies that allow pharmacists (6 states) or pharmacies (2) to refuse to provide EC.

2.6.1.5 **Contraceptive Insurance Coverage Mandates**

Another area where states have set reproductive health policy is insurance coverage of prescription contraceptive drugs and devices. As of January 2012 (Guttmacher, 2012d) more than half of the states (28) required insurance coverage for prescription drugs and devices when they cover other prescription drugs, and 17 of those states also required coverage of outpatient services. However, in 20 of these 28 states there are refusal provisions of varying degrees. Only four states have the most limited refusal, for churches and church associations; while another seven states have a broader refusal that extends to religious schools, charities and universities, but not hospitals. The most extensive refusal laws, enacted in eight states, include all religious organizations, including some hospitals, and in two states the laws even include secular

organizations that have a moral or religious objection to coverage. Although Nevada's refusal provision is extensive, it only exempts religious insurers, not employers. Unfortunately, only 14 of the 20 states with a refusal clause in their coverage mandate require employee notification of the refusal (Guttmacher, 2012d).

Of note, as of 2012, under the ACA, new health plans must include contraceptive coverage. While clearly exempting religious institutions (churches, synagogues, mosques, etc.) from the requirement, other religiously-affiliated organizations were initially required to provide coverage. However, after much public outcry from some of these organizations, especially Catholic organizations, at this writing the responsibility for coverage has been shifted from the employer to the insurer; lawsuits have been filed against this compromise and are still working their way through the courts.

2.6.2 Other State-level Influences on Promotion of and Access to Postpartum Contraception

Our review of influences would not be complete without exploring any possible differences in other influences on *postpartum use*. The two areas we explore below reflect opposite ends of the spectrum of influences on *postpartum* use: state programs not focused on family planning, and a segment of the health care infrastructure that provides direct care for many women during pregnancy and the postpartum period.

2.6.2.1 Non-Family Planning Programs for Low-income Women

In addition to allocation of funds from TANF and the MCH and SSBG block grants, these programs may also encourage family planning services as part of their services. Although MCH programs should have an interest in interconception care, a

search of state Title V objectives in their electronic evaluation system (TVIS) did not identify any state that had an objective specific to postpartum contraceptive use. Both TANF and the SSBG may be portals for women to enroll in Medicaid. Other federally-funded programs, including home visiting programs such as Healthy Start, may also help promote postpartum contraceptive use. However, we did not find a systematic source for this information, and we think that the programmatic differences, and the significance of the differences, would be minimal.

2.6.2.2 **Catholic Health Care**

The Catholic Church has relatively well known beliefs against modern contraception, and in the U.S. is the largest religious provider of health care services. And, although many different Catholic orders "own" the many Catholic health care systems, and they function under the geographic boundaries of many different Bishops, all Catholic health care institutions are required to function under the "direction" of the United States Conference of Catholic Bishops. The Conference directs Catholic health care institutions by issuing "Ethical and Religious Directives for Catholic Health Care Services" (the *Directives*). The fifth edition of the *Directives* was issued in November 2009 (USCCB, 2009). The *Directives* clearly forbid abortion in any situation. And, as of the fourth edition (2001) of the *Directives* (USCCB, 2001), sterilization, the most common means of contraception in the U.S., was put on par with abortion in its hierarchy of prohibited services (CFFC, 2002). The *Directives* forbid Catholic institutions to "promote or condone contraceptive practices," but allow for married couples to be instructed in "methods of natural family planning" (USCCB, 2009). Despite multiple Catholic owners, in multiple states, the *Directives* are designed to

assure everyone has the same approach, which limits the ability of any one Catholic health system to make their own decisions based on community need.

2.6.3 **Evidence of Impact of State Policies and Health Care Infrastructure**

We described above the potential for state policies as well as a state's health care infrastructure to affect access to family planning programs. We consider below any evidence that these factors actually affect postpartum contraceptive use.

2.6.3.1 **State Policies**

Allowing *Religious Refusals* for contraceptive services may be especially detrimental for PP use since we suspect (no evidence available) that postpartum women are more likely to seek contraceptive methods from a *private provider,* and that based on the evidence of the relationship of prenatal and postpartum care to postpartum contraceptive use, that this care is a source of information and encouragement to begin using a contraceptive method in the postpartum period. As to the *Limitation of Use of State Funds for Subsidized Family Planning Services* there is no analytic evidence, and we hypothesize that this limitation might reduce access in some areas of a state, but would not rise to importance at the state-level on its own.

A requirement that contraceptive methods be taught as part of sex education is both illustrative of the general reproductive health environment in a state and more directly assures a better knowledge base for young adults in their early years of sexual activity. Most evaluations of sex education requirements focus on teenagers. However, a recent study of young adults (18-29 years old) found that the more women knew about contraception, the less likely they were to expect to have unprotected sex, the more

likely they were to be using a hormonal or long-acting reversible contraceptive method, and the less likely they were to be using no method (Frost et al., 2012b). This is just the most recent evidence of the importance of sex education in contraceptive use.

Although none of the *Other Policies* (i.e., emergency contraception, minor consent, abortion) related to reproductive health on their own could be expected to have a measureable impact on postpartum contraceptive use, we would suggest that as a group these policies reflect the general environment for reproductive health in a state. As such, they could affect the attitudes of some women regarding contraceptive use and therefore should be considered as a whole.

There is clear evidence that *Contraceptive Insurance Coverage Mandates* do make a difference (Sonfield et al., 2004) in access to contraception. However, because low-income women are much less likely to have this type of coverage, we do not think this policy would be important to consider as a stand-along factor in a study of PP contraceptive use among low-income women.

2.6.3.2 **Other State-level Influences on Promotion of, and Access to, Postpartum Contraception**

We were unable to document any *Programs for Low-income Women* that had a specific objective regarding postpartum contraception. Therefore we have no reason to further explore the relationship of these programs to *postpartum use.*

Although knowledgeable persons have documented that practices do vary by institution and diocese (Gallagher, 1997), there is no documentation of state-level variation in practices regarding contraception among *Catholic Health Care* facilities. However, there are differences in the proportion of delivery hospitals that are Catholic

and the proportion of deliveries that occur at Catholic hospitals across the states. And, if those receiving care at a facility that will only promote fertility awareness-based methods (FAM) are less likely to use postpartum contraception other than FAM, then there might be differences in PP use between states with a higher proportion of hospital obstetric services that are *Catholic Health Care* facilities than those with a smaller proportion.

2.6.4 **Summary and Implications for Research**

This section has described differences in state policies that might have an effect on low-income women's access to subsidized family planning services and subsequent use of contraception postpartum. Unfortunately, there is very little analytic evidence linking these policies to contraceptive use, or more specifically PP use. Indeed, for many of these factors there have not been any studies. It is to some extent for this reason that we think it is important to study some of these factors as a first step, or to provide additional evidence where there is very little, or where there are contradictory findings. We also think it is important to look at the broader "contextual" environment for family planning which may result from the combination of several policies.

With these reasons in mind, we propose to study the relationship between the following policies and PP contraceptive use: 1) religious refusals; 2) sex education policies; and 3) an index of other reproductive health-friendly policies. In addition, we propose to take this opportunity to be the first study of the proportion of obstetric services that are Catholic, and its association with postpartum contraceptive use.

2.7 Summary of Literature Review

The preceding literature review began by discussing national trends in contraceptive use, including postpartum contraceptive use and variation in both contraceptive use and postpartum contraceptive use across the states. However, the description was incomplete because of missing information: there were no data on national levels of postpartum contraceptive use, and there was no comprehensive information regarding postpartum contraceptive use among low-income women across the states.

The literature documented many individual characteristics related to contraceptive use and postpartum contraceptive use that may account for some of the variation in postpartum contraceptive use rates across the states. However, there is no research that documents how much of the variation in *postpartum contraceptive use* across the states may be due to these individual characteristics.

Considering the IOM barriers to personal health care (structural, financial and personal), we then focused our literature search on financial and structural obstacles, which because low-income women are the target population for publicly-funded family planning services, led us to explore differences in these services across the states. And, we found considerable variation in the structure, funding and organization of subsidized family planning services across the states, as well as state policies related to reproductive health. Unless all of the variation in the prevalence of PP use across the states is accounted for by individual characteristics that vary across the states, we hypothesize that some of the variation is associated with the differences in subsidized family planning services and/or reproductive health policies that we have documented. Therefore, we planned this study of state-level differences in access to subsidized family

planning services and policies and their relationship to postpartum contraceptive use as described in the following sections.

This study has many unique aspects that justify its implementation. As we have documented in our literature review, many researchers have studied individual characteristics (demographic, risk or protective markers) and behaviors related to contraceptive use generally, and specifically PP use. Researchers have also studied individual-level interventions that might increase contraceptive use generally, and specifically PP use. State and federal policies and programs have also been a focus of contraceptive use research, but most often simply identifying the number of women receiving a contraceptive method and the number of unintended pregnancies averted by their contraceptive use. This study will be unique in its focus on PP use among low-income women, and its study of state-level differences in the subsidized family planning system and policies that might affect low-income women's access to and use of postpartum contraception. It will complement the study of Kost, Finer and Singh (2012) on variation in unintended pregnancy rates in the U.S. and may point to aspects of the subsidized family planning system that should be addressed, and provide evidence of the influence of reproductive health policies on PP use and thus on unintended pregnancies and birth spacing.

3. RESEARCH OVERVIEW

Given the importance of postpartum contraceptive use in decreasing unintended pregnancies, increasing the length of birth spacing, and assuring any subsequent pregnancy occurs at the best time for the health of the mother and baby, the relatively recent surge in research on postpartum contraception has been very valuable. However, the preceding literature review identified remaining gaps in our knowledge of postpartum contraceptive use; this research was designed to address some of these.

As described in the Problem Statement (Chapter 1), the ultimate goal of this research was to assess the independent contribution of state-level factors to differences in postpartum contraceptive use across the states, specifically among low-income women 20-44 years of age. To reach this goal, we used multilevel modeling. Prior to the multilevel analysis we conducted descriptive and analytic (unadjusted and multivariable logistic regression) analyses of the association between maternal characteristics and PP contraceptive use utilizing national (National Survey of Family Growth) and state (Pregnancy Risk Assessment Monitoring System) survey data. For the multilevel analysis, we also utilized the individual-level PRAMS outcome and covariate data, as well as state-level data from multiple sources.

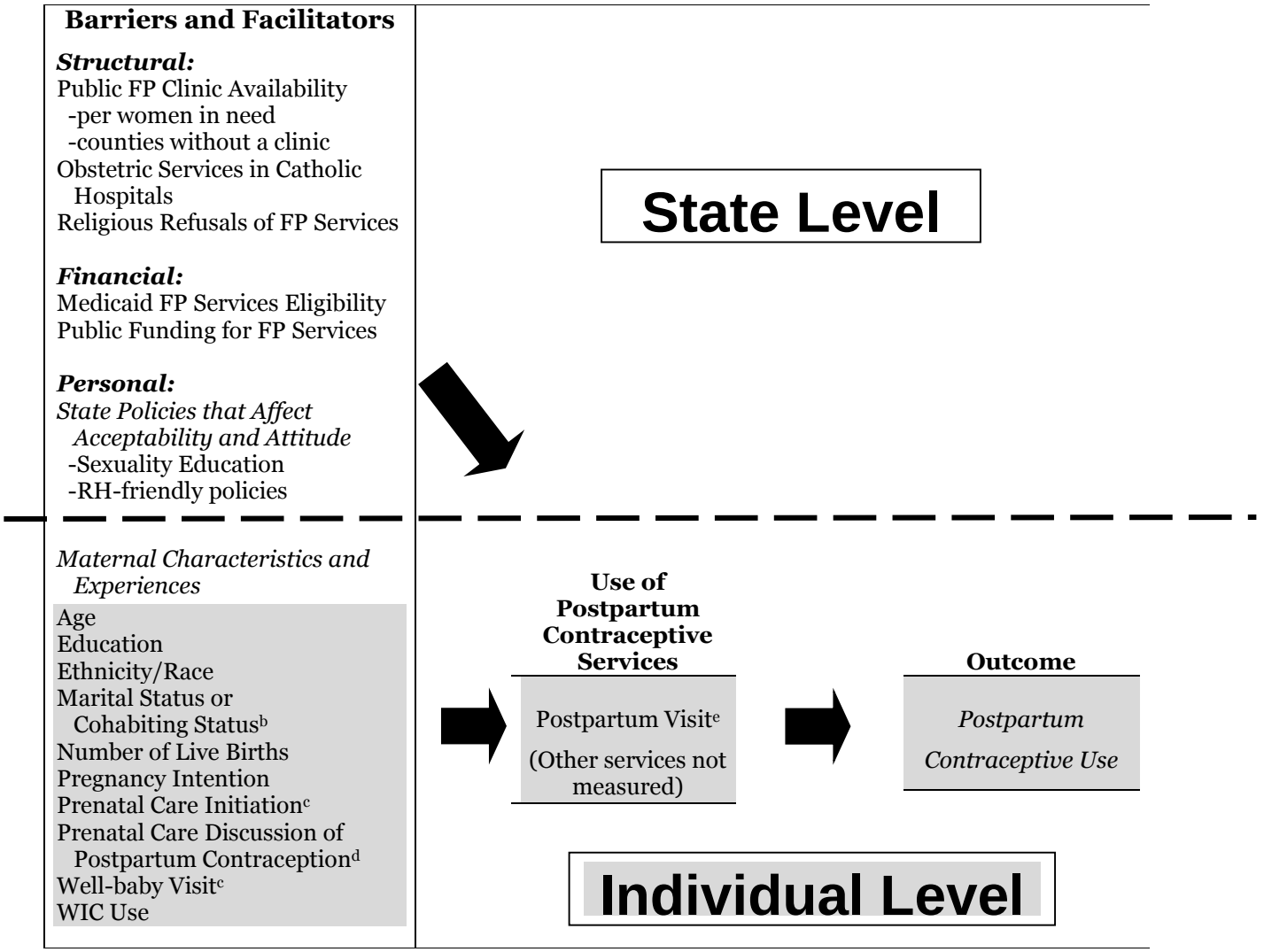
3.1 Refined Conceptual Framework

Our initial conceptual framework was the Institute of Medicine's "Model of Access to Personal Health Care Services" (Figure 1) which identified structural, financial, and personal barriers to access to health care services and ultimately health outcomes. Using this model to guide a review of the literature, we identified personal

factors already shown to be associated with postpartum contraceptive use. In addition, because prior research on state-level factors associated with PP use is lacking, in our review of the literature we focused on measureable structural and financial aspects of state family planning programs and health care delivery, as well as state policies that might be barriers to, or facilitators of, access to contraceptive information and services.

Based on this information and our plan to conduct a multilevel analysis, we adapted the IOM's access model (IOM, 1993) into *A Multi-level Model of Barriers and Facilitators of Postpartum Contraceptive Use among Low-Income Adult Women – A Framework for Measurement of State- and Individual-Level Factors* (Figure 2), which identifies the specific barriers and facilitators (factors) this research focused on and shows the level at which our research considered these: the individual level or the state level. In this model we identified eight state-level structural, financial and personal barriers or facilitators of access to contraceptive information and services. The structural factors included: public FP clinic availability (clinics per women in need and counties without a clinic), obstetric services in Catholic hospitals, and religious refusals of FP services. The financial factors included: Medicaid eligibility for family planning services, and public funding for family planning services. Lastly, we identified two personal factors in the form of state policies that might affect an individual's acceptance of and attitude towards postpartum contraceptive use: sexuality education and reproductive health-friendly policies. At the individual-level we identified ten additional personal barriers or facilitators in the form of maternal characteristics and experiences including: age, education, ethnicity/race, marital or cohabiting status, number of live births, pregnancy intention, prenatal care initiation, prenatal care discussion of postpartum contraception, a well-baby visit (WBV), and WIC Use (during pregnancy).

Figure 2. A multi-level model of barriers and facilitators of postpartum contraceptive use among low-income adult women – a framework for measurement of state- and individual-level factors.[a]



[a] Adapted from the IOM's model of access to care (IOM, 1993; page 35).
[b] Cohabiting Status was only available for the NSFG data and was compared with the use of Marital status.
[c] Only used in the NSFG analysis.
[d] Only available for the PRAMS analyses.
[e] PPV was only available in a sub-set of the PRAMS population (sensitivity analysis).

In addition, in a sensitivity analysis we were able to use postpartum visit attendance (PPV) as a measure of use of postpartum contraceptive services.

3.2 Research Components and Questions

Our final research design had three major components: individual-level analyses using both national (NSFG) and state (PRAMS) survey data and a multilevel analysis that also utilized the individual-level PRAMS data and state-level data from various sources. We began with the individual-level analysis of the NSFG data followed by the individual-level analysis of the PRAMS data. To make the data between the surveys comparable, there was some back and forth in this work. The results of these analyses provided information regarding individual-level factors (maternal characteristics) related to postpartum contraceptive use (PP use) that we applied in the final component, the multilevel analysis. In the sub-sections that follow we provide an overview of each research component and its corresponding research questions, followed by our research definitions.

3.2.1 Part One – National Postpartum Contraceptive Use Prevalence and Individual Protective and Risk Factors or Markers

For this individual-level analysis of national data we used the NSFG to calculate national postpartum contraceptive use prevalence and identify individual risk and protective factors among our target population. This analysis provided information about the maternal characteristics that we applied to our PRAMS analysis.

The two research questions were:

- What is the national postpartum contraceptive use prevalence by age, ethnicity/race, education, marital and cohabiting status, number of live births, pregnancy intention and prenatal care initiation among low-income women 20-44 years of age?
- At the national level, which maternal characteristics are associated with a low-income woman 20-44 years of age using a contraceptive method in the postpartum period?

3.2.2 Part Two – State Postpartum Contraceptive Use Prevalence and Individual Protective and Risk Factors or Markers

This individual-level analysis of state data replicated the NSFG analysis (Part One above), using multistate PRAMS data. We estimated postpartum contraceptive use prevalence overall and for each state, and then by relevant individual characteristics, and subsequently assessed the relationship between these characteristics and PP use.

The two research questions were:

- What is the postpartum contraceptive use prevalence in PRAMS states by maternal demographic characteristics and experiences among low-income women 20-44 years of age?
- In PRAMS states, which maternal characteristics are associated with a low-income woman 20-44 years of age using a contraceptive method in the postpartum period?

3.2.3 Part Three - Multilevel Analysis to Identify State-level Factors that Affect Individual-level Postpartum Contraceptive Use

A multilevel analysis using individual- and state-level data was the final research component and addressed the primary goal: identifying state-level factors associated with postpartum contraceptive use. Making use of multilevel techniques, we utilized the same multistate PRAMS data as Part Two to quantify any independent contribution of

state-level factors to individual-level PP use, while "controlling for" individual-level factors related to postpartum use that may differ in prevalence across the states.

The research questions was:

- What are the state-level factors associated with a low-income woman 20-44 years of age using a contraceptive method in the postpartum period when controlling for maternal characteristics?

3.2.4 **Research Definitions**

For all three components of this research, we used the following definitions.

- Low-Income: We classified a respondent as low-income if she reported her delivery was paid by Medicaid. Both surveys had this information, and it is specific to the target pregnancy.

- Postpartum Contraceptive Use: We used two different measures of contraceptive use based on the effectiveness of the birth control method used. The timing of the measurement was the same regardless of the type of method used, but did vary slightly by survey data set.

- *Any* Method Postpartum Contraceptive Use (*Any* Method PP use)**:** Use of any contraceptive method, excluding emergency contraception, but including fertility awareness-based methods and withdrawal.

- *Effective* Method Postpartum Contraceptive Use (*Effective* Method PP use)**:** Use of methods which have an unintended pregnancy rate of less than 10% within the first year of typical use (Trussell, 2011), which includes: sterilization (female and vasectomy), intrauterine device (IUD), implant, and other hormonal methods (injectable, pill, patch, ring), except emergency contraception. See the Methods chapter for survey-specific listings of methods in the NSFG and PRAMS.

- Timing of Postpartum Contraceptive Use Measurement: Because PRAMS only asks about contraceptive use at the time the questionnaire is completed, normally the PRAMS measurement varies between two and nine months postpartum. By excluding respondents at the extremes, we limited our PRAMS PP contraceptive use measurement to a range of three to five months postpartum. To match this, we measured PP use among the NSFG population at four months PP.

3.3 **Summary**

This research addressed some of the gaps in our knowledge of postpartum contraceptive use, specifically among low-income women 20-44 years of age. The three distinct, but related, parts of this research used two different survey data sets (the NSFG and PRAMS), two different levels of analysis (individual level and multilevel), and two different outcomes – *Any* and *Effective* Method PP use. The Methods chapter that follows further details the three parts of this research, including the descriptive and analytic methodologies.

4. METHODS

4.1 Part One: National Postpartum Contraceptive Use Prevalence and Individual Protective and Risk Factors or Markers

In this part of the research we: 1) estimated national contraceptive use prevalence at four months postpartum among low-income women 20-44 years of age overall and by maternal characteristics that can be compared with state estimates; and, 2) through unadjusted and multivariable logistic regression, identified maternal characteristics which increase or decrease the likelihood of a low-income adult woman using a contraceptive method at four months postpartum. These analyses were conducted for both *Any* Method and *Effective* Method PP use and the results informed the analysis of PRAMS data from twelve states (see section 4.2). We describe in detail below the NSFG data and the procedures we followed to produce national-level information about contraceptive use at four months postpartum.

4.1.1 Data Source and Description – National Survey of Family Growth

The NSFG is a multi-stage area probability survey of a nationally representative sample of non-institutionalized, civilian and military (in civilian housing) men and women of reproductive age (15-44) that gathers data on reproductive health and families. The National Center for Health Statistics (NCHS), Centers for Disease Control and Prevention (CDC) manages the survey and its data, while a contractor actually conducts the field work. Although NCHS/CDC conducted each of the first six cycles of the survey (1973-1995) in a 12-month time frame, the last two versions of the NSFG have been ongoing surveys conducted in 12-week intervals over a four-year period

(Lepkowski et al., 2010), the first from 2006 to 2010 and the most recent from 2011 to 2015.

The 2006-2010 NSFG sample design had five stages, starting with the selection of 110 primary sampling units (PSUs) from a sampling frame. This sampling frame was created by grouping the 3141 counties and county equivalents identified in the 2000 Census (Lepkowski et al., 2010) into 2402 PSUs. Of these PSUs, 318 were composed of two or more counties and matched the metropolitan statistical areas (MSA) designated by the Census Bureau. The other 2084 PSUs were all classified as non-metropolitan, and each was comprised of only one county.

In the first stage of the sampling, the contractor divided the 2402 PSUs into 110 strata. In these strata they grouped PSUs that were similar with regard to metropolitan status, geographic location and size (number of housing units). Due to their size, the contractor determined the 28 largest MSA PSUs had to be included in the sample (chosen with certainty), and thus they became 28 self-representing strata (one PSU per strata). After sorting them into the nine U.S. Census geographic divisions, the contractor put the remaining 2374 PSUs into multi-PSU strata in which the PSU had in common their metropolitan status (MSA or non-MSA), size (housing units or people) and geographic proximity, ultimately creating 52 MSA and 30 non-MSA strata, with varying numbers of PSU per strata.

To create a national sample, the contractor chose one PSU from each of the 110 strata. By default and design, the 28 largest MSA PSUs were automatically in the sample since each was in its own one-PSU stratum. From each of the other 82 multi-PSU strata, one PSU was chosen based on probability proportional to the size (housing units or persons in PSU). Subsequently, the contractor divided the 110 PSU sample into four

nationally representative subsamples, each of which would be worked in a different year of the four-year survey. Among the 28 largest MSA PSUs, the first eight MSA/PSUs were included in each of the four subsamples, while the contactor divided the next 20 equally across the subsamples. The other 82 PSUs, representing smaller MSA (52) and non-MSA (30) areas were carefully divided across the four subsamples to be representative of the whole. These *quarter* samples had 33 to 35 PSUs each, and one was randomly chosen to be worked in each of the four survey years.

The second stage of sampling involved the selection of housing segments (contractor created Census blocks or groups of adjacent blocks with a minimum number of housing unit) within the 110 PSUs. By design the segment selections were made to oversample non-Hispanic blacks and Hispanics by first defining segment domains (differentiated by proportion minority population) within each PSU, which were then systematically sampled.

The third stage of sampling involved the selection of households within the segments. In this stage, additional screening was done to verify the occupied status of the housing units. From the list of occupied housing units within a segment (within a PSU), units were randomly selected to be screened for eligible individuals.

In the fourth stage field workers first conducted a screening interview that identified all individuals in a selected household. If the household included any members eligible to be interviewed (15-44 years old), then one individual in the household was randomly selected to be interviewed. To aid in reaching the oversampling targets for women, teens, Hispanics and non-Hispanic blacks, the selection was based on weighting of the eligible individuals in the household by gender, age, ethnicity and race.

In order to address both screening and main interview non-response, the fifth stage was actually a phase change focused on non-response, implemented at the end of every twelve-week interview period. After choosing a sample of non-responders, during weeks eleven and twelve field workers used alternate contact and participation techniques, including an increased incentive, to try to obtain a screening and/or main interview from these households.

Whether chosen in the fourth or fifth stage, if the selected person was at home during the screening interview, the field worker tried to conduct the main interview at that time. If not completed during the screening visit, the field worker made arrangements to complete the interview at another time. All adult interviewees provided signed consent, with minors providing signed assent after signed parental consent (CDC, 2013). During Phase 1, upon signed consent of the interviewee, respondents received a $40 incentive, which was increased to $80 in Phase 2 (Lepkowski et al., 2010).

The female field workers used laptop computers to conduct the face-to-face interviews (computer-assisted personal interviewing, CAPI), supplemented by an audio computer-assisted, self-interviewing (ACASI) section that allowed respondents to provide sensitive information in privacy. The female interviews took on average 71 minutes (Lepkowski et al., 2013) and collected a lifetime reproductive health history. This history included detailed information on sexual activity, contraceptive use and pregnancies, including, for every pregnancy: conception and end dates, outcome, and other information specific to the outcome, such as PNC for a live birth. During the three- to four-year period just prior to the interview, the survey records contraceptive method use on a monthly basis, creating what is called the contraceptive Method Calendar (MC).

For the same time period, the survey also documented sexual activity, or lack thereof, on a monthly basis. The time frame for the MC and the sexual activity record extended back to the January three years prior to the interview, which meant women interviewed in January provided 36 months of contraceptive use and sexual activity information, while those interviewed in December provided 48 months of method use and sexual activity information.

4.1.2 **Timing of Postpartum Contraceptive Use Measurement**

The NSFG data allows a researcher to identify contraceptive use on a monthly basis; therefore, it is possible to measure postpartum contraceptive use at any time (month) postpartum. But, because we wanted to compare national and state postpartum contraceptive use prevalence, and use our identification of maternal characteristics related to postpartum contraceptive use to guide our state-level analysis using PRAMS, we wanted the two measurements to be as similar as possible, including timing of the measurement. After an extensive review of the PRAMS data, described later, we chose four-months postpartum as our measurement point.

4.1.3 **Target Population Identification**

Using the publicly available 2006-2010 NSFG data set downloaded from the CDC website, we identified all women who had at least one live birth for which four-months postpartum was within the time frame of their MC, and who were at least 20 years old at the time of that birth. This means we included those women whose births occurred before the MC began, if four months postpartum was within their MC and, we excluded women whose births were within the MC if the women were less than four months

postpartum at the time of the interview (end of the MC). For women who had more than one live birth for which four months postpartum was within the MC time frame, we used the most recent live birth.

4.1.4 **Postpartum Contraceptive Use Classification**

To measure postpartum contraceptive use, we used the Method Calendar (MC). For each month of the MC, a respondent could report no method use, or up to four methods of contraception recorded by order of mention, with further probing to distinguish between simultaneous and sequential use when more than one method was reported. Figure 3 lists the birth control method choices, which included all methods available at the time of the survey and an 'Other method' (with a request to specify) option. For each month, interviewers recorded the method(s) reported, or one of five other options: 'No method used', 'Respondent sterile', 'Respondent's partner sterile', 'Don't Know', 'Refused' or 'Not ascertained'.

To identify contraceptive use at four months postpartum, we matched the fourth month postpartum for each respondent in our target population with the same calendar month in the MC using the NSFG's century-month date identification system. We then extracted the contraceptive use information reported for that month. Because the proportion of women who reported use of two methods was less than 7%, and the proportion using three or more methods in the target month was less than 0.5%, we simply classified women according to the more effective of the first two methods they mentioned, and did not look at simultaneous versus sequential use. (Of note, among the women who reported more than one method, for 75% of these women, one of the methods mentioned was a condom.) Two groups of respondents were classified as 'No

Method': 1) women who reported 'No method' use in that specific month, but who had used a method at some time in the past (pre-pregnancy or earlier in the postpartum period) as indicated by having a MC; and, 2) women who had not used a birth control method up until that point (neither before or since the pregnancy) which meant their MC was blank through that month.

Women who at four months postpartum had MC responses of 'Other', 'Sterility', 'Don't Know', 'Refused' or 'Not Ascertained' were excluded from the study population. Having classified all other women as a user of 'No method', or as a user of one of the 20 methods listed in Figure 3 (the most effective used that month), we then created three PP use variables.

To assess PP use by contraceptive method type, our first PP use variable grouped contraceptives into six categories based on their reported first-year failure rates (Trussell, 2011) and prevalence in the population. The categories and the specific methods included in each were: Sterilization (female sterilization, partner's vasectomy), LARC (IUDs, hormonal implants), Other (non-LARC) Hormonal Methods (birth control pills, injectables, patch, ring), Condoms, Withdrawal, and lastly a category that was comprised of all other methods listed in Figure 3, which included Barriers (other than condoms), Spermicides and Fertility Awareness-based Methods (FAM). Based on their prevalence condoms and withdrawal deserved their own categories, while the last category, which included methods that had a failure rate which ranged from 12% (diaphragm) to 28% (spermicides), overlapping with the failure rates of condoms (18%) and withdrawal (22%), was necessary due to very small numbers.

From the four month postpartum BCM use information, we also created the two dichotomous PP use measures used for the majority of analyses. For *Effective* Method

Figure 3: Monthly method choices for the contraceptive method calendar in the 2006-2010 NSFG.

Methods[a]	**Failure Rate**[b]
Permanent - Female sterilizing operation, such as tubal sterilization and hysterectomy - Partner's vasectomy **Long-Acting Reversible Contraception (LARC)** - IUD, coil, loop - Hormonal implants (Norplant or Implanon)	**< 1%**
Other Hormonal - Birth control pills - Contraceptive patch - Depo-Provera, injectables - Lunelle injectable (monthly shot) - Vaginal contraceptive ring	**6-9%**
***Effective* Method Postpartum Use**	
Barriers - Cervical cap - Condom - Diaphragm - Female condom, vaginal pouch - Today™ sponge[c] Withdrawal, pulling out	**12-22%**
Spermicides - Foam - Jelly or cream - Suppository, insert **Fertility Awareness-Based Methods** - Rhythm or safe period by calendar - Safe period by temperature or cervical mucus test, natural family planning	**24-28%**
***Any* Method Postpartum Use**	
- Other method -- specify: _____ - Emergency contraception	

[a] For each method, this list reflects the exact wording used in the 2006-2010 NSFG interviews. The sub-titles (underlined) were added for clarity. The list also included "respondent sterile" and "respondent's partner sterile" not shown here.

[b] The list has been re-arranged in levels from most effective to least effective based on the unintended pregnancy rate (per 100 women) in the first year of typical use (Trussell, 2011).

[c] The sponge is included at this level based on typical use of a nulliparous woman at 12%, while for parous women the rate is 24%.

PP use, we classified women as 'Yes' if their reported method had a first year typical use unintended pregnancy rate of less than 10% (Trussell, 2011) and 'No' if they reported use of a less effective method or no method. The effective methods are shown in the first two levels of Figure 3 and include: female sterilization, partner's vasectomy, IUDs, hormonal implants, as well as all other hormonal methods (birth control pills, injectables - monthly and quarterly, patch, and ring). For *Any* Method PP use, we simply assigned women who reported use of any BCM listed in Figure 3 to the 'Yes' category and those who reported no method use at four months postpartum to the 'No' category.

4.1.5 **Identification and Classification of Early Repeat Pregnancies**

In addition to identifying each respondent's contraceptive use at four months postpartum, we also looked for and flagged any reported conception between the live birth and four months postpartum. Because of our study design, which targeted the most recent live birth that ended at least four months before the interview, the outcome of these early repeat pregnancies was, in almost all cases, an outcome other than a live birth with the exception of a live birth shortly before the interview for which four-months postpartum was after the interview (end of MC), or a pregnancy at the time of the interview, for which the outcome remains unknown, but might be a live birth.

Most often, contraceptive use prevalence is measured among those "at risk of unintended pregnancy," excluding those trying to get pregnant and those already pregnant, or it is measured among those "at risk of pregnancy," excluding those currently pregnant, but, in consideration of short pregnancy intervals, including those trying to get pregnant. Although we could have excluded respondents who had an early

repeat pregnancy, we thought they were an important group to include when studying factors associated with postpartum use at four months postpartum. So, instead, we classified these women (n=28) as 'No' for PP contraceptive use, even if they were pregnant at four months, or had already ended an early repeat pregnancy and were actually using a method again. The only difference between these respondents and those who were not using a method at four months PP, was the latter had not become pregnant.

4.1.6 **Identification of Sub-population of Sexually Active Women**

Just as the NSFG gathers monthly information on contraceptive use, so too it gathers monthly information on sexual activity. The interviewer gathered this information by initially asking respondents to identify the months within the method calendar time frame when they did not have intercourse with a male, and then proceeded to verify sexual activity status month by month using similar techniques to those used for the MC. As such, the NSFG has for every month of the contraceptive MC a corresponding dichotomous sexual activity status variable.

As with our identification of contraceptive use, to identify sexual activity status at four-months postpartum, we used the NSFG's century-month date identification system to match the fourth month postpartum for each respondent with the dichotomous sexual activity variable that corresponded to the same month. The response (sexually active or not sexually active) for this variable became our classification of sexual activity status at four months postpartum.

As part of our initial exploration of postpartum use, we observed large differences in postpartum contraceptive use by reported sexual activity. This led us to limit our study population to those women who were sexually active at four months postpartum.

4.1.7 **Identification of Sub-population of Low-income Women**

The NSFG provides several variables that could on their own, or when combined with others, be used to identify respondents by their income level. The NSFG records income at the time of the interview. For respondents whose target live birth was within a year of the interview, this would be an acceptable measure of income at four months postpartum. However, for respondents whose target live birth was four years before the interview, income at the time of the interview may not be an accurate representation of income status at four months postpartum. Therefore, we chose to measure income status based on the source of payment for the delivery, which would be specific to the target live birth, rather than the time of the interview. We classified women who reported delivery of the target live birth as paid by Medicaid as 'low income,' and all others, who would be excluded from the analysis, as 'not low income.'

4.1.8 **Maternal Characteristics – Identification and Categorization**

We used the personal/individual barriers and facilitators of postpartum contraceptive use identified in our literature search (Figure 2) as our independent variables. We identified these maternal characteristics -- demographics and experiences -- from one of two different NSFG files: the female response file, where each observation is a different female respondent, or the pregnancy file, in which each pregnancy of a respondent is a separate observation. After identifying the respondent and their target

live birth from the respondent file, we obtained the information related to that pregnancy and birth from the pregnancy file.

In Table VII we list the independent variables and their categorization. With the exception of education and ethnicity/race, the characteristics are specific to the target live birth, and thus part of the pregnancy file. Although not ideal, the education variable is the educational status at th0.e time of the interview. For a younger respondent, whose target live birth was several years before the interview, education at the time of the interview might overstate the educational status at the time of the birth. However, the difference is probably minimal since to be included in our study population, the respondent had to be at least 20 years old at the time of the birth. This means the youngest women we included in our study were at least 20 years old at the time of the interview and had very recently given birth.

For most of the variables, we explored various options for categorization. When exploring age categorizations, we determined that dividing the youngest respondents (20-29) into two groups, and putting all those 30 years of age and older in the third group best showed differences in PP use by age, and kept the highest category (30+) sufficiently large. As with age, we kept those with the highest levels of education together, both because their use was similar (when comparing 'some post-high school' and 'college degree') and the small numbers in these cells required they remain combined.

We maintained the four most often used Census categories for Ethnicity/race, even though the 'Other' category was small. Because we wanted to show the difference in the association of these two variables to postpartum contraceptive use, we included both Marital Status and Cohabiting Status in our prevalence estimates and unadjusted

TABLE VII
MATERNAL CHARACTERISTICS USED AS INDEPENDENT VARIABLES
NSFG, 2006-2010

Characteristic/ Variable Name	Data Type	Type of Variable	Categories[a]
Age	Continuous	Categorical (3)	20-24 years old **25-29 years old*** 30+ years old
Education	Continuous	Categorical (3)	Less than High School **High School/GED*** More than High School
Ethnicity/Race	Categorical	Categorical (4)	Hispanic Non-Hispanic Black **Non-Hispanic White*** Other
Marital Status	Categorical	Categorical (2)	**Married*** Not (currently) Married
Cohabiting Status	Categorical	Categorical (2)	**Cohabiting or Married*** Not Cohabiting or Married
Number of Live Births	Continuous	Categorical (4)	One **Two*** Three Four +
Pregnancy Intention	Categorical	Categorical (3 or 4)	Intended – Wanted Sooner Intended – Wanted Then **Unintended – Mistimed*** Unintended - Unwanted
Prenatal Care Initiation	Categorical	Categorical (3)	First Trimester **Second Trimester*** Third Trimester

[a] The refe*rent* category has an asterisk and is in bold.

analysis. The relationship was stronger, although not significant, for Cohabiting Status, so for our multivariable analyses we used Cohabiting Status.

For both the Number of Live Births (which includes target live birth) and Pregnancy Intention variables, we started with four categories. However, when assessing association we reduced the Pregnancy Intention variable to three categories by combining the 'Wanted Sooner' and 'Wanted Then' categories into one 'Intended' category, while maintaining both the 'Unwanted' and 'Mistimed' categories. We used the 'Mistimed' category as our referent. For Prenatal Care Initiation we created three categories based on trimester PNC began, putting those who reported no PNC in with those who initiated PNC in the third trimester. For the unadjusted and multivariable analyses we used 'Second Trimester' as the referent category for PNC Initiation. Even though the 'Third Trimester/No PNC' category was extremely small (32), we kept it as a separate category because the prevalence of *Effective* Method PP use was more than thirty points higher than that of second trimester PNC initiation.

4.1.9 **Data Analysis Basics**

Because of the NSFG's complex sample design, we conducted all analyses using two statistical analysis packages: SAS and a version of SUDAAN which works within SAS and is known as SAS-callable SUDAAN. Although most standard data analysis software can apply analysis weights from complex sample surveys to calculate accurate point estimates, most can only calculate standard errors for a simple random sample, which results in an underestimate of the standard error and thus an overestimate of a point estimate's significance (test statistics or confidence interval). However, SUDAAN was specifically created to accurately calculate standard errors of point estimates from

complex sample survey data without unduly complicating the data analysis. It accomplishes this by requiring survey developers to create a sample design variable for each sample design feature, *e.g.*, stratification or clusters, which describes the application of the feature on each respondent. And analysts then must use these sample design variables in their SUDAAN programming. With this information SUDAAN then uses Taylor series linearization to calculate the standard errors. In the publicly available NSFG data set, NCHS provides the analysis weighting variable necessary to provide accurate point estimates, as well as the two survey design variables required by SUDAAN to account for the survey's design features when calculating accurate standard errors. NCHS also directs analysts to follow standard practice and specify to SUDAAN a design with replacement (Lepkowski et al., 2013), even though the PSUs were selected without replacement.

To provide nationally representative point estimates, the NSFG weighting adjusts for oversampling (unequal probability of selection) by age, ethnicity and race at all design stages, as well as nonresponse and non-coverage (Lepkowski et al., 2010). The fully adjusted sampling weight for each person included three factors: the inverse probability of selection at each stage of sampling, an adjustment for non-response during both screening and interviewing, and lastly an adjustment for non-coverage, which is only calculated after the other two factors have been applied. This last weight factor is often referred to as poststratification, and is an adjustment that allows survey designers to make their final weighted sample match external population numbers. For the NSFG, NCHS matched the final sample to population data supplied by the U.S. Census Bureau and the Military (for military in civilian housing), by age, sex, Hispanic

origin and race. For all analyses, we used the NSFG weight variable that provided the proper weight for each respondent based on the total four-year sample used (wgtq1q16).

In addition to the weighting, the other two NSFG survey design features that programs such as SUDAAN must account for in order to calculate accurate standard errors are the first stage sampling use of clusters and stratification. Although techniques other than simple random sampling are also used at other stages, they are ignored. Lepkowski et al. (2013) showed in their analysis of 2006-2010 NSFG data that only the first stage design effects needed to be accounted for. This finding is reflected in the lack of ability in SUDAAN, and other complex survey software packages, to accommodate design effects beyond the first stage.

Because the variance cannot be estimated directly from a design where only one PSU was chosen from each stratum (CDC, 2010 and 2013) as was the case in the NSFG, the PSUs were regrouped into Sampling Error Computer Units (SECU) that were then paired and put into a stratum. (In survey sampling this regrouping is referred to as "collapsing strata and combining strata.") From the 28 largest self-representing PSUs (one PSU per strata), a total of 72 SECUs (4 from each of the 8 largest, and 2 from each of the next 20 MSA PSUs) were created and put into 36 strata (two SECUs/strata). From the other 80 non-self-representing PSUs, 80 SECUs were created and put into 20 strata (four SECUs/stratum). So, in the end the sample design had 152 SECUs across 56 strata. To identify which stratum and which SECU in a stratum each respondent belonged to, NCHS included two design variables in the data set: SEST (sampling error stratum codes) with values from 101 to 156 and SECU (sampling error computing units) with values from 1-4 (up to four SECU in a stratum). Of note, NCHS ordered the codes for these variables at random to hide the identity of any particular unit.

4.1.10 Calculation of Postpartum Contraceptive Use Prevalence

Using the categorizations described in section 4.1.4, we calculated the overall population prevalence of *Any* Method and *Effective* Method PP use, as well as prevalence by method type group. We also estimated prevalence by maternal demographics (age, ethnicity/race, education, marital status, cohabiting status, and number of live births) and other characteristics (pregnancy intention and prenatal care initiation) and then calculated 95% confidence intervals around these estimates.

4.1.11 Unadjusted Association of Maternal Characteristics

To verify the importance of the maternal characteristics listed in Table VII, and assess the accuracy of their categorization, using logistic regression we calculated odds ratios and 95% confidence intervals for each of these variables and their relationship with *Any* Method and *Effective* Method PP use. For variables with more than two categories, we calculated odds ratios for each of the categories relative to the referent category (in bold with an asterisk in Table VII). To determine which variables to include in our multivariable logistic regression analysis, in addition to the 95% confidence intervals, when needed, we also assessed significance at 85% ($p < .15$).

4.1.12 Multivariable Logistic Regression Analysis

We began our *Any* Method and *Effective* Method PP use multivariable logistic regression analysis with all of the variables that had a p-value of less than .15 in the analysis of unadjusted associations (crude OR) for that particular outcome. We then used a manual backward elimination approach [sequentially removing non-significant variables ($p < .05$)] and re-ran the model until all variables that remained were

significant. We documented the sequential models showing the adjusted odds ratios for all variables and their 95% confidence intervals.

4.2 Part Two: State Postpartum Contraceptive Use Prevalence and Individual Protective and Risk Factors or Markers

In this second part of our research we: 1) estimated total population and state-specific contraceptive use prevalence at 3-5 months postpartum among low-income women 20-44 years of age overall and by maternal characteristics; and, 2) identified maternal characteristics that increased or decreased the likelihood of a low-income woman using contraception postpartum through unadjusted and multivariable logistic regression. These analyses were conducted for both *Any* Method and *Effective* Method PP use. This information was used for our multilevel analysis described in section 4.3.

4.2.1 Data Source and Description - Pregnancy Risk Assessment Monitoring System

The PRAMS surveys are the source of an abundance of state-level information regarding pregnancies that precede a live birth and the subsequent postpartum period, including contraceptive use after a live birth. The CDC's Division of Reproductive Health coordinates PRAMS via cooperative agreements with state health departments who conduct the survey, and provides both funding and technical assistance. The number of states that participate in PRAMS has varied over the years, however, it is currently on its way to full coverage.

Participating states conduct a stratified systematic sample survey of new mothers using a state-customized standardized protocol (CDC, 2015). States use their electronic

birth certificate records as the sampling frame. The PRAMS protocol identifies specific exclusions to the sampling frame, including out-of-state births to residents (for whom the birth certificate often arrives late) and in-state births to nonresident women (who would be harder to track and would not be the target of the state's public health efforts). For multiple gestations, only one live birth is included in the sample frame.

Stratification allows states to oversample characteristics of interest, *e.g.,* low birth weight infant, maternal ethnicity/race, or geography (rural vs. urban). States choose their own stratification variables from among those on the birth certificate. However, to assure data quality and efficiency, the PRAMS protocol (CDC, 2015) limits stratification variable choices to those known to be highly accurate; while to assure a manageable sample size, the protocol requires states to choose stratification variables with two to four categories, and limit the total strata to six. The PRAMS staff calculates desired stratum sample sizes based on stratum-specific birth distributions and expected response rates. Total monthly samples sizes vary by state from 100 to 300 (1200 to 3600 per year).

In cooperation with their vital statistics staff, on a monthly basis state PRAMS staff prepares a sampling frame of newly processed birth certificates from live births two to four months prior to the sampling date. After exclusion of ineligible births, PRAMS staff creates a separate sampling frame for each strata which is then systematically sampled based on its sampling fraction. After the full sample has been chosen, the data collection process is initiated using the birth certificate contact information.

States begin their data collection by mail, with telephone follow up as needed. Every new mother included in a monthly sample receives an introductory letter from the state PRAMS office, followed a few days later by the initial questionnaire. Most states re-

mail questionnaires twice to non-respondents, and after continued non-response, contact women by phone in hopes of completing a telephone interview. Most questionnaires are completed by mail. Late responses may be accepted up to nine months postpartum.

States are responsible for data entry, cleaning and editing. After receiving the cleaned PRAMS data, CDC checks data consistency and calculates sampling weights (see details in sub-section 4.2.10). Using a state's annual birth file/tape, CDC also helps with yearly evaluation of the sampling, recommending adjustments if birth distributions or response rates have changed.

Each state ultimately controls its own PRAMS data and its use. However, states pass on to CDC a yearly data set that can be combined with others. Researchers can request a single-state data set from the state of interest, or request a multi-state data set from the CDC; either can be made available for multiple years. The CDC has set a participation threshold for surveys (now 65%), and does not include states that fall below the threshold in multi-state data sets. Before providing data sets to researchers, both states and the CDC require a research proposal. For multi-state data requests, CDC requires proposal review and approval from the states that are to be included in the multi-state data set. Because the PRAMS data are de-identified, CDC does not require institutional review, and UIC considers PRAMS data exempt from its Institutional Review Board requirements.

Since at the time this research was proposed, the most recent version of data available for several of the state-level variables was 2006, we decided to use PRAMS data from 2005-2007. All three years used the Phase 5 PRAMS questionnaire. Table VIII below lists the 32 states that conducted at least one PRAMS survey between 2005

TABLE VIII

PRAMS SURVEYS THAT MET CDC RESPONSE RATE THRESHOLD[a] AND USED RELEVANT *STANDARD* QUESTIONS, BY STATE AND YEAR, 2005-2007

State	Met CDC Threshold* for Response Rate			*Standard* Questions[b] Used			
	2005	2006	2007	Method Specific BC	Talk BC After Birth	Had PP Visit	Talk BC At PP Visit
Alaska	Yes	Yes	Yes				
Arkansas	Yes	Yes	Yes	**Yes**		**Yes**	
Colorado	Yes	Yes	Yes		Yes		
Delaware			Yes				
Florida	Yes			**Yes**			
Georgia	Yes	Yes	Yes			Yes	Yes
Hawai'i	Yes	Yes	Yes			Yes	
Illinois	Yes	Yes	Yes		Yes		
Maine	Yes	Yes	Yes				
Maryland	Yes	Yes	Yes				
Massachusetts			Yes			Yes	
Michigan	Yes	Yes	Yes	**Yes**			
Minnesota	Yes	Yes	Yes			Yes	
Mississippi		Yes		**Yes**			
Missouri			Yes	**Yes**	**Yes**	**Yes**	
Nebraska	Yes	Yes	Yes	**Yes**			
New Jersey	Yes	Yes	Yes			Yes	Yes
New Mexico	Yes						
New York[c]	Yes	Yes	Yes	**Yes**	**Yes**	**Yes**	
North Carolina	Yes		Yes	**Yes**			
Ohio	Yes	Yes	Yes		Yes	Yes	
Oklahoma	Yes	Yes	Yes				
Oregon	Yes	Yes	Yes	**Yes**			
Pennsylvania			Yes				
Rhode Island	Yes	Yes	Yes	**Yes**		**Yes**	
South Carolina	Yes	Yes	Yes	**Yes**		**Yes**	
Utah	Yes	Yes	Yes		Yes		
Vermont	Yes	Yes	Yes			Yes	
Washington	Yes	Yes	Yes				
West Virginia	Yes	Yes	Yes	**Yes**		**Yes**	
Wisconsin			Yes			Yes	
Wyoming			Yes			Yes	
Total Number of States	**25**	**23**	**29**	**12**	**6**	**15**	**2**

[a] From 1988 to 2006 CDC set the response rate threshold at 70%, but reduced it to 65% in 2007.

[b] *Standard* questions are those states can choose to add to their PRAMS questionnaires. The 'Method-specific BC' question asks respondents who reported using a method, "what kind of birth control" they are using. 'Talk BC After Birth' asks if after the birth a health care worker (HCW) talked about using BC with the respondent. 'Had PPV' asks respondents if since the birth they have had "a postpartum checkup for yourself?" 'Talk BC at PPV' asks women who had a PPV if during that visit a health care worker discussed FP or BC.

[c] Does not include New York City, as it does its own PRAMS.

and 2007 which met the CDC response rate threshold (70% in 2005 and 2006, and 65% in 2007) and shows the year(s) they achieved that threshold.

Each Phase of PRAMS questionnaires has its own specific set of 'core' questions that all states must use, but also has a set of optional 'standard' questions that states may choose to include, along with questions states have developed on their own. The Phase 5 questionnaire had three questions that asked about postpartum contraceptive use (CDC, 2009): two sequential *core* questions, and one *standard* question. The first question, a Yes/No *core* question, asks participants about current contraceptive use, and is followed by a *core* follow-up question asking those who responded 'No' to identify their reasons for not using contraception. For those who responded 'Yes,' states could choose to insert a *standard* follow-up question that asks women to specify what birth control method they are using. Slightly more than one-third of states who met the CDC response threshold used the *standard* method-specific follow-up postpartum use question (see Table VIII).

Because we were expecting to be able to use the *core* Yes/No PP use question for the majority of our analyses, we requested data from all states that met the response threshold. The CDC provided a multi-year (2005-2007), multi-state (32 states and New York City) data set, among which 12 states (and New York City) included the *standard* method-specific follow-up postpartum use question (Table VIII). We describe in sub-section 4.2.3 below why, for the individual-level and multilevel PRAMS analyses, we ultimately decided to only use data from the twelve states that used the method-specific question.

The Phase 5 questionnaire also offered three other relevant *standard* questions, in that they gathered information on receipt of postpartum birth control

counseling/education and receipt of a postpartum visit (PPV). Immediately following the *standard* method-specific question, states could add "After your new baby was born, did a doctor, nurse or other health care worker talk with you about using birth control?" with a Yes/No response. (Of note, this does not necessarily refer to the PPV.) Following this, states could insert another question that asks "… have you had a postpartum checkup for yourself" with a Yes/No response. Lastly, for respondents who reported they had a PPV, states could insert "At that visit, did a doctor, nurse, or other healthcare worker discuss family planning or birth control with you?" with a Yes/No response.

Table VIII also shows the states that chose to use these three *standard* questions and puts in bold the 'Yes' for those states that used any of these *standard* questions and the method-specific question. Among the twelve states that opted to use the method-specific question, just two included the question about health care workers providing BC information after the birth, only six used the PPV question, and none used the question that inquired about BC counseling at the PPV. Unfortunately, without a common question among the twelve states, we were not able to assess the relationship between PP contraceptive use and these PP experiences in our primary individual-level or multilevel analyses. But, using the sub-set of six states that included the *standard* PPV question, we did conduct a sensitivity analysis, described in more detail in sub-section 4.2.14 below.

4.2.2 **Initial Sample**

Using the PRAMS data for the 32 states who met the CDC response threshold in the years 2005-2007, we first limited our study population to women who, at the time of

the birth, were 20 years of age or older. After this reduction, we further refined our sample based on the exploratory analyses we describe below.

4.2.3 **Measures of Postpartum Contraceptive Use - Assessing Equivalency with the NSFG**

Although the two data sets being used in this research are meant to stand alone and provide information regarding national and state-level research questions, we wanted to make the measurement of postpartum contraceptive use as comparable as possible between the NSFG and PRAMS. Because the detailed information the NSFG collects on contraceptive method use and sexual activity is relied on for many of the US contraceptive use statistics, we considered this the standard to which we should compare the PRAMS data. Therefore, our initial exploration of the PRAMS data focused on documenting how PRAMS collects information on contraceptive use and sexual activity, so we could determine how comparable it is to the NSFG data.

As briefly mentioned above, the PRAMS Phase 5 questionnaire had three PP use-related questions: two *core* questions, and one *standard* question (CDC,2017). The questions are shown in Figure 4. When planning this analysis, we assumed the *core* question "Are you… doing anything… to keep from getting pregnant …" would be sufficient to accurately identify Yes/No postpartum contraceptive use. However, after some exploratory analysis, we decided this question was not sufficient for a Yes/No contraceptive use analysis, mostly, as we explain below, due to the inconsistent collection of information regarding sexual activity.

Unlike the NSFG, PRAMS does not ask separately about sexual activity, but rather this information is obtained indirectly, as part of the two different *PP Use* follow-

Figure 4. The three questions available to identify postpartum contraceptive use in Phase 5 PRAMS questionnaires.

❖ ***Core* Yes/No Birth Control Method (BCM) Use Question**
Question For All

"Are you or your husband or partner doing anything now to keep from getting pregnant? (Some things people do to keep from getting pregnant include not having sex at certain times [rhythm] or withdrawal, and using birth control methods such as the pill, condoms, cervical ring, IUD, having their tubes tied, or their partner having a vasectomy.)"

❖ ***Core* Follow-up Question – Reasons for Not Using a BCM**
Question for those who answered 'No' to *Core* BCM Use question

"What are your or your husband's or partner's reasons for not doing anything to keep from getting pregnant now?
Check all that apply."

- ***I am not having sex***
- *I want to get pregnant*
- *I don't want to use birth control*
- *My husband or partner doesn't want to use anything*
- *I don't think I can get pregnant (sterile)*
- *I can't pay for birth control*
- *I am pregnant now*
- *Other -- Please tell us: _____*[a]

Note: Despite checking 'No' to BCM use, among the ***Other*** comments some women actually reported method use, most commonly sterilization.

❖ ***Standard* (Optional) Follow-up Method-Specific Birth Control Question**
Question for those who replied 'Yes' to Core BCM Use Question, in states that added it

"What kind of birth control are you or your husband or partner using now to keep from getting pregnant. Check all that apply."

- *Tubes tied or closed (female sterilization)*
- *Vasectomy (male sterilization)*
- *Pill*
- *Condoms*
- *Shot once a month (Lunelle®)*
- *Shot once every 3 months (Depo-Provera®)*
- *Contraceptive Patch (OrthoEvra®)*
- *Diaphragm, cervical cap, or sponge*
- *Cervical ring (NuvaRing® or others)*
- *IUD (including Mirena®)*
- *Rhythm method or natural family planning*
- *Withdrawal (pulling out)*
- ***Not having sex (abstinence)***
- *Other -- Please tell us: _____* [a]

[a] Because this list does not include implants, all reports of its use were captured from the 'Other' specification when implant or Implanon® was written in. Other methods listed that were written in rather than checked, were re-classified to the appropriate method category.

[b] CDC, 2017.

up questions – the *core* question and the *standard* (optional) question (see bold type in Figure 4 above). As described in more detail below, respondents can report they are not sexually active as a reason for not using a BCM in the *core* PP use follow-up question, or as an actual BCM in the *Standard* PP use follow-up question, which is not used by all states (CDC, 2017).

When for the *core* PP use question, a respondent reports that she is **not** "doing anything now to keep from getting pregnant" (PP use = **No**), in the *core* follow-up question (Figure 4), she can check "I am not having sex" as one of a 'check all that apply' list of reasons for "**not** doing anything." But, PRAMS does not have a *core* follow-up question that allows a respondent who reported she **is** "doing anything now to keep from getting pregnant" (PP use = **Yes**) to report she is not sexually active. Fortunately, the *standard* method-specific follow-up question does allow respondents who reported 'Yes' to the *core* PP use question, to report they are not sexually active at the time. When asked "What kind of birth control are you or your husband or partner using now to keep from getting pregnant. Check <u>all</u> that apply," a respondent can check "Not having sex (abstinence)" as a BCM: either as her only BCM, or one of her BCMs (Figure 4).

As summarized in Table IX below, women who reported they were **not** using a BCM can report that they are "not sexually active" using the *core* follow-up method-specific PP use question, but for women who report they are using a BCM, PRAMS does not have a *core* follow-up question. Only the optional *standard* follow-up method-specific question allows women who reported they are using a BCM to report they are not sexually active by checking 'not having sex' as a BCM. Thus, only states that use the *standard* follow-up question obtain sexual activity information for all respondents,

TABLE IX
IDENTIFICATION OF THOSE NOT SEXUALLY ACTIVE USING *CORE* ONLY AND USING *CORE* AND *STANDARD* METHOD-SPECIFIC BIRTH CONTROL USE QUESTIONS
PRAMS PHASE 5 QUESTIONNAIRES, 2005 -2007

	Documentation of Sexual Activity	
Type of BCM Use Question	Among Non-BCM Users	Among BCM Users
Core Questions Only	Yes	**No**
Standard plus *Core* Questions	Yes	Yes

although it is derived from two different questions in which women report it as a reason for not using a BCM, or conversely as a BCM.

Although determining sexual activity status from directly gathered information would have been preferred, because our NSFG analysis showed that PP use varied significantly by sexual activity status, we assessed the pros and cons of the two options we had to use the PRAMS sexual activity information that was available: 1) use only the *core* follow-up question, which would mean, for those who reported they were using a BCM, we would not have sexual activity information, but we could use the data for all 32 states in our multi-state data set; or 2) use the *core* and *standard* method-specific follow-up questions, which would mean having sexual activity information for all respondents, but limiting our data set to the twelve states that used the *standard* question.

To assess the two options, we conducted an exploratory analysis of sexual activity and postpartum use, comparing the findings when we only utilized information from the *core* follow-up question with the findings when we utilized information from the *core*

follow-up question and the *standard* method-specific follow-up question. To ensure that the comparability of the analysis of the *core*-only vs. the *core* plus *standard* questions was not compromised by differences between the states, we conducted this analysis using only the twelve states which used the *standard* method-specific question. We describe our findings below, and summarize them in Table X.

We found that 4.4% of women used the *core* follow-up question to report they were not sexually active (as a reason for not doing anything to keep from getting pregnant). When combining the information from the *core* follow-up question and the *standard* method-specific follow-up question, which allows those who reported using a BCM to specify "**Not having sex (abstinence)**" as a BCM, 12.9% of all respondents reported they were not sexually active (Table X). This means, using the *core* question only, we missed more than 65% of those who actually reported not having sex, because these women reported it as a birth control method, either their only method, or one of their methods, rather than a reason for not using a BCM.

Using the information from the *core* questions only, the prevalence of PP contraceptive use was 87.7% among all women. When adding the information from the *standard* method-specific questions to that of the *core* questions, we calculated an overall prevalence of PP use of 84.3%. The difference in the overall prevalence between the *core*-only and *standard* questions is due to respondents who reported they were using a BCM, but whom we re-classified as non-users, because in their method-specific response they either checked or wrote-in 'not having sex' as their only BCM.

With the additional information from the *standard* question, we calculated PP contraceptive use prevalence by sexual activity. Using a PP contraceptive use algorithm (described later), we noted that PP contraceptive use prevalence among those who were

TABLE X
THE EFFECT OF THE *CORE* VERSUS *STANDARD* METHOD-SPECIFIC BIRTH CONTROL USE QUESTIONS ON MEASUREMENT OF SEXUAL ACTIVITY AND POSTPARTUM CONTRACEPTIVE USE PREVALENCE
PRAMS, TWELVE STATES, 2005-2007

Sexual Activity and Postpartum Contraceptive Use Status	**Use of *Core* Questions Only**	**Use of *Standard* Method-Specific & *Core* Questions**
Not Sexually Active	4.4%	12.9%
Postpartum Contraceptive Use among All Respondents	87.7%	84.3%
Postpartum Contraceptive Use among Sexually Active	***Unable to Calculate:*** Only those who were not using a BCM could report they were not sexually active.	90.8%
Postpartum Contraceptive Use among *Non*-Sexually Active		40.7%

sexually active was 90.8%; among those who reported they were not sexually active, prevalence was 40.7% (Table X). This large difference is similar to that found in our NSFG analysis.

Most studies of contraceptive use prevalence include only those who are 'at risk of pregnancy', thus excluding those who report they are not sexually active. The wide variation in PP contraceptive use by sexual activity found in our exploratory analysis supports the need to distinguish those who are sexually active from those who are not. But, if we only used the information from the *core* follow-up question, we would miss 65% of those who reported they were not sexually active, because they reported it using the *standard* question. We concluded that we must limit our data set to those states that included the *standard* method-specific follow-up question so that we could identify sexual activity among all respondents and then limit our study to those who were sexually active.

4.2.4 **Identification of Sub-population of Sexually Active Women**

Having limited our data set to the twelve states that used the *standard* method-specific follow-up question, we used the data available from both the *core* and *standard* follow-up questions to classify respondents' sexual activity status. For women who reported they were **not** using a BCM, we classified their sexual activity status based on the *core* follow-up question that asked women to identify their reasons for not using a BCM: we recorded women who checked "*I am not having sex*" as '**Not Sexually Active**;' and, those who did not check this reason as '**Sexually Active**.' If a woman checked 'Other' on the list of reasons, and then wrote in a comment that we interpreted as the respondent reporting that she was not sexually active, we classified her sexual activity status as such, even if she had not checked that as a reason for not using a BCM.

For respondents who reported they were using a BCM, using the *standard* method-specific follow up question, we classified respondents who checked '*Not having sex (abstinence)'* as a BCM (either one of several, or only method) as '**Not Sexually Active',** while we classified respondents who did not check this option as '**Sexually Active**.' If a woman checked '*Other'* on the BCM list, and then wrote a comment that we interpreted as a report of no sexual activity, we classified her sexual activity status as '**Not Sexually Active,'** even if she had not checked it as one of her BCMs.

4.2.5 **Identification of Sub-population of Low-income Women**

To match our measurement of low-income women in the NSFG, we identified women who had a delivery paid by Medicaid. We considered other options including using the reported income, and the classification that the CDC used to adjust for the year and number of dependents in a PRAMS analysis of breastfeeding (Lind, 2014).

Although we found considerable overlap in the population identified when comparing low-income defined by reported income, and by a delivery paid by Medicaid, we also found respondents for whom classification was not the same for reported income and a Medicaid delivery (which may be related to varying cutoffs for Medicaid across the states). We decided not to use reported income because Medicaid rules require states to cover a six-week postpartum visit and contraceptives up until the Medicaid pregnancy coverage ends, so we would have a more homogenous population within which to measure other factors related to access to contraceptives postpartum if all women had the same base access.

4.2.6 **Identification and Classification of Early Repeat Pregnancies**

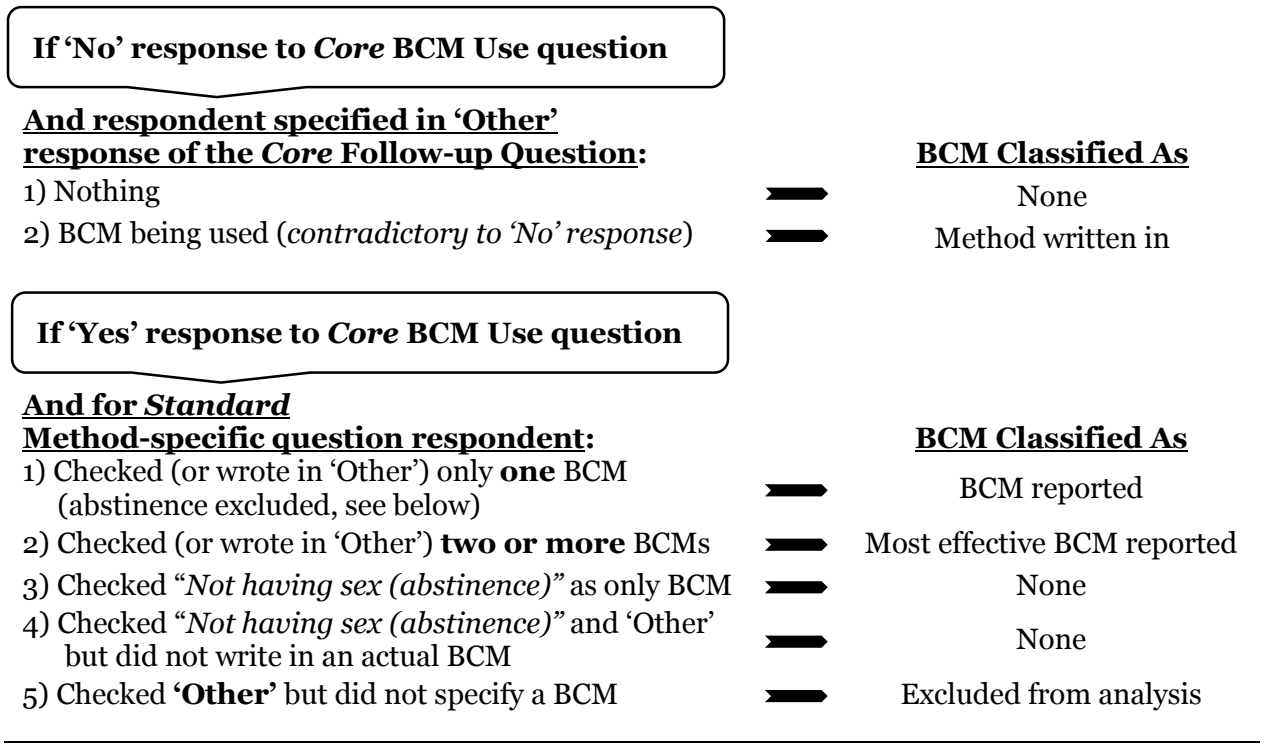
Unlike the NSFG, PRAMS does not collect a complete pregnancy history from which we could identify early repeat pregnancies, nor does it directly ask about a pregnancy after the live birth on which the PRAMS questionnaire is focused. Instead, as seen in Figure 4, the *Core* BCM use follow up question allows a woman to report "*I am pregnant now*" as a reason for not using a BCM. This response identifies women who are pregnant at the time they completed the questionnaire, but does not allow a respondent to report an earlier pregnancy that may have already ended due to a miscarriage or abortion, nor does it allow women who reported they were using a BCM to report an early repeat pregnancy. As with our NSFG analysis, we did not exclude women who reported a pregnancy from our analysis (n=86), rather we left them in as 'non-users' of PP contraception. Since as we noted above, PRAMS does not allow women who checked 'yes' to using a BCM to report an early repeat pregnancy, these women were already classified as non-users by default.

4.2.7 **Postpartum Contraceptive Use Classification**

To classify PP contraceptive use, we used both the *core* and *standard* follow-up PP use questions. We first captured and classified any method-related information provided when, for either the *core* follow-up question or the *standard* method-specific question, a woman checked 'Other' and wrote something in when asked to specify ("Please tell us"). For example, as noted in Figure 4 above, some women checked 'No' to the *core* question, checked 'Other' in the *core* follow-up question regarding reasons for not using contraception, and then wrote in that they were sterilized. And for the method-specific question, the 'Other' write-ins were the only way to identify implant use since the Phase 5 questionnaire did not include it on the method list. To account for this complimentary, or contradictory, information, and the complexity of the *standard* method-specific question that included "Check all that apply" directions, an open-ended 'Other' response, as well as '*Not having sex (abstinence)'* listed as a BCM, we adopted the algorithm detailed in Figure 5 below to assign each respondent to one BCM, or None.

After completing all of the steps in Figure 5, we had identified for each respondent the most effective method being used at the time the questionnaire was completed. From this information we created three PP use outcome variables that were as similar to the NSFG variables as possible given the differences in how and what information was collected. These were: 1) the dichotomous *Any* Method PP use variable (*Any* BCM use vs. None*)*; 2) the dichotomous *Effective* Method PP use variable (*Effective* BCM use vs. Other BCM use/None), for which we used the same first year typical use failure rate cutoff of less than 10% (Trussell, 2011) as we did for the NSFG,

Figure 5. Algorithm used for birth control method assignment in PRAMS.



and thus 'Yes' included: female sterilization, partner's vasectomy, IUDs, hormonal implants, and all other hormonal methods (birth control pills, injectables, patch, and ring); and, 3) a variable for PP use by method type group, which were the same as those for the NSFG [Sterilization (female sterilization, partner's vasectomy), LARC (IUDs, hormonal implants), Other Hormonal Methods (birth control pills, injectables, patch, ring), Condoms, Withdrawal, and the combined category of lower prevalence methods Barriers/Spermicides/Fertility Awareness-based Methods].

4.2.8 **Population Limitation by Timing of Questionnaire Completion**

Because of the NSFG's collection of month-to-month information on both contraceptive use and sexual activity, PP contraceptive use measurement is very

specific; it can be measured for any one specific month as we have done. Because PRAMS only asks about BCM use at the time the questionnaire is being completed ("Are you … doing anything now…*")*, and that time can vary considerably between respondents, depending on questionnaire receipt and completion, PRAMS measurement of PP contraceptive use is not specific. Using PRAMS data, PP use measurement generally reflects a time period with a range between two and nine months postpartum.

To narrow the time frame for PP use, we explored the mean, median and range of questionnaire completion. To do this we used the month and year of infant birth and questionnaire completion, added the 15th of the month as the day for each of these dates (not supplied in PRAMS data sets due to privacy concerns), and then calculated the interval between infant birth and questionnaire completion, the point at which PRAMS gathers PP contraceptive use information. After reviewing the central tendencies and dispersion of the interval, we tentatively decided to focus on questionnaires completed between three and five months postpartum. To be sure limiting our data would not give us a biased sample, we compared the demographics of those who completed their survey in this time frame, and the total respondent population (Table XI). Because those who completed the survey between three and five months postpartum appeared on the whole to be similar demographically to the total population, we limited our study population to those who completed the questionnaire between 3-5 months postpartum. In conjunction with this decision, we decided to use the four-month PP use measurement for our NSFG analysis.

TABLE XI

COMPARISON OF DISTRIBUTION OF MATERNAL DEMOGRAPHIC CHARACTERISTICS BY MONTH OF QUESTIONNAIRE COMPLETION LOW INCOME, SEXUALLY ACTIVE WOMEN, 20-44 YEARS OLD PRAMS, TWELVE STATES, 2005-2007

	Total Population		**Questionnaire Completed at 3-5 Months PP**	
Variables	Percent	95% CI	Percent	95% CI
Age				
20-24	47.26	45.87-48.65	46.98	45.47-48.50
25-29	30.62	29.36-31.91	31.10	29.72-32.52
30+	22.12	20.97-23.32	21.91	20.67-23.21
Ethnicity/Race				
Hispanic	20.72	19.55-21.94	20.63	19.36-21.96
NH Black	22.19	21.13-23.28	20.74	19.60-21.93
NH White	54.04	52.65-55.36	55.61	54.12-57.09
NH Other	3.08	2.66-3.57	3.02	2.57-3.55
Education		*		
< HS	28.93	27.65-30.25	28.41	27.03-29.84
HS/GED	40.89	39.52-42.27	40.65	39.17-42.16
> HS	30.18	28.94-31.46	30.93	29.56-32.34
Marital Status				
Married	42.54	41.18-43.91	43.12	41.63-44.62
Not Married	57.46	56.09-58.82	56.88	55.38-58.37

4.2.9 **Maternal Characteristics - Identification and Categorization**

Using the findings from our literature review, we explored the maternal characteristics we identified as the individual-level variables in our framework for a multi-level analysis (Figure 2). These variables are listed in Table XII with their final categorization, including the referent category (in bold with an asterisk). For PRAMS, the demographic information is specific to the delivery, including education, as it comes from the birth certificate. We used our findings from the NSFG analysis to guide the exploration of the maternal variables. In the end, for the most part, we found patterns similar to the NSFG, and consequently kept the same categorizations. Although in our NSFG analysis we found cohabiting to be a stronger predictor of postpartum use than marital status, because PRAMS does not collect cohabiting information, we used marital status. Like the NSFG, we kept four categories for the number of total live births and for pregnancy intention we started with four and ended with three categories, eventually combining the two intended pregnancy categories of 'wanted sooner' and 'wanted then.'

The PRAMS data have two sources of prenatal care information: the birth certificate and the questionnaire. The birth certificate provides information on the number of PNC visits and the timing of the first PNC visit. Based on this information both Kotelchuck and Kessner indexes are calculated. The Phase 5 questionnaire also asks about the timing of the initiation of PNC. Unfortunately, the information was sometimes discordant within and between these two sources (birth certificate and questionnaire). We explored all of these variables.

Although both the birth certificate and the questionnaire information identified about 1.3% of women as not getting PNC, the overlap between those who did not get PNC according to the birth certificate variable and according to the questionnaire was

TABLE XII
MATERNAL CHARACTERISTICS USED AS INDEPENDENT VARIABLES
PRAMS, PHASE 5 QUESTIONNAIRE, 2005-2007

Variable Name/ Characteristic	Data Type	Type of Variable	Categories[a]
Age	Continuous	Categorical (3)	20-24 years old **25-29 years old*** 30+ years old
Education	Continuous	Categorical (3)	Less than High School **High School/GED*** More than High School
Ethnicity/Race	Categorical	Categorical (4)	Hispanic Non-Hispanic Black **Non-Hispanic White*** Other
Marital Status	Categorical	Categorical (2)	**Married*** Not (currently) married
Number of Live Births	Continuous	Categorical (4)	One **Two*** Three Four +
Pregnancy Intention	Categorical	Categorical (3 or 4)	Intended – Wanted Sooner Intended – Wanted Then **Unintended – Mistimed*** Unintended – Unwanted
Prenatal Care Talk Birth Control	Categorical	Categorical (2)	Yes **No***
WIC Use	Categorical	Categorical (2)	Yes **No***
Well-Baby Visit	Categorical	Categorical (2)	Yes **No***
Postpartum Visit[b]	Categorical	Categorical (2)	Yes **No***

[a] The refe*rent* category has an asterisk and is in bold.
[b] Postpartum visit is only available for six states, and thus could only be used in a sensitivity analysis.

only about one-third (the other two-thirds were discordant between the two sources). We decided to use the questionnaire's information on PNC initiation because we were interested in a related *core* question that asked women if during their PNC a health care worker had talked about BCMs to use after pregnancy. To avoid the overlap of using both of these variables, we created a dichotomous composite variable (PNC Talk BC) that put respondents who reported a discussion about PP BCM use in one category, and put both those that had PNC, but did not talk about BCM use after pregnancy with a health care worker and those who reported no PNC in the other category.

The last three variables in Table XII, which reflect maternal access to and use of other pregnancy-related services, were not available in the NSFG: WIC Use (during pregnancy), Well-baby Visit (WBV) and Postpartum Visit (PPV). These variables were all Yes/No questions for which no classification decisions needed to be made. As noted in the data description (4.2.1), the PPV variable was a *standard* question in the PRAMS Phase 5 questionnaire that was only used by six of the twelve states that used the *standard* method-specific question.

4.2.10 **Data Analysis Basics**

To account for PRAMS' complex survey design, specifically the stratified systematic sampling which allows oversampling of sub-populations, we conducted all analyses with SAS-callable SUDAAN, using the design and weight variables provided by CDC. Using SUDAAN language, we first identified the sampling design as stratified without replacement. For multi-state, multi-year data sets such as we used, CDC combines the state stratification scheme and the sample year variables into a single variable (sud_nest). We used this variable to provide the design stage information to

SUDAAN (for proper sorting). In addition, in our SUDAAN programming we identified the total population count (ranging from 253 to 125,976) and sample count (ranging from 66 to 905) via the corresponding variables (totcnt and samcnt) included with the data set. Lastly, we identified for SUDAAN the analysis weight variable (wtanal) described below.

The CDC calculates the analysis weights for states using the actual PRAMS data set, birth certificate records, and sampling frame data provided by the states. The analysis weight is composed of the three factors described below.

The primary weight factor is the sampling weight. For each respondent the sampling weight is the reciprocal of the sampling fraction in her stratum. If CDC staff note the use of an improper sampling fraction, they may make appropriate adjustments to this weight.

The second weight factor adjusts for non-response. Non-response weighting is done assuming non-respondents would answer similarly to respondents. CDC first identifies any differences in response rates across strata. If differences are identified, CDC looks for characteristic(s) related to the non-response, specifically looking for differential response across ten mostly demographic characteristics, including age and education. Depending on the findings, the weight adjustment is either applied to respondents with the specific characteristic(s) related to the non-response, or to the entire stratum (if they did not find a specific factor or set of factors).

The third weight factor adjusts for omissions in the sampling frame (sampling frame non-coverage weight). The CDC identifies any omissions by comparing the annual sampling frame with the annual birth certificate file. Non-coverage might be specific to a stratum or related to a county or delivery hospital which submits birth certificates late

and the adjustment depends on the findings. Like non-response weighting, non-coverage weighting assumes those not covered in the frame would have similar responses to those in the frame.

The final analysis weight for each respondent includes her assigned stratum-specific sampling weight adjusted, if needed, for differing non-response and lastly non-coverage and indicates how many persons she represents in the target population. The CDC includes this final analysis weight variable (wtanal) in the data sets they provide to researchers.

4.2.11 **Calculation of Postpartum Contraceptive Use Prevalence**

For our final population of low-income women, 20 years of age or older, who were sexually active and completed the PRAMS questionnaire between three and five-months after delivery, we calculated overall prevalence of *Any* Method and *Effective* Method PP use and prevalence by method type groups. Using the categorization of the variables shown in Table XII above, we also obtained the prevalence of both *Any* Method and *Effective* Method PP use by these maternal characteristics. In addition, for each of the twelve states, we calculated state-specific *Any* Method and *Effective* Method PP use prevalence overall and by age, ethnicity/race, education, marital status and parity. For all PP use prevalence estimates, we also obtained 95% confidence intervals.

4.2.12 **Unadjusted Association of Maternal Characteristics**

To assess the relationship between each maternal characteristic and *Any* and *Effective* Method PP use, as we did for the NSFG analysis, we calculated unadjusted odds ratios and 95% confidence limits. We used the p-values from these analyses to

determine those variables that would be included in our multivariable logistic regression.

4.2.13 **Multivariable Logistic Regression Analysis**

Using the maternal characteristics found to be significantly associated with *Any* Method or *Effective* Method PP use at p< .15 in the unadjusted analysis described above, we conducted a multivariable logistic regression analysis. Starting with all variables that were significant at p < .15 in our model, we used a manual backward elimination approach, sequentially removing non-significant (p > .05) variables, and re-running the model until all variables that remained were significant. Through this methodology, we identified the group of maternal characteristics that best modeled the likelihood of PP use; this was done separately for both *Any* Method and *Effective* Method PP use. The variables in the final PRAMS models became the individual-level variables used in the multilevel analysis described in the next section.

4.2.14 **Sensitivity Analysis of the Postpartum Visit Variable: Six States**

As noted previously, the *standard* PPV question was only used by six of the twelve states that used the method-specific question. And, because using just six states would not provide sufficient variation for our multilevel analysis, we had to conduct our primary analyses without taking into account the effect of a PPV on PP contraceptive use. However, given the historical expectation that PP contraception would be discussed at this visit (Speroff and Mishell, 2008) and the importance of the PPV in another PRAMS study (DePiñeres, 2005), we wanted to assess the importance of the PPV in our study population, so we could assess how our results might differ if this information had

been available for all twelve states. To do this, we repeated the unadjusted and multivariable logistic regression analyses described above using only data from the six states which had the PPV variable. To assure comparability of the two analyses, we followed the same process of identifying variables significant in unadjusted logistic regression and using them in the multivariable logistic regression, rather than relying on the unadjusted results of the larger twelve-state population. We also compared the demographics of the six-state and twelve-state study populations to identify any major population differences that might alter the results.

4.3. **Part Three: Multilevel Analysis to Identify State-level Factors that Affect Individual-level Postpartum Contraceptive Use**

To address our primary goal, in the final part of this research we used individual- and state-level data to identify state-level factors associated with *Any* Method or *Effective* Method PP use among low-income adult women. The multilevel approach – using both state-level and individual-level data – allowed us to measure any association between state-level factors and individual-level postpartum use, while controlling for (taking into account) individual-level maternal characteristics associated with PP use that may differ in composition across the states. The PRAMS data set used in Part Two provided the individual-level data: the independent variables representing maternal characteristics (identified in Part Two to be related to PP use) and the dependent variables, *Any* Method and *Effective* Method PP use. The state-level data, variables representing potential barriers to or facilitators of PP use, came from various sources (see sub-section 4.3.1), and were added to the PRAMS data set.

We included individual-level variables in all multilevel analyses that assessed the relationship between state-level variables and individual-level postpartum contraceptive use. The final models from our PRAMS multivariable analyses of *Any* Method and *Effective* Method PP use, determined the individual-level variables we included in our multilevel models for *Any* Method and *Effective* Method PP use.

In the sub-sections that follow we describe the state-level variables and then detail the steps in our multilevel analysis. These steps included: creating dichotomous state-level variables, identifying from unadjusted analyses, significant state-level variables, and lastly, conducting multilevel modeling to identify the state-level variable or group of variables that best explains variation in *Any* Method and *Effective* Method PP use across the states while controlling for individual-level factors related to PP use.

4.3.1 **State-level Variables – Descriptions and Data Sources**

In the Research Overview (Chapter 3) we identified and discussed the eight measureable state-level factors we hypothesized might be barriers to, or facilitators of, postpartum contraceptive use. In Figure 2 these factors are divided into three categories: Structural Barriers and Facilitators (four factors); Financial Barriers and Facilitators (two factors); and Personal Barriers and Facilitators (two factors, both state policies affecting acceptability and attitude). In this sub-section we describe the preliminary formulation of the state-level variables representing these factors and their data sources.

The basic formulation of the four Structural Barrier/Facilitator variables is delineated in Table XIII below. For Number of Public FP Clinics per 10,000 Women in Need of Subsidized Services (WINSS), we used data provided by the Guttmacher

Institute from their 2006 state-level survey that identified all public family planning clinics, and their 2006 estimates of WINSS by state (Guttmacher, 2009). For Proportion of Counties with One or More Public FP Clinics we obtained, from the Guttmacher Institute (personal communication), the raw county-level data from their 2006 state-level survey of family planning clinics. For each state, we identified and totaled the number of counties that had at least one public family planning clinic as well as the total number of counties, from which we calculated the proportion of counties that had at least one FP clinic.

Unlike most of the other variables, we did not have a published source of data for the Proportion of Delivery Hospitals that are Catholic, so we relied on informal sources to gather the information for its two components (Table XIII). In 2016 we obtained for each state, in most cases from the state's Hepatitis B Coordinator (personal communication), a list of hospitals in the state that currently provide delivery services. To identify which of the delivery hospitals were Catholic, we accessed a current (2016) listing of Catholic hospitals by state, available online from the Catholic Health Care Association (CHA, 2016). From this identification of Catholic and non-Catholic delivery hospitals, we calculated the proportion of delivery hospitals that are Catholic. For the last structural variable, Religious Refusals Policy, we used the Guttmacher Institute's 2005 *Contraceptive Counts* update (Guttmacher, 2006a and b) to identify which states allowed religious refusals for contraception and sterilization and then categorized these.

As seen in Table XIII, the formulation of one of the Financial Barrier/Facilitator variables was categorical while the other was numeric. We used the ongoing reporting of the Guttmacher Institute (Guttmacher, 2005c) to identify each state's 2005 Medicaid Family Planning Waiver status. Because this analysis focuses on postpartum

TABLE XIII
STATE-LEVEL VARIABLE DEVELOPMENT FROM STATE BARRIERS AND FACILITATORS OF POSTPARTUM CONTRACEPTIVE USE IN FIGURE 2

Factor from Figure 2	Variable Name	State Data Formulation
Structural Barriers and Facilitators		
Public FP Clinic Availability - per women in need	**Number of Public FP Clinics per 10,000 WINSS**	Number of public FP clinics / 10,000 WINSS
Public FP Clinic Availability - counties without a clinic	**Proportion of Counties with One or More Public FP Clinics**	Number of counties with one or more Public FP clinics / Total number of counties
Obstetric Services in Catholic Hospitals	**Proportion of Delivery Hospitals that are Catholic**	Number of Catholic hospitals with delivery services / Total number of hospitals with delivery services
Religious Refusals of FP Services	**Religious Refusals Policy**	Categorical: Contraception Refusal: Yes or No; Sterilization Refusal: Yes or No
Financial Barriers and Facilitators		
Medicaid FP Services Eligibility	**Medicaid Family Planning Waiver**	Categorical: Yes or No
Public Funding for FP Services	**Public Expenditures on FP Services per WINSS**	Total public dollars spent for FP services / WINSS
Personal Barriers and Facilitators (Policies affecting Acceptability and Attitude)		
Sexuality Education	**Sex Education Policies**	Categorical Mandate: Yes or No; BCM Requirement: Yes or No
Reproductive Health-Friendly Policies	***Comprehensive* Index**	Total score when add Guttmacher score for each component
Reproductive Health-Friendly Policies	***Access-specific* Index**	Total score when add Guttmacher score for each component
Reproductive Health-Friendly Policies	***Study-specific* Index**	Total score when add Guttmacher score for each component

contraception, we did not distinguish between waiver types, deeming postpartum waivers just as important, and perhaps more important, than comprehensive waivers. In 2005, only three states did not have either type of Medicaid family planning waiver: Michigan, Nebraska and West Virginia (Guttmacher, 2005c). However, Michigan began a waiver in July of 2006. Although we did have Michigan PRAMS data for 2006 and 2007, because we would expect a new program to have a relatively small impact in its first 18 months, we left Michigan in the 'No Waiver' category. For the second of our financial variables, Public Expenditures on FP Services per WINSS, we calculated each state's expenditures per WINSS using Guttmacher's 2006 expenditures data (Sonfield et al., 2008a) and their estimate of WINSS in 2006 (Guttmacher, 2009).

As with the Financial Barrier/Facilitator variables, one of the two Personal Barrier/Facilitator variables was categorical while the other was a numeric score (Table XIII). We used the Guttmacher Institute's 2005 information to create a Sex Education Policies variable (Guttmacher, 2005b) whose categories focused on two different policy aspects: a mandate that schools provide sexuality education; and a requirement that if sexuality education is taught that it include information about birth controls methods (BCMs). We consider the BCM requirement the most desirable and a mandate without a BCM requirement potentially detrimental, as a mandate without a BCM requirement could simply mean that all students receive abstinence-only sex education.

To create a variable representing reproductive health friendly policies, we relied on the work of the Guttmacher Institute which, as part of its *Contraception Counts: Ranking State Efforts*, developed a comprehensive index of 2005 state policies (Guttmacher, 2006a and b). The components of this *Comprehensive* Index were: Medicaid eligibility for family planning services (waivers), insurance coverage of

contraception, access to emergency contraception, Minors' consent laws, sex education policies, restrictions on the use of state family planning funds, and refusal clauses for contraceptives. Some of these individual components are already part of our analysis as stand-alone state-level variables; however, we consider this index a more general measure of a state's overall efforts to improve reproductive health outcomes.

Because of the overlap in elements of the *Comprehensive* Index and other state-level variables, and because three components of the index (Access to emergency contraception, Minors' consent laws, Insurance coverage for contraceptives) are not directly relevant to our study of postpartum contraceptive use among adult women with Medicaid coverage, we also created two more specific indices that excluded two or all three of these elements. For one alternate index, we focused on universal *access* to contraceptives (*Access-specific* Index), while for the other we focused on access and knowledge for our study-specific population (*Study-specific* Index). We compare the elements of the three indices in Table XIV, and further describe them below.

For the *Access-specific* Index, we limited the measure to policies that might affect access to contraceptive services for any woman, regardless of income. The components of this index included: Medicaid eligibility for family planning services, insurance coverage of contraception, restrictions on the use of state family planning funds, and provider refusal clauses. For the *Study-specific* Index, we focused on components that would specifically affect access to contraceptives for low-income women, and added a component that measured potential 'knowledge' about contraceptives. The components of this alternate index included: Medicaid eligibility for family planning services, restrictions on the use of state family planning funds, provider religious refusal clauses, and sex education policies. For the components of all three indices, we used the

TABLE XIV
ELEMENTS OF INDICES OF REPRODUCTIVE HEALTH-FRIENDLY POLICIES
FAMILY PLANNING LAWS AND POLICIES, GUTTMACHER INSTITUTE, 2005[a]

	Focus of Index		
Element	**Comprehensive**	**Access-specific**	**Study-specific**
Access to Emergency Contraception	X		
Insurance Coverage of Contraception	X	X	
Expanded Medicaid Eligibility for FP (Medicaid FP waivers)	X	X	X
Minors' Consent Law	X		
Refusal Clause for Contraceptives	X	X	X
Restrictions on FP Funds	X	X	X
Sex Education Policies	X		X

[a] As developed by the Guttmacher Institute (Guttmacher, 2006a and b).

Guttmacher scoring scheme (Guttmacher, 2006a and b). We present the actual scores of each index variable and explore their categorization in the sub-section that follows.

4.3.2 State-level Variables - Variation and Initial Categorization

In this step, we assessed the variation in the ten state-level variables that represent the eight barriers or facilitators of postpartum contraceptive use (Table XIII) and made initial categorizations. Unlike the individual-level variables, for which we relied on both our experience with the NSFG and published literature, for the categorization of our state-level variables, we had neither. We therefore determined our initial categorization empirically, by identifying logical division(s) specific to the variable, considering natural groupings across the states, as well as resulting category sizes.

We first created tables that show, for each variable, the value for every state, thus identifying the range and natural clustering of values. We based our preliminary

categorization, as described below, on the data in these tables, with the goal of developing three-category variables with an acceptable distribution of the number of states and respondents.

The values for Number of Public FP Clinics per WINSS ranged from 4.60 to 17.75 per 10,000 WINSS (Table XV). For this range, we identified three natural groupings: less than seven, those at seven, and those at 11 or above. The Proportion of Counties with One or More Public FP Clinics had a rather lopsided natural division (Table XV). In eight of the twelve states, all counties had at least at one clinic. The percent for the other four states ranged from 26 to 99. We put the states with 99% and 100% in one category, and those with fewer than 99% in the other. Although this left a wide range for the second category (26% to 83%), we felt these states were different than those that had a clinic in every county, or almost every county.

The Proportion of Delivery Hospitals that are Catholic also had a rather lopsided natural division. Missouri and Oregon were bunched together at the top with more than one quarter of their delivery hospitals part of a Catholic health system (Table XV). We also noted two other natural groupings: states where the proportion was very low (from 2.3% in Mississippi and South Carolina to no Catholic delivery hospitals in North Carolina and Rhode Island; and, the four states whose proportions range from 11.1% to 16.7%. Almost exactly in the middle of these last two groupings was Florida, where 7.0% of its delivery hospitals are Catholic. Because we did not know if Florida was more like the states in the 'Low' or the 'Medium' category, we created two versions of the variable ('Original' and 'Alternate') with different low to medium category cutoffs (<8% and <7%, respectively). In the 'Original' version, with a cutoff of less than 8%, Florida was in the 'Low' category, while in the 'Alternate' version, with the < 7% cutoff, Florida was in

TABLE XV
STATE-LEVEL VARIABLES REPRESENTING STRUCTURAL BARRIERS AND FACILITATORS, VALUES BY STATE

State	Number of Public FP Clinics per 10,000 WINSS 2006[a]	Proportion of Counties with One or More Public FP Clinics 2006[b]	Proportion of Delivery Hospitals that are Catholic 2016[c]	Religious Refusals Policy 2005[d] *Allows religious refusals for:* Contraception	Religious Refusals Policy 2005[d] *Allows religious refusals for:* Sterilization
Arkansas	11.06	100	12.2	Yes	Yes
Florida	4.60	100	7.0	Yes	No
Michigan	6.34	100	16.7	No	No
Mississippi	12.33	99	2.3	Yes	Yes
Missouri	7.45	83	27.3	No	No
Nebraska	5.65	26	13.3	No	No
New York*	4.87	100	14.9	No	No
North Carolina	5.13	100	0	No	No
Oregon	7.53	100	26.0	No	No
Rhode Island	7.15	80	0	No	Yes
South Carolina	7.89	100	2.3	No	No
West Virginia	17.75	100	11.1	Yes	Yes

[a] Data from: Sonfield, 2008.
[b] Data from author calculations of survey data provided by Guttmacher, as reported in Guttmacher, 2009.
[c] Data obtained from personal communication and the Catholic Health Association (CHA, 2016).
[d] Guttmacher, 2005b.

the 'Medium' category. Because their proportions were so much higher than the others, for both versions we left MO and OR in a 'High' category of their own. Although not desirable, because we intended to reduce all of the state-level variables further, we waited to decide how to handle this natural grouping of only two states.

We used the most obvious and logical divisions for Religious Refusals Policy, putting those who allowed refusals for either sterilization or contraceptives in one category and those who allowed refusals for both in a second category. Those states that did not allow religious refusals were placed in the third and largest category (Table XV).

Among the financial factors (Table XVI), the Medicaid FP Waiver variable had only one option for categorization: the nine states that had a waiver versus the three that

TABLE XVI

STATE-LEVEL VARIABLES REPRESENTING FINANCIAL AND PERSONAL BARRIERS AND FACILITATORS, VALUES BY STATE

	Financial Barrier or Facilitator Variables		**Personal Barrier or Facilitator Variables**			
State	Medicaid FP Waiver[a]	Public Expenditures on FP Services per WINSS[c]	Sex Education Policies[d]	*Comprehensive* Index (score)[e]	*Access-specific* Index (score)[f]	*Study-specific* Index (score)[f]
Arkansas	Yes	112.40	None	10	10	-20
Florida	Yes	66.22	Mandate	-20	10	-10
Michigan	No[b]	69.26	None	-30	-10	-30
Mississippi	Yes	67.33	None	-20	0	-20
Missouri	Yes	86.47	Required	30	30	30
Nebraska	No	51.07	None	0	0	0
New York	Yes	126.41	None	80	40	30
No Carolina	Yes	111.28	Mandate	30	30	0
Oregon	Yes	278.93	Required	50	20	30
Rhode Island	Yes	58.10	Both	40	40	30
So Carolina	Yes	121.18	Both	40	20	30
West Virginia	No	93.24	Both	30	20	10

[a] Guttmacher, 2005a.

[b] Michigan began a waiver in July 2006. Given the time a rollout of a new program takes, we chose to classify Michigan as a non-waiver state for the purposes of this survey.

[c] Sonefield, 2008a.

[d] Guttmacher, 2005c. Required: Must provide birth control method information. Mandate: Must provide Sex Education.

[e] Guttmacher, 2006a and b.

[f] Adapted from: Guttmacher, 2006a and b.

did not. The considerably wide range in Public Expenditures on FP Services per WINSS went from $51 per woman in need at the low end to $278 at the high end (Table XVI). We identified three natural groupings: less than $70, between $85 and $100, and those states spending $111 or greater. Although the middle category only included two states, and the high category had a rather wide range, we decided to keep these categories, and assess the options for combining categories later.

Because we had all four combinations of the two sex education policies of interest, we created a four-category Sex Education Policies variable (Table XVI). The four categories included: None, a sex education mandate alone, a BCM requirement alone, and a category for the three states that had both a BCM requirement and a mandate.

For each of the three indices of reproductive health friendly policies, Table XVI shows the actual scores. Since the two alternate indices had fewer elements than the *Comprehensive* Index, the ranges varied. Based on the scores for each index, we divided the states into three levels: low, medium and high. We adjusted our category cutoffs for each index based on the range and clustering of scores. Each index had one category with three, one category with four, and one category with five states.

Table XVII shows the actual categorization for each state across the indices. As seen in this table, four of the states were at the low end for all three of the indices (AR, FL, MI, MS), while one state was consistently part of the medium category (West Virginia), and two states had the highest ranking for each of the indices (New York, Rhode Island). Among the five states whose categorization varied across the indices, one state (Nebraska) was either in the low or medium category, while the other four always ranked in the upper two-thirds (medium or high).

TABLE XVII
INDICES OF REPRODUCTIVE HEALTH-FRIENDLY POLICIES[a]
SCORE AND PROPOSED CATEGORIZATION BY STATE

	Indices of Reproductive Health Friendly Policies					
	Original *Comprehensive*		Modified *Access-specific*		Modified *Study-Specific*	
State	Score	Category	Score	Category	Score	Category
Arkansas	10	**Low**	10	**Low**	-20	**Low**
Florida	-20	**Low**	10	**Low**	-10	**Low**
Michigan	-30	**Low**	-10	**Low**	-30	**Low**
Mississippi	-20	**Low**	0	**Low**	-20	**Low**
Missouri	30	*Medium*	30	High	30	High
Nebraska	0	**Low**	0	**Low**	0	*Medium*
New York*	80	High	40	High	30	High
North Carolina	30	*Medium*	30	High	0	*Medium*
Oregon	50	High	20	*Medium*	30	High
Rhode Island	40	High	40	High	30	High
South Carolina	40	High	20	*Medium*	30	High
West Virginia	30	*Medium*	20	*Medium*	10	*Medium*

[a] As listed in: Guttmacher, 2006a and b.

In Table XVIII we show, for each of the now eleven state-level variables, its final categorization or categorizations (in the case of Proportion of Delivery Hospitals that are Catholic), and the resultant distribution of states and total PRAMS population across the categories. As discussed above, for most of the variables we found somewhat obvious or natural groupings into three categories, although for some variables the divisions are a bit more arbitrary. And, as seen in Table XVIII, the cutoffs we set led to, if not equal, at least somewhat balanced categories. However, given these categorizations were not based on prior research, as part of our multilevel analysis, we first assessed the appropriateness of these categorizations with regards to differences, or conversely similarities, in postpartum use between categories, with the goal of creating dichotomous variables as described in sub-section 4.3.4 below.

TABLE XVIII

DISTRIBUTION OF STATES AND RESPONDENTS BY VARIABLE CATEGORY
MULTI-CATEGORY STATE-LEVEL VARIABLES FROM VARIOUS SOURCES
PRAMS, TWELVE STATES, 2005-2007

Variable and Categorization	# of States	States	# Women	Weighted Percent
Structural Barriers and Facilitators				
Number of Public FP Clinics per 10,000 WINSS – 3 Categories				
Low (4.6-6.3)	5	FL/MI/NE/NY/NC	4262	**59.97**
Medium (7.2-7.9)	4	MO/OR/RI/SC	4621	**25.23**
High (11.06-17.75)	3	AR/MS/WV	4121	**14.80**
Proportion of Counties with One or More Public FP Clinics				
Low (< 99%)	3	MO/NE/RI	2924	**10.57**
High (99-100%)	9	AR/FL/MI/MS/NY/NC/OR/SC/WV	10080	**89.43**
Original - Proportion of Delivery Hospitals that are Catholic – 3 Categories				
Low **(< 8%)**	5	FL/MS/NC/RI/SC	3996	**38.32**
Medium **(8-17%)**	5	AR/MI/NE/NY/WV	6833	**48.65**
High (> 17%)	2	MO/OR	2175	**13.03**
Alternate - Proportion of Delivery Hospitals that are Catholic – 3 Categories				
Low **(< 7%)**	4	MS/NC/RI/SC	3551	**27.66**
Medium **(7-17%)**	6	AR/FL/MI/NE/NY/WV	7278	**59.31**
High (> 17%)	2	MO/OR	2175	**13.03**
Religious Refusals Policy (Contraception & Sterilization) – 3 Categories				
None	7	MI/MO/NE/NY/NC/OR/SC	7336	**72.51**
One or Other	3	FL/RI/WV	2868	**16.53**
Both	2	AR/MS	2800	**10.96**
Financial Barriers and Facilitators				
Medicaid Family Planning Waiver				
Yes	10	AR/FL/MS/MO/NY/NC/OR/RI/SC/WV	9267	**74.95**
No	3	MI/NE/WV	3737	**25.05**
Public Expenditures on FP Services per WINSS – 3 Categories				
Low (51.1-69.3)	5	FL/MI/MS/NE/RI	4292	**35.90**
Medium (86.5-100)	2	MO/WV	1711	**8.35**
High (101 +)	5	AR/NY/NC/OR/SC	7001	**55.75**

TABLE XVIII (continued)
DISTRIBUTION OF STATES AND RESPONDENTS BY VARIABLE CATEGORY
MULTI-CATEGORY STATE-LEVEL VARIABLES FROM VARIOUS SOURCES
PRAMS, TWELVE STATES, 2005-2007

Variable and Categorization	# of States	States	# Women	Weighted Percent
Personal Barriers and Facilitators (Policies affecting Acceptability and Attitude)				
Sex Education Policies - 4 Categories				
BCM Requirement & Mandate	3	RI/SC/WV	3767	**16.04**
BCM Requirement	2	MO/OR	2175	**13.03**
Mandate Only	2	FL/NC	1221	**24.13**
None	5	AR/MI/MS/NE/NY	5841	**46.80**
***Comprehensive* Index of Reproductive Health Friendly Policies - 3 Categories**				
Low (LE 10)	5	AR/FL/MI/MS/NE	5661	**42.83**
Medium (30)	3	MO/NC/WV	2487	**21.82**
High (GE 40)	4	NY/OR/RI/SC	4856	**35.35**
***Access-specific* Index of Reproductive Health Friendly Policies - 3 Categories**				
Low (LE 10)	5	AR/FL/MI/MS/NE	5661	**42.83**
Medium (20)	3	OR/SC/WV	4450	**22.53**
High (GE 30)	4	MO/NY/NC/RI	2893	**34.63**
***Study-specific* Index of Reproductive Health Friendly Policies - 3 Categories**				
Low (< 0)	4	AR/FL/MI/MS	4229	**38.80**
Medium (0-10)	3	NE/NC/WV	3529	**21.34**
High (30)	5	MO/NY/OR/RI/SC	5246	**39.86**

4.3.3 **Multilevel Logistic Regression – Statistical Methodology**

We conducted our multilevel logistic regression analysis using population-averaged modeling with general estimating equations (GEE). For parameter estimates, as well as standard errors, this approach accounted for most of the clustering at the state level and thus provided us with odds ratios and confidence intervals for the state-level variables that would be similar to those that we would have obtained with mixed (random effects) modeling (Hubbard et al., 2010). We used exchangeable SUDAAN for all multilevel analyses. SUDAAN actually uses GEE to address the complexities of survey design effects and weighting; programming SUDAAN to use 'exchangeable' GEE assured that the clustering at the state level was taken into account.

We conducted this analysis for both *Any* Method and *Effective* Method PP use. The individual-level component of the multilevel models was always the same: the variables in the final main PRAMS multivariable logistic regression model for *Any* Method or *Effective* Method PP use.

4.3.4 **Preliminary Step: Creation of Dichotomous State-level Variables**

Because of the complexity of the multilevel analysis, we first sought to reduce all state-level variables to two categories. Dichotomizing the state-level variables reduced the parameters in our models, which was advantageous to conducting the statistically sophisticated multilevel analysis.

To collapse variable categories, we sought to identify adjoining categories that were not significantly different in postpartum contraceptive use (OR=1) and could thus be combined. We accomplished this preliminary step using multilevel techniques: by adding a single state-level variable to our final individual-level model. We repeated this

modeling process (one state-level variable + all individual-level variables) for all state-level variables to obtain low vs. medium, medium vs. high and low vs. high category comparisons of the odds of PP use. From this process, we obtained ORs for these comparisons, controlling for all significant individual-level variables.

Although we proceeded with this process for both *Any* and *Effective* Method PP use, because *Effective* Method PP use had more significant differences between categories, we made decisions based on the *Effective* Method PP use results. Using this technique we reduced all multi-category state-level variables to dichotomous variables, although a few variables required extra review and additional analyses.

After dichotomization of the state-level variables we looked at the distribution of states and total population across the two categories of each variable. In addition, to better understand the relationships between these nine final analysis variables, we created a correlation matrix showing the Pearson's correlation coefficient. With two dichotomous variables, the Pearson correlation coefficient is in effect the Phi coefficient, which is considered the appropriate measure to assess association between two binary variables. We conducted this analysis without weighting.

4.3.5 Unadjusted Association of Dichotomous State-level Variables in a Multilevel Model

We began our formal multilevel analysis with an unadjusted analysis of the final dichotomous versions of the state-level variables. As in our preliminary step (described above), we once again added one state-level variable to the final individual-level model and then ran this multilevel model to obtain an OR and CI for the association between each state-level variable and PP use. This method was used to identify significant

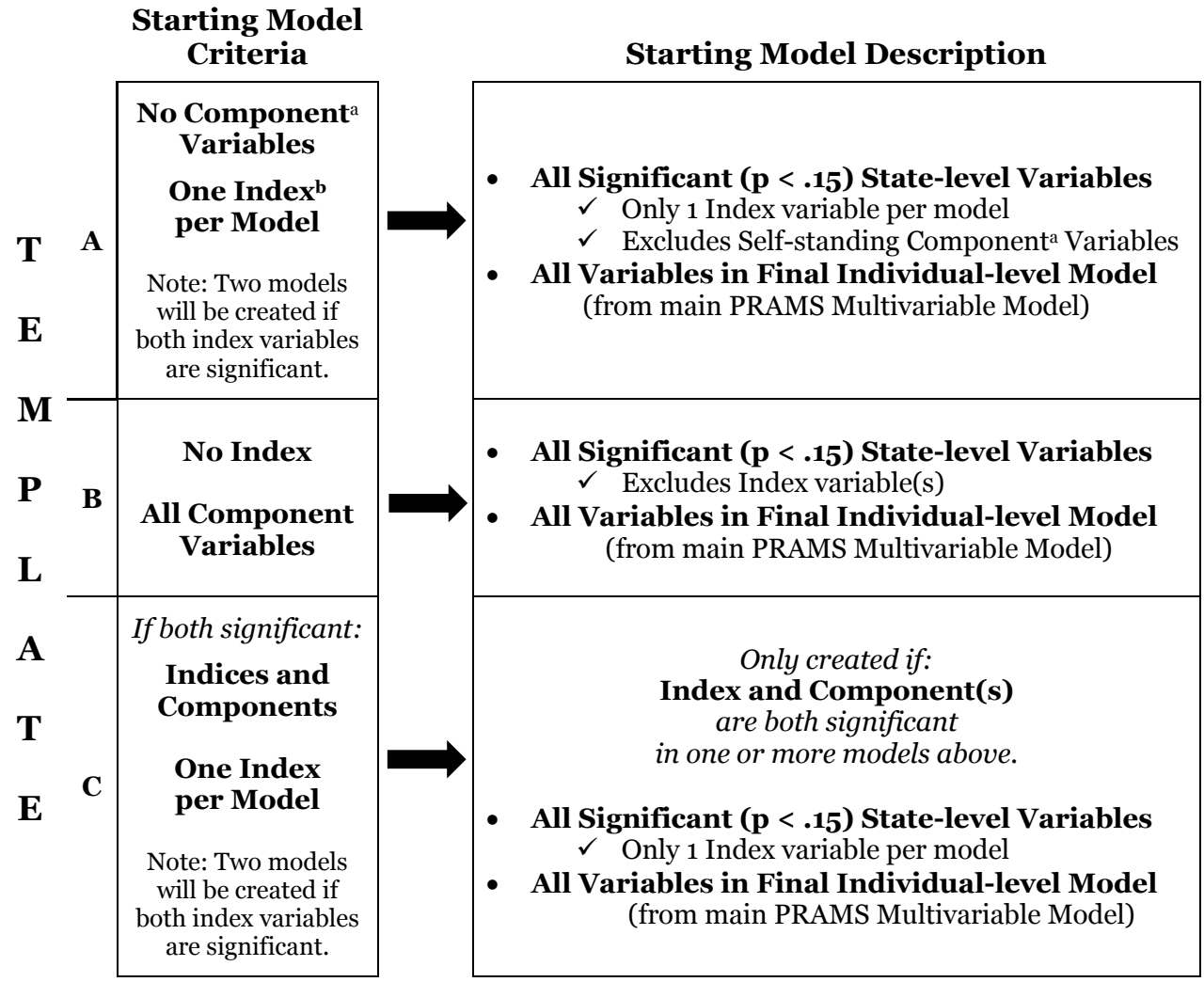
relationships between each state-level variable and both *Any* Method and *Effective* Method PP contraceptive use. The dichotomous state-level variables with a significant OR ($p < .15$) were used in the next step: multilevel modeling.

4.3.6 **Multilevel Modeling with All Significant State-level Variables**

Using the state-level variables that were identified as significant in the unadjusted analysis, we proceeded with multilevel modeling for both *Any* Method and *Effective* Method PP use. Because of the similarities between the indices of reproductive health-friendly policies (two are subsets of the other), and the replication of some components of the indices as stand-alone variables, we did not simply put all of the variables into the same model and proceed with backwards elimination modeling. Instead, as described above, we assessed the correlation between the variables and we planned for multiple starting models that would meet these criteria: 1) have only one index per model; 2) model the index variable without stand-alone component variables; 3) model the stand-alone component variables without an index; and, 4) if an index and a component were significant in the initial models, model them together. To make building the starting models consistent, we developed three templates that followed these modeling criteria (Figure 6). Template "A" allows one index per model, but does not allow components of that index to be included. Template "B" includes component variables, but excludes the indices. Template "C" would be used if both an index and a component are significant in models from Template A or B.

The specific starting models were constructed according to the templates (Figure 6) using the state-level variables significant in their unadjusted analyses in a multilevel model. Because Templates "A" and "C" can contain only one index, if both indices were

Figure 6. Starting model templates for multilevel modeling of ***Any*** and ***Effective*** method postpartum contraceptive use.



[a] Components are stand-alone variables that are also a component of the indices which include: Religious Refusals Policy, Medicaid FP Waiver and Sex Education Policies.

[b] Indices include the *Comprehensive*, *Access-specific* and *Study-specific* Index, all based on the Guttmacher Institute 's efforts to rank states (Guttmacher, 2006a and b).

significant, we created two starting models per template, each with a different index variable, so that the number of starting models depended on the results of the unadjusted analyses and in the case of Template C the initial modeling results. The template requirements, as well as the number of state-level variables significant in the unadjusted analyses, determined how many state level variables were in each model. All starting models included the same individual-level variables – those that were in the final main PRAMS individual-level multivariable models (see sub-section 4.2.13) for *Any* Method or *Effective* Method PP use.

For each starting model, we proceeded with multilevel backwards elimination modeling. Based on the ORs, for each successive model we removed all state-level variables that were not significant at $p < .05$, but kept in all of the individual-level variables. We continued with the backwards elimination until all state-level variables in the model remained significant. This process was completed for both *Any* and *Effective* Method PP use.

With multiple starting models we did not end our multilevel modeling with one final model that represented the state-level variable or group of state-level variables that best predicted *Any* Method and *Effective* Method PP use while controlling for individual-level differences across the states. Instead, with a final model for each starting model, we compared the final models in terms of variables in common and the strength of the association of each. If both indices were significant, or the components of the indices were involved, we compared the results for an indication of which might be more strongly associated with PP use.

5. RESULTS

Our final study population of low-income, sexually-active women 20-44 years of age, included 985 respondents from the NSFG survey who had a live birth within four years of their interview, and 13,004 PRAMS respondents from 12 states. Excluding high income women and those who were not sexually active reduced the study populations considerably.

We begin our analysis presentation with a comparison of the PRAMS and NSFG populations: by demographic distribution, by PP use prevalence, and by type of method used. We then proceed with the descriptive and analytic analyses of the NSFG data, followed by the same information for the PRAMS population. The last section presents the findings of our PRAMS multilevel analysis, beginning with a brief look at differences across the states, followed by a review of our state-level variables and the actual multilevel modeling results.

5.1 PRAMS and NSFG: Study Population and Prevalence Comparisons

When comparing demographic characteristics across the two surveys (Table XIX), we found both similarities and differences. The distributions by education and marital status were very similar, while there was more variation in the distributions of age, ethnicity/race and number of live births. The PRAMS population was younger (20-24 year olds - NSFG: 41.6%; PRAMS: 47.0%), and correspondingly had a larger percentage of first births (NSFG: 24.7%; PRAMS: 31.1%). The other noticeable difference in maternal characteristics was the distribution of ethnicity/race. While in the PRAMS study population only 20.6% of women were Hispanic, 35.3% of our NSFG study

TABLE XIX

PERCENT DISTRIBUTION OF MATERNAL DEMOGRAPHICS BY SURVEY
LOW INCOME, SEXUALLY ACTIVE WOMEN, 20-44 YEARS OLD
NSFG, UNITED STATES, 2006-2010 AND PRAMS, TWELVE STATES, 2005-2007

	NSFG (n=985)			**PRAMS** (n = 13004)		
Variables	N[a]	Percent[a]	95% CI[a]	N[a]	Percent[a]	95% CI[a]
Age						
20-24	420	41.6	36.8-46.5	6012	47.0	45.5-48.5
25-29	310	29.3	24.7-34.3	4011	31.1	29.7-32.5
30+	255	29.2	23.8-35.2	2981	21.9	20.7-23.2
Ethnicity/Race						
Hispanic	366	35.3	27.2-44.4	2382	20.6	19.4-22.0
NH Black	264	20.5	15.4-26.8	3094	20.7	19.6-21.9
NH White	290	36.5	29.9-43.7	6329	55.6	54.1-57.1
NH Other	65	7.6	5.1-11.3	1012	3.0	2.6-3.6
Education						
< HS	343	30.8	26.2-35.8	3430	28.4	27.0-29.8
HS/GED	361	39.0	34.6-43.7	5313	40.7	39.2-42.2
> HS	277	30.2	26.1-34.7	4117	30.9	29.6-32.3
Marital Status						
Married	348	42.0	37.4-46.7	5883	43.1	41.6-44.6
Not Married	633	58.0	53.3-62.6	7099	56.9	55.4-58.4
Cohabiting Status[b]						
Yes	737	81.6	77.0-85.5			
No	248	18.4	14.5-23.0			
Number of Live Births						
One	221	24.7	20.7-29.1	4211	31.1	29.7-32.5
Two	334	34.3	29.7-39.1	3998	32.6	31.2-34.0
Three	233	23.0	18.7-27.9	2656	20.7	19.5-21.9
Four +	197	18.1	15.0-21.6	2084	15.7	14.6-16.8

[a] Ns are unweighted, while percentages and confidence intervals (CIs) are based on weighted data.
[b] PRAMS did not collect cohabiting status information.

population reported Hispanic ethnicity. Correspondingly, 55.6% of the PRAMS study population reported their ethnicity/race as white, non-Hispanic, while only 36.5% of the NSFG respondents reported they were white and non-Hispanic.

We found the overall prevalence of postpartum contraceptive use consistently lower in the NSFG than in PRAMS (Table XX): an 11 percentage point lower prevalence of postpartum contraceptive use for *Any* Method (NSFG: 79.4; PRAMS: 90.8%), *a*nd a 17 percentage point lower prevalence of *Effective* Method PP use (NSFG: 54.6%; PRAMS: 71.8%). With relatively small differences in Sterilization and LARC use, use of Other (non-LARC) Hormonal Methods made up the bulk of the difference in *Effective* method use (10 percentage points). The reduction in the difference between the two surveys from 17 percentage points for *Effective* Method PP use to 11 for *Any* Method PP use was mostly due to the higher percentage of NSFG participants who used withdrawal (7.4% vs. 2.7%) compared to the PRAMS population (Table XX).

When comparing method choice among contraceptive users (Table XXI), as above, we found similar proportions who chose sterilization and LARC, but not Other Hormonal Methods (NSFG: 44.6% ; PRAMS: 37.1%), such that *Effective* Method PP use among PRAMS respondents was 10 percentage points greater than that of the NSFG respondents. Correspondingly, women in the NSFG had 10 percentage points more use of less-effective methods. While condoms accounted for 4.5 percentage points, withdrawal accounted for 6.3 percentage points of the higher use of less-effective methods. Among NSFG method users, more than 9% reported withdrawal as their primary method, while only 3% of PRAMS respondents reported this method (Table XXI).

TABLE XX

POSTPARTUM CONTRACEPTIVE USE PREVALENCE
BY METHOD TYPE GROUP BY SURVEY
LOW INCOME, SEXUALLY ACTIVE WOMEN, 20-44 YEARS OLD
NSFG, UNITED STATES, 2006-2010 AND PRAMS, TWELVE STATES, 2005-2007

Contraceptive Method Type Group	NSFG		PRAMS	
	Percent	95% CI	Percent	95% CI
Sterilization	16.89	13.66-20.71	20.76	19.57-22.01
LARC[a]	8.23	5.91-11.36	10.51	9.64-11.45
Other Hormonal Methods	29.43	25.22-34.01	40.50	39.02-42.00
***Effective* Method Use**	**54.55**	**49.92-59.11**	**71.77**	**70.37-73.13**
Condoms	16.44	13.72-19.58	14.68	13.62-15.82
Withdrawal	7.40	5.11-10.60	2.69	2.23-3.23
Barriers/Spermicides/FAM[b]	0.97	0.31-2.94	1.62	1.28-2.06
***Any* Method Use**	**79.36**	**75.20-82.98**	**90.77**	**89.84-91.62**
No Method Use	**20.64**	**17.02-24.80**	**9.23**	**8.38-10.16**

[a] LARC: Long-acting reversible contraception, which includes IUDs and hormonal implants.
[b] FAM: Fertility Awareness-based Methods.

TABLE XXI

PERCENT DISTRIBUTION OF CONTRACEPTIVE METHOD TYPE GROUP
AMONG POSTPARTUM CONTRACEPTIVE METHOD USERS[a] BY SURVEY
LOW INCOME, SEXUALLY ACTIVE WOMEN, 20-44 YEARS OLD
NSFG, UNITED STATES, 2006-2010 AND PRAMS, TWELVE STATES, 2005-2007

Contraceptive Method Type Group	NSFG		PRAMS	
	Percent	95% CI	Percent	95% CI
Sterilization	21.29	17.12-26.14	22.87	21.57-24.23
LARC[b]	10.38	7.44-14.29	11.58	10.62-12.61
Other Hormonal Methods	37.08	32.26-42.17	44.62	43.04-46.20
Sub-total Effective Methods	**68.75**		**79.07**	
Condoms	20.72	17.31-24.60	16.18	15.02-17.41
Withdrawal	9.32	6.50-13.20	2.96	2.46-3.56
Barriers/Spermicides/FAM[c]	1.22	0.40-3.67	1.79	1.41-2.26
Sub-total Less Effective Methods	**31.26**		**20.93**	
Total	**100%**		**100%**	

[a] Those not using a method have been excluded from this analysis.
[b] LARC: Long-acting reversible contraception, which includes IUDs and hormonal implants.
[c] FAM: Fertility Awareness-based Methods.

5.2 Part One: National Findings from the NSFG

The findings of the NSFG analysis presented below represent national-level estimates of postpartum contraceptive use and identification of risk and preventive factors for postpartum contraceptive use among low-income women 20-44 years old. In the text and tables that follow we share the results of our analyses of both *Any* Method and *Effective* Method PP use prevalence and association with maternal characteristics (unadjusted and multivariable logistic regression). For all point estimates we include the 95% confidence interval.

5.2.1 NSFG *Any* Method Postpartum Contraceptive Use Prevalence and Unadjusted Associations

Among the NSFG study population, the prevalence of *Any* Method PP use varied significantly by education and pregnancy intention (Table XXII). We found a significant association between *Any* Method PP use and three maternal characteristics: education, number of live births, and pregnancy intention (Table XXII). Those with at least some post-high school education or training had a higher odds of *Any* Method PP use compared to those who only had a high school degree or GED (OR: 1.93; CI: 1.16-3.21). Women with four or more live births had a lower odds of *Any* Method PP use than those with two live births (OR: 0.55; CI: 0.31-0.95). And lastly, both those with an intended pregnancy (OR: 0.49; CI: 0.29-0.85) and those with an unwanted pregnancy (OR: 0.50; CI: 0.25-0.99) had a lower odds of *Any* Method PP use compared to those with a mistimed pregnancy. Not shown in Table XXII are the marginally significant associations (.05 < p-value < .15) between *Any* Method PP use and cohabiting status as well as ethnicity/race (non-Hispanic blacks versus non-Hispanic whites).

TABLE XXII

PREVALENCE (PERCENT) AND ASSOCIATION BY MATERNAL CHARACTERISTICS[a]
ANY METHOD POSTPARTUM CONTRACEPTIVE USE
LOW INCOME, SEXUALLY ACTIVE WOMEN, 20-44 YEARS OLD
NSFG, UNITED STATES, 2006-2010

		Prevalence[b]		**Unadjusted Association[b]**	
Variables	N[a]	Percent[a]	95% CI[a]	OR[a]	95% CI[a]
Total	981	79.36	75.20-82.98	----	
Age					
20-24	418	81.23	76.07-85.48	1.22	0.77-1.93
25-29	309	77.98	70.78-83.81	*Ref*	----
30+	254	78.09	68.10-85.61	1.01	0.54-1.87
Ethnicity/Race					
Hispanic	365	78.93	70.80-85.26	0.77	0.42-1.40
NH Black	263	72.73	63.08-80.63	0.55	0.29-1.01
NH White	289	83.03	76.63-87.95	*Ref*	----
NH Other	64	81.65	67.95-90.33	0.91	0.38-2.17
Education					
< HS	343	**73.63**	**66.18-79.94**	0.79	0.51-1.24
HS/GED	361	**77.86**	**71.75-82.96**	*Ref*	----
> HS	277	**87.14**	**81.66-91.17**	**1.93**	**1.16-3.21**
Marital Status					
Married	348	81.83	75.06-87.07	*Ref*	----
Not Married	633	77.57	72.57-81.89	0.77	0.48-1.22
Cohabiting Status					
Yes	735	80.74	76.24-84.56	*Ref*	----
No	246	73.21	64.40-80.50	0.65	0.40-1.05
Number of Live Births					
One	218	76.93	66.28-84.98	0.67	0.34-1.32
Two	333	83.35	77.28-88.04	*Ref*	----
Three	233	80.87	71.66-87.60	0.84	0.45-1.58
Four +	197	73.20	63.29-81.22	**0.55**	**0.31-0.95**
Pregnancy Intention					
Wanted Sooner[c]	60	**73.44**	**53.39-86.97**	**0.49**	**0.29-0.85[c]**
Planned[c]	453	**77.32**	**71.23-82.45**		
Mistimed	255	**87.03**	**80.66-91.53**	*Ref*	----
Unwanted	205	**77.10**	**67.57-84.48**	**0.50**	**0.25-0.99**
Prenatal Care Initiation					
1st Trimester	825	79.65	74.83-83.74	1.34	0.65-2.76
2nd Trimester	123	74.53	60.72-84.71	*Ref*	----
3rd Tri/None	32	89.42	72.29-96.48	2.89	0.85-9.86

[a] Ns are unweighted, while percentages, ORS and CIs are based on weighted data.

[b] Bold type indicates significant difference between categories or significant OR (p < .05).

[c] The categories of 'Wanted Sooner' and 'Planned' were combined into one 'Intended' category for association.

5.2.2 NSFG *Effective* Method Postpartum Contraceptive Use Prevalence and Unadjusted Associations

The prevalence of *Effective* Method PP use did not vary significantly ($p < .05$) by any maternal characteristic (Table XXIII). Two maternal characteristics were significantly associated with *Effective* Method PP use (Table XXIII). Respondents with an intended pregnancy had a lower odds of *Effective* Method PP use than those with a mistimed pregnancy (OR: 0.6; CI: 0.4-0.9). When comparing those who sought prenatal care during their second trimester (referent), both those who sought prenatal care earlier (OR: 1.9; CI: 1.1-3.5) and those who sought prenatal care later or not at all (OR: 3.7; CI: 1.3-10.9), were more likely to use an *Effective* Method. As with *Any* Method PP use, there were also two marginally significant associations (.05 < p-value < .15, not shown in Table XXIII) between *Effective* Method PP use and maternal characteristics: cohabiting vs. not-cohabiting and three live births vs. two live births.

5.2.3 NSFG Multivariable Modeling – *Any* Method Postpartum Contraceptive Use

We started the multivariable modeling of *Any* Method PP use with all variables for which the association (OR) between the variable and *Any* Method PP use had a p-value < .15, which included ethnicity/race, education, cohabiting status, number of live births and pregnancy intention. With these five variables in a model (Model 1), only two remained significant at $p < .05$: education and pregnancy intention (Table XXIV). When we ran a model with only these two variables (Model 2), one level of each variable remained associated with *Any* Method PP use as in the prior model. Women who had an

TABLE XXIII

PREVALENCE (PERCENT) AND ASSOCIATION BY MATERNAL CHARACTERISTICS[a]
EFFECTIVE METHOD POSTPARTUM CONTRACEPTIVE USE
LOW INCOME, SEXUALLY ACTIVE WOMEN, 20-44 YEARS OLD
NSFG, UNITED STATES, 2006-2010

		Prevalence[b]		**Unadjusted Association[b]**	
Variables	N[a]	Percent[a]	95% CI[a]	OR[a]	95% CI[a]
Total	981	54.55	49.92-59.11	----	
Age					
20-24	418	55.16	47.09-92.96	0.97	0.64-1.48
25-29	309	55.83	48.49-62.92	*Ref*	----
30+	254	52.42	43.15-61.53	0.87	0.53-1.42
Ethnicity/Race					
Hispanic	365	55.26	49.81-60.59	0.90	0.63-1.30
NH Black	263	49.46	39.39-59.58	0.72	0.43-1.20
NH White	289	57.73	49.62-65.45	*Ref*	----
NH Other	64	49.68	32.99-66.43	0.72	0.33-1.57
Education					
< HS	343	50.81	43.19-58.39	0.76	0.53-1.11
HS/GED	361	57.46	50.06-64.53	*Ref*	----
HS +	277	54.64	46.42-62.61	0.89	0.55-1.43
Marital Status					
Married	348	52.86	45.58-60.03	*Ref*	----
Not Married	633	55.78	49.43-61.93	1.12	0.75-1.68
Cohabiting Status					
Yes	735	56.07	50.80-61.20	*Ref*	----
No	246	47.81	39.59-56.14	0.72	0.49-1.06
Number of Live Births					
One	218	52.27	41.08-63.24	1.04	0.59-1.83
Two	333	51.25	42.23-60.20	*Ref*	----
Three	233	61.59	52.98-69.54	1.53	0.88-2.64
Four +	197	54.94	44.89-64.61	1.16	0.69-1.95
Pregnancy Intention					
Sooner[c]	60	45.39	29.91-61.82	**0.56**	**0.35-0.91[c]**
Wanted Then[c]	453	50.73	43.59-57.85		
Mistimed	255	64.00	54.69-72.37	*Ref*	----
Unwanted	205	55.32	45.87-64.41	0.70	0.42-1.16
Prenatal Care Initiation					
1st Trimester	825	55.93	51.25-60.51	**1.90**	**1.05-3.46**
2nd Trimester	123	39.99	26.93-54.64	*Ref*	----
3rd Tri/None	32	71.17	50.85-85.49	**3.71**	**1.26-10.90**

[a] Ns are unweighted, while percentages, ORS and CIs are based on weighted data.
[b] Bold type indicates significant difference between categories or significant OR (p < .05).
[c] The categories of 'Wanted Sooner' and 'Planned' were combined into one 'Intended' category for association.

TABLE XXIV
MULTIVARIABLE LOGISTIC REGRESSION MODELING
ODDS RATIOS FOR MATERNAL CHARACTERISTICS BY MODEL
ANY METHOD POSTPARTUM CONTRACEPTIVE USE
LOW INCOME, SEXUALLY ACTIVE WOMEN, 20-44 YEARS OLD
NSFG, UNITED STATES, 2006-2010

		Model 1 All Variables Significant at p < .15 Included		**Model 2** Variables Significant at p < .05 in Model 1 Included	
Variables	(Significance[a])	OR[b,c]	95% CI[b,c]	OR[b,c]	95% CI[b,c]
Ethnicity/Race	(85%)				
Hispanic		1.10	0.56-2.14		
NH Black		0.57	0.28-1.12		
NH White		*Ref*	----		
NH Other		0.93	0.37-2.33		
Education	(95%)				
< HS		0.76	0.48-1.21	0.81	0.52-1.27
HS/GED		*Ref*	----	*Ref*	----
HS +		**2.05***	**1.20-3.51**	**1.90***	**1.15-3.14**
Cohabiting Status	(85%)				
Yes		*Ref*	----		
No		0.73	0.45-1.19		
Number of Live Births	(95%)				
One		0.60	0.30-1.20		
Two		*Ref*	----		
Three		0.76	0.40-1.46		
Four +		0.58	0.31-1.07		
Pregnancy Intention	(95%)				
Intended		**0.46***	**0.26-0.81**	**0.50***	**0.29-0.86**
Mistimed		*Ref*	----	*Ref*	----
Unwanted		0.62	0.30-1.30	0.56	0.28-1.11

[a] Unadjusted significance of association of at least one category compared to the referent.
[b] All ORs and CIs are based on weighted data.
[c] **Bold type indicates significant OR (p < .05).**

education beyond high school were almost twice as likely to use *Any* Method than women with only a high school education (OR: 1.90, CI: 1.15-3.14), while women who had an intended pregnancy were less likely to use *Any* method (OR: 0.50; CI: 0.29-0.86) than women who had a mistimed pregnancy (Table XXIV).

5.2.4 NSFG Multivariable Modeling – *Effective* Method Postpartum Contraceptive Use

Following the same procedures as *Any* Method PP use, our first model for *Effective* Method PP use included those variables that were significant at $p < .15$: cohabiting status, number of live births, pregnancy intention and PNC Initiation. When we ran the model with these four variables (Model 1, Table XXV), Pregnancy Intention (intended vs. mistimed) and PNC Initiation (third trimester vs. second trimester) were significant at $p < .05$; cohabiting status and first vs. second trimester PNC Initiation were marginally significant and the number of live births was not significant.

In the second model which included Pregnancy Intention and PNC Initiation (Table XXV), the OR for intended vs. mistimed pregnancy remained associated with essentially the same OR (.56 or .54), while the OR for first vs. second trimester PNC initiation became significant with an OR of 1.94 (CI: 1.05-3.59) and third vs. second trimester PNC remained associated with a slightly higher OR of 3.96 and CIs that remained wide (1.23-10.95). Because both variables remained associated with *Effective* Method PP use, the second model became the final model.

TABLE XXV
MULTIVARIABLE LOGISTIC REGRESSION MODELING
ODDS RATIOS FOR MATERNAL CHARACTERISTICS BY MODEL
EFFECTIVE METHOD POSTPARTUM CONTRACEPTIVE USE
LOW INCOME, SEXUALLY ACTIVE WOMEN, 20-44 YEARS OLD
NSFG, UNITED STATES, 2006-2010

	Model 1 All Variables Significant at p < .15 Included[a]		**Model 2** Variables Significant at p < .05 in Model 1 Included	
Variables (Significance[a])	OR[b,c]	95% CI[b,c]	OR[b,c]	95% CI[b,c]
Cohabiting Status (85%)				
Yes	*Ref*	----		
No	*0.70*	0.45-1.07		
Number of Live Births (85%)				
One	1.02	0.58-1.77		
Two	*Ref*	----		
Three	1.42	0.85-2.37		
Four +	1.18	0.67-2.06		
Pregnancy Intention (95%)				
Intended	**0.54***	**0.33-0.88**	**0.56***	**0.35-0.90**
Mistimed	*Ref*	----	*Ref*	----
Unwanted	0.68	0.40-1.15	0.72	0.43-1.18
Prenatal Care Initiation (95%)				
1st Trimester	1.76	0.96-3.23	**1.94**	**1.05-3.59**
2nd Trimester	*Ref*	----	*Ref*	----
3rd Tri/None	**3.35***	**1.09-10.26**	**3.66***	**1.23-10.95**

[a] Unadjusted significance of association of at least one category compared to the referent.
[b] All ORs and CIs are based on weighted data.
[c] **Bold type indicates significant OR (p < .05).**

5.3 Part Two: Individual-level State Findings From PRAMS

The PRAMS study population included the survey populations of 12 states between 2005 and 2007 (Table XXVI). Because not every state met the CDC response inclusion criteria every year, each year included a different combination of the 12 states. Two years (2005 and 2007) had 10 of the 12 states, while 2006 included only nine states. Among the states, two-thirds (8 states) were represented in every year, while three states (FL, MS, MO) were represented in only one year, and one state (FL) contributed respondents for two of the three years. The representation by state in the total population (Table XXVI) ranged from 2% (MS and RI) to 17% (MI).

TABLE XXVI
STUDY POPULATION SAMPLE SIZE BY YEAR BY STATE AND PERCENT DISTRIBUTION OF TOTAL STUDY POPULATION BY STATE
LOW INCOME, SEXUALLY ACTIVE WOMEN, 20-44 YEARS OLD
PRAMS, TWELVE STATES, 2005-2007

	Number of Respondents by Year				Weighted % Distribution
State	**2005**	**2006**	**2007**	**Total**	**All Years**
Arkansas	899	847	725	2471	8.97
Florida	445	0	0	445	10.66
Michigan	304	300	380	984	17.18
Mississippi	0	329	0	329	1.99
Missouri	0	0	390	390	4.51
Nebraska	506	476	450	1432	4.03
New York[a]	259	126	240	625	14.63
North Carolina	363	0	413	776	13.47
Oregon	588	612	585	1785	8.52
Rhode Island	420	305	377	1102	2.03
South Carolina	570	305	469	1344	10.17
West Virginia	459	473	389	1321	3.84
Total	**4813**	**3773**	**4418**	**13,004**	**100%**

[a] New York represents all of the state of New York except New York City, which conducts its own PRAMS survey.

5.3.1 PRAMS *Any* Method Postpartum Contraceptive Use Prevalence and Unadjusted Associations

Among the states, the prevalence of *Any* Method PP use ranged from 88.3% in Florida to 93.7% in Mississippi (Table XLV, Appendix A). The overall prevalence among the total study population was more or less in the middle of this range at 90.8% (Table XXVII).

Among the total PRAMS population, the prevalence of *Any* Method PP use (Table XXVII), was associated with only one of the five demographic variables --education. However, as seen in Table XLV, Appendix A, in some states the prevalence of *Any* Method PP use was associated with age (four states), ethnicity/race (five states) and the number of live births (six states), in addition to the level of education (two states). Marital status was not associated with *Any* Method PP use, in the overall population (Table XXVII), or in any state population (Table XLV, Appendix A). In FL, NY and RI no demographic characteristic was associated with *Any* Method PP use, while in MS and WV three demographic characteristics were associated with *Any* Method PP use and in the other seven states we found an association with one or two characteristics.

For the overall PRAMS population, we also calculated prevalence of PP use by pregnancy intention and receipt of pregnancy-related services (Table XXVII). *Any* Method PP use was associated with Pregnancy Intention and PNC Talk BC, but not WIC Use or a Well-baby Visit.

In the unadjusted logistic regression analysis using the total PRAMS population, we found only three of nine maternal characteristics (Table XXVII) associated with *Any* Method PP use. The odds of *Any* Method PP use was greater for those with an education beyond high school compared to those with only a high school degree or GED

TABLE XXVII

PREVALENCE (PERCENT) AND ASSOCIATION BY MATERNAL CHARACTERISTICS[a]
ANY METHOD POSTPARTUM CONTRACEPTIVE USE
LOW INCOME, SEXUALLY ACTIVE WOMEN, 20-44 YEARS OLD
PRAMS, TWELVE STATES, 2005-2007

		Prevalence[b]		**Unadjusted Association[b]**	
Variables	N[a]	Percent[a]	95% CI[a]	OR[a]	95% CI[a]
Total	13004	90.77	89.84-91.62	---	---
Age					
20-24	6012	90.84	89.47-92.05	0.95	0.74-1.22
25-29	4011	91.25	89.55-92.70	*Ref*	----
30+	2981	89.93	87.77-91.75	0.86	0.64-1.15
Ethnicity/Race					
Hispanic	2382	91.31	89.01-93.17	1.06	0.79-1.43
NH Black	3094	90.65	88.62-92.36	0.98	0.75-1.27
NH White	6329	90.84	89.57-91.96	*Ref*	----
NH Other	1012	86.94	79.78-91.83	0.67	0.39-1.16
Education					
< HS	3430	**89.07**	**87.07-90.79**	0.85	0.66-1.10
HS/GED	5313	**90.55**	**89.03-91.88**	*Ref*	----
HS +	4117	**92.67**	**91.12-93.97**	**1.32**	**1.01-1.72**
Marital Status					
Married	5883	90.41	89.00-91.66	*Ref*	----
Not Married	7099	91.03	89.75-92.17	1.08	0.87-1.33
Number of Live Births					
One	4211	89.27	87.41-90.88	0.79	0.61-1.03
Two	3998	91.31	89.68-92.71	*Ref*	----
Three	2656	92.61	90.62-94.20	1.19	0.86-1.65
Four +	2084	90.40	87.89-92.44	0.90	0.65-1.24
Pregnancy Intention					
Sooner[c]	1709	**85.86**	**82.56-88.62**	**0.43[c]**	**0.34-0.55[c]**
Planned[c]	4407	**87.47**	**85.58-89.14**		
Mistimed	4864	**93.96**	**92.68-95.04**	*Ref*	----
Unwanted	1824	**94.74**	**92.81-96.18**	1.16	0.78-1.72
PNC Talk Birth Control					
Yes	10512	**91.93**	**90.96-92.79**	**1.88**	**1.45-2.44**
No	2277	**85.85**	**82.84-88.41**	*Ref*	----
WIC Use					
Yes	10376	90.73	89.66-91.69	0.96	0.74-1.25
No	2533	91.05	88.98-92.76	*Ref*	----
Well-Baby Visit					
Yes	11981	91.20	90.26-92.06	1.71	0.95-3.07
No	275	85.85	77.39-91.50	*Ref*	----

[a] Ns are unweighted, while percentages, ORS and CIs are based on weighted data.
[b] Bold type indicates significant difference between categories or significant OR (p < .05).
[c] The categories of 'Wanted Sooner' and 'Planned' were combined into one 'Intended' category.

(OR: 1.32; CI: 1.01-1.72), lower in those with an intended pregnancy compared to those with a mistimed pregnancy (OR: 0.43; CI: 0.34-0.55), and greater among women who discussed postpartum birth control use at a PNC visit than those who did not (OR: 1.88; CI: 1.45-2.44). Of note, for both of the three-category variables, one of the levels was not associated with *Any* Method PP Use: there was no difference in the odds of *Any* method PP use in women who had less than a high school education compared with those with a high school education and there was no difference in the odds when comparing those with an unwanted pregnancy and those with a mistimed pregnancy.

5.3.2 PRAMS *Effective* Method Postpartum Contraceptive Use Prevalence and Unadjusted Associations

At 71.8% the overall prevalence of *Effective* Method PP use was 19 points lower than *Any* Method PP use (Table XXVIII). However, its range across the states was much broader (Table XLVI, Appendix A), ranging from 64.8% in FL to 83.3% in MS.

The prevalence of *Effective* Method PP use among the total PRAMS population (Table XXVIII) was significantly associated with all of the demographic variables except education. No state had an association with more than three demographic characteristics (Table XLVI, Appendix A). Three states (NC, OR, RI) had significant associations with three of the demographic variables. Missouri had no significant association by any demographic characteristics, while in the other eight states *Effective* Method PP use was associated with either one or two of these variables (Table XLVI, Appendix A). As with *Any* Method PP use, for *Effective* Method PP use, for the total population we calculated prevalence by pregnancy intention and receipt of pregnancy-

TABLE XXVIII

PREVALENCE (PERCENT) AND ASSOCIATION BY MATERNAL CHARACTERISTICS[a]
EFFECTIVE METHOD POSTPARTUM CONTRACEPTIVE USE
LOW INCOME, SEXUALLY ACTIVE WOMEN, 20-44 YEARS OLD
PRAMS, TWELVE STATES, 2005-2007

		Prevalence[b]		**Unadjusted Association[b]**	
Variables	N[a]	Percent[a]	95% CI[a]	OR[a]	95% CI[a]
Total	13004	71.77	70.37-73.13	---	
Age					
20-24	6012	**73.72**	**71.73-75.62**	1.16	0.99-1.36
25-29	4011	**70.68**	**68.11-73.13**	*Ref*	----
30+	2981	**69.16**	**65.96-72.18**	0.93	0.77-1.13
Ethnicity/Race					
Hispanic	2382	**64.50**	**60.87-67.97**	**0.67**	**0.56-0.80**
NH Black	3094	**75.51**	**72.59-78.22**	1.13	0.95-1.35
NH White	6329	**73.13**	**71.30-74.88**	*Ref*	----
NH Other	1012	**68.19**	**60.17-75.26**	0.79	0.55-1.13
Education					
< HS	3430	70.73	67.97-73.35	0.87	0.73-1.03
HS/GED	5313	73.59	71.40-75.67	*Ref*	----
HS +	4117	70.77	68.22-73.20	0.87	0.74-1.02
Marital Status					
Married	5883	**66.64**	**64.46-68.75**	*Ref*	----
Not Married	7099	**75.65**	**73.82-77.40**	**1.56**	**1.36-1.79**
Number of Live Births					
One	4211	**67.01**	**64.33-69.58**	**0.77**	**0.65-0.91**
Two	3998	**72.50**	**70.09-74.79**	*Ref*	----
Three	2656	**76.25**	**73.21-79.04**	1.22	1.00-1.49
Four +	2084	**74.35**	**70.79-77.60**	1.10	0.89-1.36
Pregnancy Intention					
Sooner	1709	**63.40**	**59.03-67.56**	**0.54**	**0.47-0.63**
Intended	4407	**64.97**	**62.44-67.41**		
Mistimed	4864	**77.02**	**74.86-79.05**	*Ref*	----
Unwanted	1824	**81.69**	**78.19-84.73**	**1.33**	**1.04-1.71**
PNC Talk Birth Control					
Yes	10512	**73.97**	**72.47-75.43**	**1.85**	**1.55-2.21**
No	2277	**60.61**	**56.74-64.34**	*Ref*	----
WIC Use					
Yes	10376	**72.66**	**71.09-74.18**	**1.22**	**1.03-1.43**
No	2533	**68.62**	**65.42-71.66**	*Ref*	----
Well-Baby Visit					
Yes	11981	**72.29**	**70.85-73.68**	**1.98**	**1.30-3.02**
No	275	**56.83**	**45.56-66.55**	*Ref*	----

[a] Ns are unweighted, while percentages, ORS and CIs are based on weighted data.
[b] Bold type indicates significant difference between categories or significant OR (p < .05).
[c] The categories of 'Wanted Sooner' and 'Planned' were combined into one 'Intended' category.

related services. All four variables (Pregnancy Intention, PNC Talk BC, WIC Use and Well-baby Visit) were associated with *Effective* Method PP use (Table XXVIII).

In unadjusted logistic regression analysis, we found all but two (age and education) of the nine characteristics (Table XXVIII) associated with *Effective* Method PP use. Using high school/GED as the referent, there was no association between education and *Effective* Method PP use. And, although the prevalence was significantly different across all age groups (Table XXVIII), we found no significant relationships when 25 to 29 year olds were the referent age group (Table XXVIII). For the other seven variables, when compared to the referent, at least one category of each was significantly associated with *Effective* Method PP use (Table XXVIII). Respondents who were not married were 1.5 times more likely to use *Effective* method postpartum contraception than those who were married, and respondents who had an unwanted pregnancy were 1.3 times more likely to be using an *Effective* Method of contraception than respondents with a mistimed pregnancy. Other factors that increased the likelihood of *Effective* Method PP use included having a PNC visit during which PP contraception was discussed, using WIC services during pregnancy, and taking the infant to at least one well-baby visit. In the opposite direction, we found Hispanics had a lower odds of *Effective* Method PP use than non-Hispanic whites, as did women with one live birth compared to those with two, and those with an intended pregnancy (wanted sooner or wanted then) and compared to those with a mistimed pregnancy.

5.3.3 PRAMS Multivariable Modeling - *Any* Method Postpartum Contraceptive Use

The multivariable modeling of *Any* Method PP use (Table XXIX) started with the six variables that were associated at $p < .15$: ethnicity/race, education, number of live births, pregnancy intention, PNC Talk BC, and Well-baby Visit. In this initial model (Model 1), ethnicity/race and Well-baby Visit were not associated at $p < .05$, while among the other four variables at least one level of the variable was significantly associated with Any Method PP use at $p < .05$. We therefore included these four variables in our second model. In this second model (Table XXIX) education and number of live births were no longer associated, while pregnancy intention and PNC Talk BC remained at the same level of association. The final model, with only these two variables, indicated that women with an intended pregnancy had a lower odds of *Any* Method PP use compared to those who had a mistimed pregnancy (OR: 0.44; CI: 0.34-0.56), and those who discussed postpartum contraception at a PNC visit had twice the odds of *Any* Method (OR: 1.97; CI: 1.48 to 2.61) PP use than those who did not (Table XXIX).

5.3.4 PRAMS Multivariable Modeling - *Effective* Method Postpartum Contraceptive Use

Since all nine variables were significant at $p < .15$, we began our modeling of *Effective* Method PP use with all variables (Table XXX). When we ran this full model, three variables were not significant at $p < .05$: age, education and WIC Use. Therefore our second model included six variables (Table XXX), all of which remained associated (at least one category compared to referent), and so it became the final model.

TABLE XXIX
MULTIVARIABLE LOGISTIC REGRESSION MODELING
ODDS RATIOS FOR MATERNAL CHARACTERISTICS BY MODEL
ANY METHOD POSTPARTUM CONTRACEPTIVE USE
LOW INCOME, SEXUALLY ACTIVE WOMEN, 20-44 YEARS OLD
PRAMS, TWELVE STATES, 2005-2007

	Model 1 All Variables Significant at p < .15 Included		**Model 2** Variables Significant at p < .05 in Model 1 Included		**Final Model** Variables Significant at p < .05 in Model Included	
Variables (Sig[a])	**OR**	**95% CI**[b,c]	**OR**[c]	**95% CI**[b,c]	**OR**	**95% CI**[b,c]
Ethnicity/Race (85%)						
Hispanic	1.32	0.93-1.87				
NH Black	0.86	0.64-1.14				
NH White	*Ref*	----				
NH Other	0.65	0.37-1.13				
Education (95%)						
< HS	**0.75**	**0.55-1.00**	0.81	0.62-1.07		
HS/GED	*Ref*	----	*Ref*	----		
HS +	1.29	0.97-1.72	1.26	0.96-1.66		
Number of Live Births (85%)						
One	**0.74**	**0.56-0.99**	0.77	0.58-1.01		
Two	*Ref*	----	*Ref*	----		
Three	1.41	0.99-2.02	1.35	0.96-1.91		
Four +	0.88	0.61-1.28	0.83	0.59-1.18		
Pregnancy Intention (95%)						
Intended	**0.45**	**0.34-0.59**	**0.45**	**0.35-0.59**	**0.44**	**0.34-0.56**
Mistimed	*Ref*	----	*Ref*	----	*Ref*	----
Unwanted	1.20	0.76-1.88	**1.16**	**0.75-1.78**	1.15	0.77-1.72
PNC Talk Birth Control (95%)						
Yes	**1.97**	**1.48-2.61**	**1.96**	**1.50-2.57**	**1.97**	**1.48-2.61**
No	*Ref*	----	*Ref*	----	*Ref*	----
Well-Baby Visit (85%)						
Yes	1.63	0.90-2.98				
No	*Ref*	----				

[a] Unadjusted significance of association of at least one category compared to the referent.
[b] All ORs and CIs are based on weighted data.
[c] **Bold type indicates significant OR (p < .05).**

TABLE XXX
MULTIVARIABLE LOGISTIC REGRESSION MODELING
ODDS RATIOS FOR MATERNAL CHARACTERISTICS BY MODEL
EFFECTIVE METHOD POSTPARTUM CONTRACEPTIVE USE
LOW INCOME, SEXUALLY ACTIVE WOMEN, 20-44 YEARS OLD
PRAMS, TWELVE STATES, 2005-2007

	Model 1 All Variables Significant at p < .15 Included		**Final Model** Variables Significant at p < .05 in Model 1 Included	
Variables (Significance[a])	**OR**[b]	**95% CI**[b]	**OR**[b]	**95% CI**[b]
Age (85%)				
20-24	1.15	0.96-1.38		
25-29	*Ref*	----		
30+	0.99	0.81-1.23		
Ethnicity/Race (95%)				
Hispanic	**0.70**	**0.57-0.66**	**0.68**	**0.56-0.82**
NH Black	0.94	0.77-1.15	0.94	0.77-1.15
NH White	*Ref*	----	*Ref*	----
NH Other	0.92	0.63-1.34	0.79	0.55-1.14
Education (85%)				
< HS	0.85	0.70-1.04		
HS/GED	*Ref*	----		
HS +	0.92	0.77-1.10		
Marital Status (95%)				
Married	*Ref*	----	*Ref*	----
Not Married	**1.44**	**1.23-1.68**	**1.48**	**1.26-1.72**
Number of Live Births (95%)				
One	**0.73**	**0.60-0.87**	**0.74**	**0.62-0.88**
Two	*Ref*	----	*Ref*	----
Three	**1.34**	**1.08-1.68**	**1.29**	**1.04-1.61**
Four +	1.14	0.89-1.45	1.04	0.82-1.32
Pregnancy Intention (95%)				
Intended	**0.61**	**0.52-0.72**	**0.60**	**0.51-0.71**
Mistimed	*Ref*	----	*Ref*	----
Unwanted	1.28	0.97-1.69	1.26	0.97-1.65
PNC Talk Birth Control (95%)				
Yes	**1.74**	**1.44-2.10**	**1.81**	**1.50-2.18**
No	*Ref*	----	*Ref*	----
WIC Use (95%)				
Yes	1.17	0.98-1.41		
No	*Ref*	----		
Well-Baby Visit (95%)				
Yes	**2.12**	**1.37-3.30**	**1.99**	**1.28-3.07**
No	*Ref*	----	*Ref*	----

[a] Unadjusted significance of association of at least one category compared to the referent.
[b] All ORs and CIs are based on weighted data.
[c] **Bold type indicates significant OR (p < .05).**

In this final model (Table XXX), we found that compared to non-Hispanic whites, Hispanics were less likely to use an *Effective* Method of contraception (OR: 0.68), as were respondents with one live birth compared to those with two live births (OR: 0.74), and respondents with an intended pregnancy compared to those with a mistimed pregnancy (OR: 0.60). In the other direction, we found an increase in the odds of *Effective* Method PP use for married women compared to non-married women (OR: 1.48), women with three live births compared to those with two live births (OR: 1.29), women who discussed PP contraceptive use during a PNC visit (OR: 1.81) compared to those who did not, and lastly women who took their infant(s) to at least one well-baby visit compared to those who had not.

5.3.5 **PRAMS Sensitivity Analysis – Association of the Postpartum Visit and Postpartum Contraceptive Use**

The six-state sub-population (AR, MO, NM, RI, SC, WV) used for the PPV sensitivity analysis was very similar to that of the main study population (Table XLVII, Appendix A). The only notable difference was that compared to the total population, the sub-population had a lower proportion of Hispanics (Six States: 17.8%; Total: 20.6%) and a higher proportion of whites (Six States: 58.5%; Total: 55.6%). The two populations were essentially the same with regards to age, education, marital status and number of live births.

In the unadjusted analysis, the PPV was more strongly associated with both *Any* (OR: 2.65; CI: 1.86-3.78) and *Effective* (OR: 2.81; CI: 2.71-3.64) Method PP use than the other maternal characteristics (Tables XXXI and XXXII). In the multivariable analyses,

TABLE XXXI
PREVALENCE (PERCENT) AND ASSOCIATION BY MATERNAL CHARACTERISTICS
ANY METHOD POSTPARTUM CONTRACEPTIVE USE
LOW INCOME, SEXUALLY ACTIVE WOMEN, 20-44 YEARS OLD
PRAMS, **SIX STATES**, 2005-2007

		Prevalence		Unadjusted Association	
Variables	N[a]	Percent[a]	95% CI[a]	OR[a]	95% CI[a]
Total	7253	90.55	89.20-91.75	----	
Age					
20-24	3467	90.02	97.98-91.74	0.78	0.54-1.11
25-29	2244	92.05	89.67-93.92	*Ref*	
30+	1542	89.53	86.16-92.16	0.74	0.48-1.14
Ethnicity/Race					
Hispanic	929	92.08	88.54-94.59	1.29	0.82-2.02
NH Black	1409	91.62	88.24-94.09	1.21	0.80-1.84
NH White	3963	90.02	88.26-91.54	*Ref*	
NH Other	144	86.02	72.10-93.61	0.68	0.28-1.66
Education					
< HS	1698	89.74	86.84-92.06	0.92	0.64-1.32
HS/GED	3139	90.50	88.34-92.29	*Ref*	
HS +	2308	91.50	89.00-93.48	1.13	0.78-1.63
Marital Status					
Married	3290	90.04	88.07-91.72	*Ref*	
Not Married	3942	90.90	88.98-92.52	1.10	0.82-1.49
Number of Live Births					
One	2475	89.76	87.52-91.64	0.94	0.65-1.34
Two	2221	90.35	87.65-92.51	*Ref*	
Three	1460	91.45	88.01-93.97	1.14	0.71-1.83
Four +	1051	91.44	87.84-94.05	1.14	0.70-1.85
Pregnancy Intention					
Sooner	990	**84.89**	**80.36-88.44**	**0.40**	**0.28-0.58**
Then	2434	**87.57**	**84.89-89.84**		
Mistimed	2695	**94.25**	**92.32-95.72**	*Ref*	
Unwanted	1013	**94.30**	**91.34-96.29**	1.01	0.58-1.75
PNC Talk Birth Control					
Yes	5799	**91.69**	**90.25-92.94**	**1.70**	**1.19-2.41**
No	1337	**86.68**	**82.78-89.81**	*Ref*	
WIC Use					
Yes	5888	90.67	89.17-91.99	1.05	0.71-1.56
No	1302	90.28	86.67-92.99	*Ref*	
Well-Baby Visit					
Yes	5978	90.98	89.62-92.19	1.49	0.70-3.19
No	598	87.11	76.36-93.39	*Ref*	
Postpartum Visit					
Yes	6119	**92.11**	**90.76-93.28**	**2.65**	**1.86-3.78**
No	1086	81.49	76.42-85.67	*Ref*	

[a] Ns are unweighted, while percentages, ORS and CIs are based on weighted data.

TABLE XXXII
PREVALENCE (PERCENT) AND ASSOCIATION BY MATERNAL CHARACTERISTICS
EFFECTIVE METHOD POSTPARTUM CONTRACEPTIVE USE
LOW INCOME, SEXUALLY ACTIVE WOMEN, 20-44 YEARS OLD
PRAMS, **SIX STATES**, 2005-2007

		Prevalence		Unadjusted Association	
Variables	N[a]	OR[a]	95% CI[a]	OR[a]	95% CI[a]
Total	7253	72.33	70.31-74.26	----	
Age					
20-24	3467	**74.85**	**72.08-77.43**	1.17	0.93-1.47
25-29	2244	**71.80**	**68.09-75.24**	*Ref*	
30+	1542	**67.42**	**62.54-71.95**	0.81	0.61-1.08
Ethnicity/Race					
Hispanic	929	**64.40**	**58.59-69.81**	**0.66**	**0.50-0.87**
NH Black	1604	**77.58**	**72.90-81.66**	1.27	0.96-1.68
NH White	4401	**73.19**	**70.74-75.51**	*Ref*	
NH Other	162	**62.08**	**46.98-75.15**	0.60	0.32-1.12
Education					
< HS	1698	70.67	66.40-74.60	0.79	0.61-1.02
HS/GED	3139	75.32	72.33-78.07	*Ref*	
HS +	2308	70.96	67.28-74.39	0.80	0.63-1.01
Marital Status					
Married	3290	**67.26**	**64.19-70.19**	*Ref*	
Not Married	3942	**75.93**	**73.24-78.43**	**1.54**	**1.26-1.87**
Number of Live Births					
One	2475	70.48	66.93-73.81	0.93	0.73-1.18
Two	2221	71.90	68.33-75.22	*Ref*	
Three	1460	74.34	69.56-78.60	1.13	0.84-1.52
Four +	1051	75.17	69.87-79.81	1.18	0.86-1.63
Pregnancy Intention					
Sooner	990	**62.13**	**55.99-67.90**	**0.54**	**0.44-0.68**
Then	2434	**67.41**	**63.79-70.83**		
Mistimed	2695	**78.15**	**75.04-80.98**	*Ref*	
Unwanted	1013	**79.14**	**73.76-83.66**	1.06	0.75-1.50
PNC Talk Birth Control					
Yes	5799	**74.99**	**72.82-77.05**	**2.00**	**1.56-2.56**
No	1337	**59.98**	**54.62-65.11**	*Ref*	
WIC Use					
Yes	5888	**73.55**	**71.33-75.66**	**1.34**	**1.04-1.72**
No	1302	**67.49**	**62.47-72.14**	*Ref*	
Well-Baby Visit					
Yes	6576	72.87	70.81-74.83	1.58	0.88-2.83
No	151	62.99	48.97-75.12	*Ref*	
Postpartum Visit					
Yes	6119	**75.63**	**73.52-77.63**	**2.81**	**2.17-3.64**
No	1086	52.46	46.67-58.19	*Ref*	

[a] Ns are unweighted, while percentages are based on weighted data.
[b] Bold type indicates significant difference between categories or significant OR (p < .05).

the strength of the PPV association either stayed the same (*Any* Method) or increased (*Effective* Method), while other associations were altered as discussed below.

In addition to the PPV, in unadjusted analyses, two other maternal characteristics/experiences were significantly associated ($p < .05$) with *Any* Method PP use in this sub-population (Table XXXI): pregnancy intention and PNC Talk BC. Because no other variables were even marginally significant ($.05 < p < .15$), the first *Any* Method multivariable model included only these three variables, and all remained associated (Table XXXIII). While the associations of *Any* Method PP use with receipt of the PPV and pregnancy intention remained essentially the same from unadjusted to multivariable (ORs: 2.65 to 2.64; and 0.40 to 0.39, respectively) analyses, the association of *Any* Method PP use with prenatal contraceptive counseling diminished from unadjusted to multivariable analyses (ORs: 1.70 to 1.57).

In addition to the PPV, in unadjusted analyses eight of the nine other maternal characteristics/experiences were either significantly, or marginally, associated with *Effective* Method PP use (Table XXXII). Number of live births was the only variable not associated in the unadjusted analysis with *Effective* Method PP use, and thus not included in the multivariable analysis.

In the first multivariable model (Table XXXIV), six of the nine variables were associated with *Effective* Method PP use. Of note, WBV was no longer significant in this model. Since all six variables in the second model remained associated, it was the final model. Interestingly, the strength of the association between PNC Talk BC and *Effective* Method PP use diminished incrementally from the unadjusted to final multivariable model (ORs: 2.00 to 1.67 to 1.63), as did marital status (ORs: 1.54 to 1.41. to 1.38), while the strength of the association with the PPV increased from the unadjusted to final

TABLE XXXIII

MULTIVARIABLE LOGISTIC REGRESSION MODELING
ODDS RATIOS FOR MATERNAL CHARACTERISTICS BY MODEL
ANY METHOD POSTPARTUM CONTRACEPTIVE USE
LOW INCOME, SEXUALLY ACTIVE WOMEN, 20-44 YEARS OLD
PRAMS, **SIX STATES**, 2005-2007

	Model 1 All Variables Significant at p < .15 Included	
Variables (Unadjusted Significance[a])	OR[b,c]	95% CI[b,c]
Pregnancy Intention (95%)		
Intended	**0.39**	**0.27-0.57**
Mistimed	*Ref*	
Unwanted	0.97	0.55-1.73
PNC Talk BC (95%)		
Yes	**1.57**	**1.09-2.27**
No	*Ref*	
Postpartum Visit (95%)		
Yes	**2.64**	**1.81-3.85**
No	*Ref*	

[a] Unadjusted significance of association of at least one category compared to the referent.

[b] All ORs and CIs are based on weighted data.

[c] **Bold type indicates significant OR (p < .05).**

TABLE XXXIV
MULTIVARIABLE LOGISTIC REGRESSION MODELING
ODDS RATIOS FOR MATERNAL CHARACTERISTICS BY MODEL
EFFECTIVE METHOD POSTPARTUM CONTRACEPTIVE USE
LOW INCOME, SEXUALLY ACTIVE WOMEN, 20-44 YEARS OLD
PRAMS, **SIX STATES**, 2005-2007

	Model 1 All Variables Significant at p < .15 Included		**Final Model** Variables Significant at p < .05 in Model 1 Included	
Variables (Significance[a])	OR[b,c]	95% CI[b,c]	OR[b,c]	95% CI[b,c]
Age (85%)				
20-24	0.94	0.73-1.21		
25-29	*Ref*	----		
30+	0.94	0.68-1.28		
Ethnicity/Race (95%)				
Hispanic	**0.65**	**0.47-0.89**	**0.68**	**0.50-0.92**
NH Black	1.13	0.83-1.54	1.13	0.83-1.52
NH White	*Ref*	----	*Ref*	----
NH Other	0.86	0.44-1.69	0.74	0.38-1.44
Education (85%)				
< HS	0.89	0.67-1.19	0.88	0.66-1.16
HS/GED	*Ref*	----		
HS +	**0.74**	**0.58-0.95**	**0.72**	**0.56-0.91**
Marital Status (95%)0				
Married	*Ref*	----	*Ref*	----
Not Married	**1.41**	**1.12-1.79**	**1.38**	**1.10-1.72**
Pregnancy Intention (95%)				
Intended	**0.58**	**0.45-0.74**	**0.58**	**0.45-0.73**
Mistimed	*Ref*	----	*Ref*	----
Unwanted	0.99	0.66-1.50	1.00	0.68-1.48
PNC Talk Birth Control (95%)				
Yes	**1.67**	**1.28-2.19**	**1.63**	**1.25-2.11**
No	*Ref*	----	*Ref*	----
WIC Use (95%)				
Yes	1.17	0.88-1.56		
No	*Ref*	----		
Well-Baby Visit (85%)				
Yes	1.27	0.62-2.61		
No	*Ref*	----		----
Postpartum Visit (95%)				
Yes	**3.04**	**2.27-4.07**	**3.07**	**2.32-4.06**
No	*Ref*		*Ref*	

[a] Unadjusted significance of association of at least one category compared to the referent.
[b] All ORs and CIs are based on weighted data.
[c] **Bold type indicates significant OR (p < .05).**

multivariable model (ORs: 2.81 to 3.04 to 3.07). Even though only marginally associated in the unadjusted analysis, in the final model, women who had an education beyond high school had a significantly lower odds of *Effective* Method PP use than those with only a high school education (OR: 0.72; CI: 0.56-0.91). Although this finding might warrant investigation of interaction between education and the PPV, it was beyond the scope of this brief sensitivity analysis.

5.4 **Comparison of Final NSFG and PRAMS Multivariable Models**

In Table XXXV, we compare the final NSFG and PRAMS models for *Any* Method PP use. In all three models, women who had an intended pregnancy had reduced odds of *Any* Method PP use compared to women with a mistimed pregnancy. While in the NSFG final model women with education beyond high school had a higher odds of *Any* Method PP use compared to those with a high school education, education was not associated with *Any* Method PP use in either PRAMS models. In the PRAMS main analysis, women who discussed PP contraception during PNC had twice the odds of *Any* Method PP use. However, when we were able to control for the highly associated PPV (OR: 2.64) in the sensitivity analysis, the strength of PNC Talk BC was diminished.

As seen in Table XXXVI, the final NSFG and PRAMS models for *Effective* Method PP use were quite different: only two variables in the final NSFG model compared to six in both the final main and sensitivity PRAMS models. Of note, the two characteristics that remained in the NSFG model (pregnancy intention and PNC) also remained in the final PRAMS models, although the PRAMS measure for PNC was more specific (a discussion of BC methods PP).

TABLE XXXV

COMPARISON OF FINAL MULTIVARIABLE LOGISTIC REGRESSION MODELS
ANY METHOD POSTPARTUM CONTRACEPTIVE USE
LOW INCOME, SEXUALLY ACTIVE WOMEN, 20-44 YEARS OLD
NSFG, UNITED STATES, 2006-2010 AND PRAMS, 2005-2007

		Final Model ORs (All Significant)		
Variables[a]	**Referent Category**	**NSFG**	**Main PRAMS**	**PRAMS Six States**
Education	High School			
Less than High School		NS	Not in Final Model	NS in Unadjusted
More than High School		**1.90**		
Pregnancy Intention	Mistimed			
Intended		**0.50**	**0.44**	**0.39**
Unwanted		NS	NS	NS
***PRAMS*: PNC Talk BC**	No			
Yes			**1.97**	**1.57**
***PRAMS 6 States*: PPV**	No			
Yes			Not Available	**2.64**

[a] Variables not in the final model for any of the data sets are not shown.

TABLE XXXVI

COMPARISON OF FINAL MULTIVARIABLE LOGISTIC REGRESSION MODELS
EFFECTIVE METHOD POSTPARTUM CONTRACEPTIVE USE
LOW INCOME, SEXUALLY ACTIVE WOMEN, 20-44 YEARS OLD
NSFG, UNITED STATES, 2006-2010 AND PRAMS, 2005-2007

		Final Model ORs (All Significant)		
Variables[a]	**Referent Category**	**NSFG**	**Main PRAMS**	**PRAMS Six States**
Ethnicity/Race	White			
Hispanic		NS in Unadjusted	**0.68**	**0.68**
NH Black			NS	NS
NH Other			NS	NS
Education	High School			
Less than High School		NS in Unadjusted	Not in Final Model	NS
More than High School				**0.72**
Marital Status	Married			
Unmarried		Not Used*	**1.48**	**1.38**
No. of Live Births	Two			
One		Not in Final Model	**0.74**	NS in Unadjusted
Three			**1.29**	
Four+			NS	
Pregnancy Intention	Mistimed			
Intended		**0.56**	**0.60**	**0.58**
Unwanted		NS	NS	NS
***NSFG:* PNC Initiation**	Second Trimester			
1st Trimester		**1.94**		
3rd Trimester		**3.66**		
***PRAMS:* PNC Talk BC**	No			
Yes			**1.81**	**1.63**
***PRAMS:* Well-Baby Visit**	No			
Yes			**1.99**	Not in Final
***PRAMS Six States*: PPV**	No			
Yes				**3.07**

[a] Variables not in the final model for *Effective* Method PP use in either data set are not shown.

Beyond pregnancy intention, the PRAMS main and sensitivity models both included two demographic variables: ethnicity/race (Hispanic vs. non-Hispanic white) and marital status. On the other hand, while education was not associated in the main analysis, it did remain associated in the final sensitivity analysis model (education beyond high school vs. high school education). Although the number of live births was associated in the final model using all twelve states, because in the six-state sub-population it was not significant in the unadjusted analysis, it was not even included in the six-state modeling. [However, as noted earlier, when number of live births was forced into the sensitivity model despite its lack of association (data not shown), the results were different. In this case, in the final model we found a higher odds of *Effective* Method PP use among women with three live births (compared to two live births) similar to that in the main analysis, although the reduced odds among women with only one live birth (compared to two) identified in the main analysis was not found.]

The other differences between the final PRAMS main and sensitivity models of *Effective* Method PP use centered on the health care experiences of respondents. When the PPV was in the modeling, not only was it the experience most strongly associated with *Effective* Method PP use, its presence diminished the strength of PNC Talk BC, and eliminated the significance of the WBV (after the first model).

Lastly, of note, only one characteristic was consistent across both surveys and both measures of PP use. Those with an intended pregnancy always had a lower odds of PP contraceptive use than those with a mistimed pregnancy (Tables XXXV and XXXVI). And, interestingly, the ORs were relatively consistent across the four models ranging only from 0.44 (*Any* Method PRAMS) to 0.60 *(Effective* Method PRAMS).

5.5 Part Three: Multilevel State Findings Using PRAMS and State-level Data

Our multilevel analysis focused on identifying state-level factors related to individual-level PP use. It began where our individual-level *analysis* left off: with our final main PRAMS individual-level multivariable models for *Any* Method and *Effective* Method PP use. The individual-level model for *Any* Method PP use included only two variables: Pregnancy Intention and PNC Talk BC (Table XXXV). The starting point for *Effective* Method PP use was a model that included six variables: Ethnicity/race, Marital Status, Number of Live Births, Pregnancy Intention, PNC Talk BC and Well-baby Visit (Table XXXVI). All of the multilevel analyses presented below included these individual-level variables, although their ORs and CIs are not extensively discussed. In the sub-sections that follow, we describe the reduction of our multi-category state-level variables to dichotomous variables, the findings of an unadjusted analysis of the dichotomous state-level variables, and lastly the results of the multilevel modeling of *Any* Method and *Effective* Method PP use.

5.5.1 Preliminary Step: Dichotomization of State-level Variables

To create dichotomous versions of the nine multi-category state-level variables (Table XVIII), we focused on the *Effective* Method results of an unadjusted analysis (Table XLVIII, Appendix B) of each of these variables in a multilevel model (one state-level variable plus all individual-level variables from the final PRAMS multivariable model). In this analysis all but one of the multi-category state-level variables had two categories that were similar with respect to their odds of *Effective* Method PP use (p-value < .05) and thus could be combined. Table XLVIII, Appendix B shows in boxes the

categories that were combined for: Number of Public FP Clinics per WINSS, Religious Refusals Policy, Public Expenditures on FP Services per WINSS, *Comprehensive* Index, *Access-specific* Index, and the *Study-specific* Index. Without any significant differences between categories of Religious Refusals Policy, we chose the most logical combination: 'Either Refusal' and 'Both Refusals.' Because the dichotomous versions of the *Comprehensive* and *Access-specific* index variables had the exact same distribution of states (see Table XVIII), we dropped the *Access-specific* variable. Sex Education Policies was reduced from four to three to two categories by sequentially combining the categories shown in boxes in Table XLVIII, Appendix B.

The results for the two three-category versions of the Proportion of Delivery Hospitals that are Catholic variable (Original and Alternate in Table XVIII) were complicated (see Table XLVIII, Appendix B) and required a detailed examination and more analyses. We summarize the process and results here, and include more details, including the results of the additional analyses, and our interpretation of them, in a technical appendix (Appendix C). Based on our review of the results of both three-category variables (Table XLVIII, Appendix B), we initially created three dichotomous versions (see Figure 9, Appendix C). Subsequently, we put each of these dichotomous versions into its own multilevel model. After comparing the results for the three dichotomous versions (Table XLIX, Appendix C), we chose the version that combined the 'Medium' and 'High' categories, so as to eliminate a problematic 'High' category with only two states, and used the lower cutoff between the 'Low' and 'Medium/High' categories (Table L, Appendix C). From here on we refer to this variable simply as Proportion of Delivery Hospitals that are Catholic.

5.5.1.1 State and Population Distribution of Dichotomous State-level Variables and Their Correlation

Having eliminated one index variable (*Access-specific*), Table XXXVII shows the states and the actual number of women included in each category of the nine dichotomous state-level variables: seven dichotomous as a result of collapsing categories, and two that started as dichotomous variables (Proportion of Counties with One or More Public FP Clinics and Medicaid Family Planning Waiver). With the exception of these last two variables, which only have three states in one category, and had no other viable categorization options, all of the other variables had four (2) or five (5) states per category.

The Pearson's correlation matrix in Table LI, Appendix D shows evidence of the not-unexpected associations between these nine dichotomous variables. Of the 36 associations in the table, only six (shown in bold) showed a relatively high correlation (0.50 or above), while another 10 pairs of variables had a medium level of correlation ($0.30 < r < 0.50$ or above). Not surprisingly we found a strong association between the Number of Clinics and Public Expenditures on FP Services ($r=0.507$), while a little more surprising was the strong association between Number of Clinics and Sex Education Policies. Of most interest for the next steps in our analysis were the relatively high levels of association between Sex Education Policies and both the *Comprehensive* Index ($r=0.805$) and the *Study-specific* Index ($r=0.637$), as well as the relationship between the two indices ($r=0.791$). These latter three associations supported our plan for multiple starting models (Figure 6) as described in the next sub-sections. The relationship between the other two components (Religious Refusals Policy and Medicaid Family Planning Waiver) and the two indices were less remarkable ($r < 0.50$).

TABLE XXXVII

DISTRIBUTION OF STATES AND RESPONDENTS BY VARIABLE CATEGORY
DICHOTOMOUS STATE-LEVEL VARIABLES FOR MULTILEVEL ANALYSIS
LOW INCOME, SEXUALLY ACTIVE WOMEN, 20-44 YEARS OLD
PRAMS, TWELVE STATES, 2005-2007

Variable & Categorization	# of States	States	# Women	Weighted Percent
Structural Barriers and Facilitators				
Number of Public FP Clinics per 10,000 WINSS				
Low (4.6-6.3)	5	FL/MI/NE/NY/NC	4262	**59.97**
Med/High (7.2-17.75)	7	AR/MS/MO/OR/RI/SC/WV	8742	**40.03**
Proportion of Counties with One or More Public FP Clinic				
Low (< 99%)	3	MO/NE/RI	2924	**10.57**
High (99-100%)	9	AR/FL/MI/MS/NY/NC/OR/SC/WV	10080	**89.43**
Proportion of Delivery Hospitals that are Catholic				
Low (< 7)	4	MS/NC/RI/SC	3551	**27.66**
Med/High (7+)	8	AR/FL/MI/MO/NE/NY/OR/WV	9453	**72.34**
Religious Refusals Policy (Contraception & Sterilization)				
None	7	MI/MO/NE/NY/NC/OR/SC	7336	**72.51**
Any (One or Both)	5	AR/FL/MS/RI/WV	5668	**27.49**
Financial Barriers and Facilitators				
Medicaid Family Planning Waiver				
Yes	10	AR/FL/MS/MO/NY/NC/OR/RI/SC/WV	9267	**74.95**
No	3	MI/NE/WV	3737	**25.05**
Public Expenditures on FP Services per WINSS				
Low (51.1-69.3)	5	FL/MI/MS/NE/RI	4292	**35.90**
Med/High (86.5-278.9)	7	AR/MO/NY/NC/OR/SC/WV	8712	**64.10**
Personal (Acceptability and Attitude) Barriers and Facilitators				
Sex Education Policies				
BCM Requirement	5	MO/OR/RI/SC/WV	5942	**29.07**
Mandate Only or None	7	AR/FL/MI/MS/NC/NE/NY	7062	**70.93**
***Comprehensive* Index of RH-Friendly Policies**				
Low (LE 10)	5	AR/FL/MI/MS/NE	5661	**42.83**
Med/High (> 10)	7	MO/NC/NY/OR/RI/SC/WV	7343	**57.17**
***Study-specific* Index of RH-Friendly Policies**				
Low (LE 10)	5	AR/FL/MI/MS	4229	**38.80**
Med/High (> 10)	7	MO/NE/NY/NC/OR/RI/SC/WV	8775	**61.20**

5.5.2 **Unadjusted Association of State-level Variables in a Multilevel Model**

Table XXXVIII shows the results of the first step in our formal multilevel analysis: unadjusted analyses of the dichotomous state-level variables in multilevel models for *Any* and *Effective* Method PP use. The ORs for each state-level variable came from a separate multilevel model (only one state-level variable per model) that included all individual-level variables in the final main PRAMS multivariable model for the specific outcome, but we do not show the ORs or CIs for the individual-level variables in each model. Because we used this step to determine which variables to be included in our multivariable modeling, the discussion below focuses more on the statistical significance than the magnitude of the associations (ORs). We emphasize more the magnitude of the association in the modeling results presentation.

Three state-level variables were significantly associated ($p < .05$) with *Any* Method PP use including Public Expenditures on FP Services per WINSS and both of the indices of RH-friendly policies (Table XXXVIII), while Religious Refusals Policy was marginally associated ($.05 < p < .15$). These four variables, representing all three types of barrier/facilitators, will used in the multivariable modeling.

Almost all (8/9) state-level variables were marginally or significantly associated with the odds of *Effective* Method PP use (Table XXXVIII). Among the variables representing Structural Barriers and Facilitators, we found that women in states categorized as 'Medium/High' for Number of Public FP Clinics per WINSS had a statistically significant greater odds of *Effective* Method PP use than women in states categorized as 'Low.' In states where 99% to 100% of the counties had a public FP clinic, women had a marginally significant lower odds (OR: 0.84; CI: 0.71-1.00; p= .0439) of *Effective* Method PP use than women in states where less than 99% of counties had at

TABLE XXXVIII

ODDS RATIOS[a] AND CONFIDENCE INTERVALS FROM UNADJUSTED ANALYSES DICHOTOMOUS STATE-LEVEL VARIABLES IN MULTILEVEL MODELS[b]
ANY AND ***EFFECTIVE*** METHOD POSTPARTUM CONTRACEPTIVE USE
LOW INCOME, SEXUALLY ACTIVE WOMEN, 20-44 YEARS OLD
PRAMS, TWELVE STATES, 2005-2007

		***Any Method* Use**		***Effective Method* Use**	
Variables		OR[a]	95% CI[a]	OR[a]	95% CI[a]
Structural Barriers and Facilitators					
Number of Public FP Clinics per 10,000 WINSS					
Low	(4.6-6.3)	Ref		Ref	
Med/High	(7.2-17.75)	1.09	0.86-1.38	**1.33**	**1.13-1.56**
Proportion of Counties with One or More Public FP Clinics					
Low	(< 99%)	Ref		Ref	
High	(99-100%)	1.03	0.84-1.27	0.84	0.71-1.00
Proportion of Delivery Hospitals that are Catholic					
Low	(< 7%)	1.12	0.84-1.50	**1.41**	**1.24-1.60**
Med/High	(7+%)	Ref		Ref	
Religious Refusals Policy (Contraception & Sterilization)					
None		1.20	0.98-1.45	1.07	0.90-1.27
Any Refusal (One or Both)		Ref		Ref	
Financial Barriers and Facilitators					
Medicaid Family Planning Waiver					
Yes		1.08	0.85-1.36	1.20	0.99-1.45
No		Ref		Ref	
Public Expenditures on FP Services per WINSS					
Low	(51.1-69.3)	Ref		Ref	
Med/High	(86.5-278.9)	**1.27**	**1.03-1.55**	**1.28**	**1.07-1.54**
Personal (Acceptability and Attitude) Barriers and Facilitators					
Sex Education Policies					
BCM Requirement		1.15	0.87-1.50	**1.33**	**1.16-1.53**
Mandate Only or None		Ref		Ref	
***Comprehensive* Index of RH-Friendly Policies**					
Low	(LE 10)	Ref		Ref	
Med/High	(20+)	**1.30**	**1.06-1.59**	**1.27**	**1.06-1.56**
***Study-specific* Index of RH-Friendly Policies**					
Low	(< 0)	Ref		Ref	
Med/High	(GE 0)	**1.31**	**1.08-1.60**	**1.29**	**1.08-1.54**

[a] The OR and 95% CI are from a separate multilevel model with only that state-level variable, but all individual-level variables in the final main *Any* Method (Pregnancy Intention and PNC Talk BC) or *Effective* Method (Ethnicity/race, marital status, number of live births, pregnancy intention, PNC Talk BC, Well-baby Visit) PP use multivariable model.

[b] **Bold are significant at p < .05.**

[c] This OR was in the opposite direction from that hypothesized.

least one public FP clinic, which, of note, went against our hypothesis. The OR of the Proportion of Delivery Hospitals that are Catholic variable was the highest (OR: 1.41; CI: 1.24-1.60), and indicated a significantly greater odds of *Effective* Method PP use for women in states categorized as 'Low' for Proportion of Delivery Hospitals compared to those in states with a 'Medium/High' proportion (Table XXXVIII).

Among the two variables representing Financial Barriers and Facilitators, the Medicaid FP Waiver variable was marginally significant (OR: .1.20; CI: 0.99-1.45; p = 0.0567) indicating a higher odds of *Effective* Method PP use among women who lived in states that had a FP waiver than those who did not. Women in states with a 'Medium/High' amount of Public Expenditures on FP Services per WINSS were significantly more likely to use *Effective* PP contraception than women in states with a 'Low' amount (Table XXXVIII). Lastly, among the Personal Barriers and Facilitators, all three policy variables were significant and had similar ORs: [Sex Education Policies (OR; 1.33; CI: 1.16-1.53); *Comprehensive* Index (OR: 1.27; CI: 1.06-1.56); *Study-specific* Index (OR: 1.29; CI: 1.08-1.54)].

Table XXXIX summarizes and highlights the similarities and differences in the association of state-level variables and *Any* and *Effective* Method PP use, and identifies variables that are components of the indices. There were far more significant ($p < .05$) or marginally significant associations ($.05 < p < .15$) for the relationship between the nine state-level variables and *Effective* Method PP use (eight) than for *Any* Method PP use (five). But, each outcome had at least one variable for each type of Barrier/Facilitator. Only one of the five variables associated with *Any* Method PP use was not also associated with *Effective* Method PP use (Religious Refusals Policy). For

TABLE XXXIX

SUMMARY OF ASSOCIATION[a] OF VARIABLES IN UNADJUSTED ANALYSES
STATE-LEVEL VARIABLES IN MULTILEVEL MODELS[b]
ANY AND ***EFFECTIVE*** METHOD POSTPARTUM CONTRACEPTIVE USE
LOW INCOME, SEXUALLY ACTIVE WOMEN, 20-44 YEARS OLD
PRAMS, TWELVE STATES, 2005-2007

State-level Variable	Association Significance Level[a]		Policy Index Component	
	Any **Method**	***Effective*** **Method**	***Compre-hensive***	***Study-Specific***
Structural Barriers and Facilitators				
Number of Public FP Clinics per 10,000 WINSS		**Sig**		
Proportion of Counties with One or More Public FP Clinics		**(Sig[c])**		
Proportion of Delivery Hospitals that are Catholic		**Sig**		
Religious Refusals Policy	**(Sig)**		Yes	Yes
Financial Barriers and Facilitators				
Medicaid Family Planning Waiver		**(Sig)**	Yes	Yes
Public Expenditures on FP Services per WINSS	**Sig**	**Sig**		
Personal (Acceptability and Attitude) Barriers and Facilitators				
Sex Education Policies (BCM Requirement & Mandate)		**Sig**	Yes	Yes
Comprehensive Index (of Reproductive Health-Friendly Policies)	**Sig**	**Sig**		
Study-specific Index (of Reproductive Health-Friendly Policies)	**Sig**	**Sig**		

[a] Sig = Significant at $p < .05$ **(Sig)** = Significant at $.05 <= p < .15$.

[b] The individual-level variables in the multilevel analysis were:
Any Method PP use models: Pregnancy Intention and PNC Talk BC
Effective Method PP use models: Ethnicity/race, marital status, number of live births, pregnancy intention, PNC Talk BC, Well-baby Visit.

[c] Significant in opposite direction from that hypothesized.

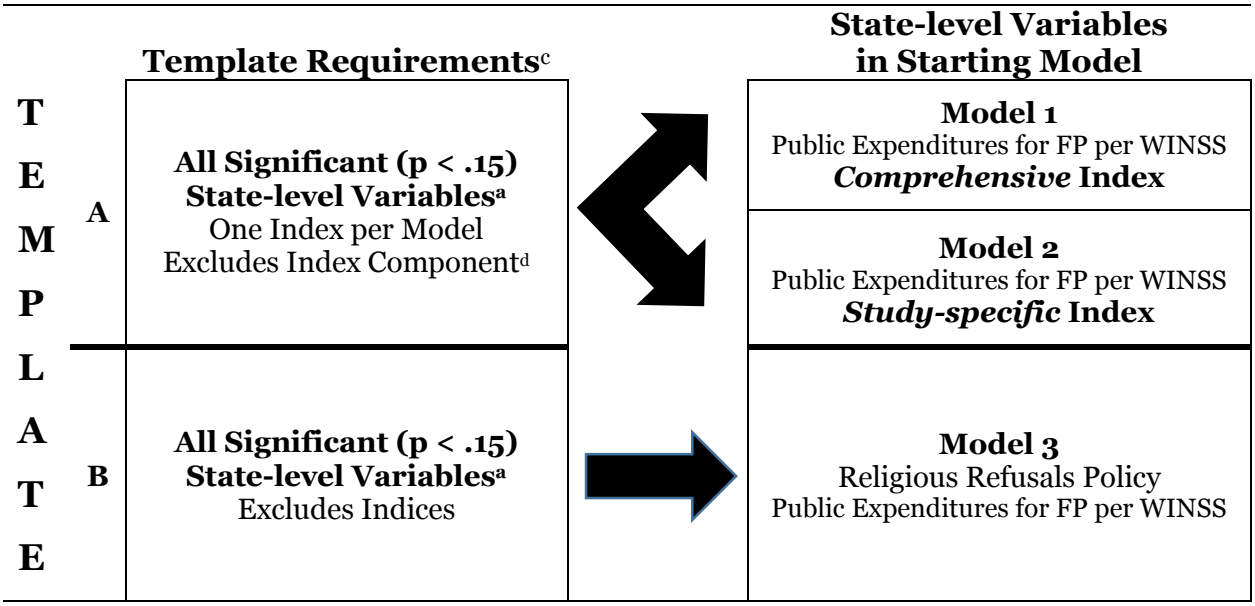
both outcomes, both indices and at least one stand-alone component variable were significant.

We used all of the variables significant or marginally significant in the unadjusted multilevel analyses summarized in Table XXXIX in the multivariable, multilevel models of PP use. Even though the OR for Proportion of Counties with One or More Public FP Clinics was not in the direction hypothesized, we did include it in our multivariable modeling of *Effective* Method PP use.

5.5.3 Multilevel Modeling - *Any* Method Postpartum Contraceptive Use

The multilevel modeling of *Any* Method PP use needed to include the four state-level variables that were associated at $p < .15$ in the unadjusted analysis (Table XXXIX): Public Expenditures on FP Services per WINSS, both indices, and Religious Refusals Policy, also a component of both indices. To accommodate this mix of variables, we relied on our model templates (Figure 6), created to systematically test the related indices and component variables. Figure 7 lists the basic requirements of the three templates and shows which of the four state-level variables we included in the three models that were initially needed. Models 1 and 2, based on Template A, test the indices separately without a stand-alone component variable in either model. Model 3 (Template B) tests the component variable without an index in the model. All three models include the non-index, non-component Public Expenditures on FP Services per WINSS. Template C would only be used if an index and a component were both significant. All three starting models included the individual-level variables significant in the main PRAMS final *Any* Method PP use multivariable model (Tables XXXI).

Figure 7. State-level variables[a] in starting multilevel models[b] based on templates[c] for ***Any*** method postpartum contraceptive use among low income, sexually active women 20-44 years old, prams, twelve states, 2005-2007.



[a] Significant (p < .15) state-level variables to be included were: Religious Refusals Policy, Public Expenditures for FP Services per WINSS, *Comprehensive* Index, *Study-specific* Index.

[b] Individual-level variables included in all models were: Pregnancy Intention and PNC Talk BC.

[c] See Figure 6 for more Template details.

[d] Religious Refusals Policy was the only significant stand-alone variable that was also a component of both indices.

The results of the three starting models are shown in Table XL. When we ran Models 1 and 2, which tested the indices without a component variable (excluding Religious Refusals Policy), and only differed with respect to the index included, the results were the same. In both Models the index that was included was significant (both with an OR of 1.23), but the other variable, Public Expenditures, was not (Table XXXVII, Part A). The results of Model 3, shown in Table XXXVII, Part B, which included the self-standing index component variable without an index, the component (Religious Refusals Policy) was not significant, while Public Expenditures for FP Services per WINSS was significant (OR: 1.23; CI: 1.02-1.49).

TABLE XL
MULTILEVEL, MULTIVARIABLE LOGISTIC REGRESSION MODELING
ODDS RATIOS FOR STATE-LEVEL AND INDIVIDUAL-LEVEL VARIABLES
ANY METHOD POSTPARTUM CONTRACEPTIVE USE
LOW INCOME, SEXUALLY ACTIVE WOMEN, 20-44 YEARS OLD
PRAMS, TWELVE STATES, 2005-2007

Part A: Models 1 & 2 Indices without Component	**Model 1** Variables Significant at p < .15 with *Comprehensive* Index No Index Component		**Model 2** Variables Significant at p < .15 with *Study-specific* Index No Index Component	
State-level Variables	**OR[a]**	**95% CI[a]**	**OR[a]**	**95% CI[a]**
Public Expenditures for FP Services per WINSS				
Low	*Ref*		*Ref*	
Med/High	1.07	0.91-1.26	1.10	0.93-1.29
***Comprehensive* Index of RH-Friendly Policies**				
Low	*Ref*		*Not Included*	
Med/High	**1.23**	**1.04-1.47**		
***Study-specific* Index of RH-Friendly Policies**				
Low	*Not Included*		*Ref*	
Med/High			**1.23**	**1.05-1.45**
Individual-Level Variables				
Pregnancy Intention				
Intended	**0.43**	**0.35-0.53**	**0.43**	**0.35-0.53**
Mistimed	*Ref*		*Ref*	
Unwanted	1.17	0.82-1.65	1.17	0.82-1.65
PNC Talk Birth Control				
Yes	**1.85**	**1.42-2.40**	**1.85**	**1.43-2.40**
No	*Ref*	----	*Ref*	----

TABLE XL (continued)
MULTILEVEL, MULTIVARIABLE LOGISTIC REGRESSION MODELING
ODDS RATIOS FOR STATE-LEVEL AND INDIVIDUAL-LEVEL VARIABLES
ANY METHOD POSTPARTUM CONTRACEPTIVE USE
LOW INCOME, SEXUALLY ACTIVE WOMEN, 20-44 YEARS OLD
PRAMS, TWELVE STATES, 2005-2007

Part B: Model 3 Component without Index	**Model 3** Variables Significant at p < .15 with Index Component No Index	
State-level Variables	**OR[a]**	**95% CI[a]**
Religious Refusals Policy		
None	1.14	0.97-1.35
Any Refusal	*Ref*	
Public Expenditures for FP Services per WINSS		
Low	*Ref*	
Med/High	**1.23**	**1.02-1.49**
Individual-Level Variables		
Pregnancy Intention		
Intended	**0.43**	**0.35-0.53**
Mistimed	*Ref*	
Unwanted	1.17	0.82-1.65
PNC Talk Birth Control		
Yes	**1.85**	**1.42-2.40**
No	*Ref*	----

[a] **Bold are significant at p < .05.**

Because none of the starting models had more than one variable that remained significant, we ran no follow-up models. The significant state-level ORs measure the association while controlling for all other state-level variables in the model (Table XXXVII), and were all a bit lower than those in their corresponding unadjusted models (Table XXXV).

The two individual-level variables included in each multilevel model remained significant (Table XL) in all models. However, while the OR comparing women with an unintended pregnancy to women with a mistimed pregnancy was essentially the same from final individual-level model (OR=0.44) to the multilevel models (OR=0.43 in all three models), the ORs comparing women who had discussed BC during a PNC visit to those had not, did change slightly. The OR of 1.97 in the final individual-level model decreased slightly, 1.85, in all three models.

Table XLI summarizes the multilevel modeling results for *Any* Method PP use. We found that three of the four state-level variables associated with the odds of *Any* Method PP use in the unadjusted analyses remained associated with *Any* Method PP use in a multilevel multivariable model (Public Expenditures on FP Services per WINSS and both policy indices), although each in a different model. All three significant state-level variables had the same point estimate of the level of association with *Any* Method PP use (OR: 1.23) and very similar confidence intervals.

Public Expenditures on FP Services per WINSS, the only variable included in all three models, was only significant in the model without an index (Model 3). Only marginally significant in the unadjusted analysis, Religious Refusals Policy was not significant even though it was modeled without an index (Model 3). Of note, all of these models included only two state-level variables.

TABLE XLI

ASSOCIATION OF STATE-LEVEL VARIABLES IN MULTILEVEL MODELS[a]
ANY METHOD POSTPARTUM CONTRACEPTIVE USE SUMMARY
LOW INCOME, SEXUALLY ACTIVE WOMEN, 20-44 YEARS OLD
PRAMS, TWELVE STATES, 2005-2007

		ORs (95% CIs) State-level Variables[b]			
Starting Model Description[a, b]	**Model**	Religious Refusals Policy	Public Expenditures for FP Services per WINSS	*Compre-hensive* Index	*Study-Specific* Index
All Significant (3) Variables (p < .15) - 1 Index per Model - No Component Variable[b]	**Model 1**	*Not Included*	NS[c]	**1.23 (1.04-1.47)**	*Not Included*
	Model 2		NS	*Not Included*	**1.23 (1.05-1.45)**
All Significant (2) Variables (p < .15) - Excluding Indices	**Model 3**	NS	**1.23 (1.02-1.49)**	*Not Included*	

[a] All models included the two individual-level variables in the final PRAMS multivariable model. Results of these two individual-level variables (Pregnancy Intention and PNC Talk BC) are not summarized here.

[b] All state-level variables included in the modeling are shown here. (See also Figure 7.)

[c] NS: Not Significant at p < .05

[d] Because neither index nor the stand-alone component variables were significant in the modeling, we did not need to test models with an index and the component.

5.5.4 **Multilevel Modeling - *Effective* Method Postpartum Contraceptive Use**

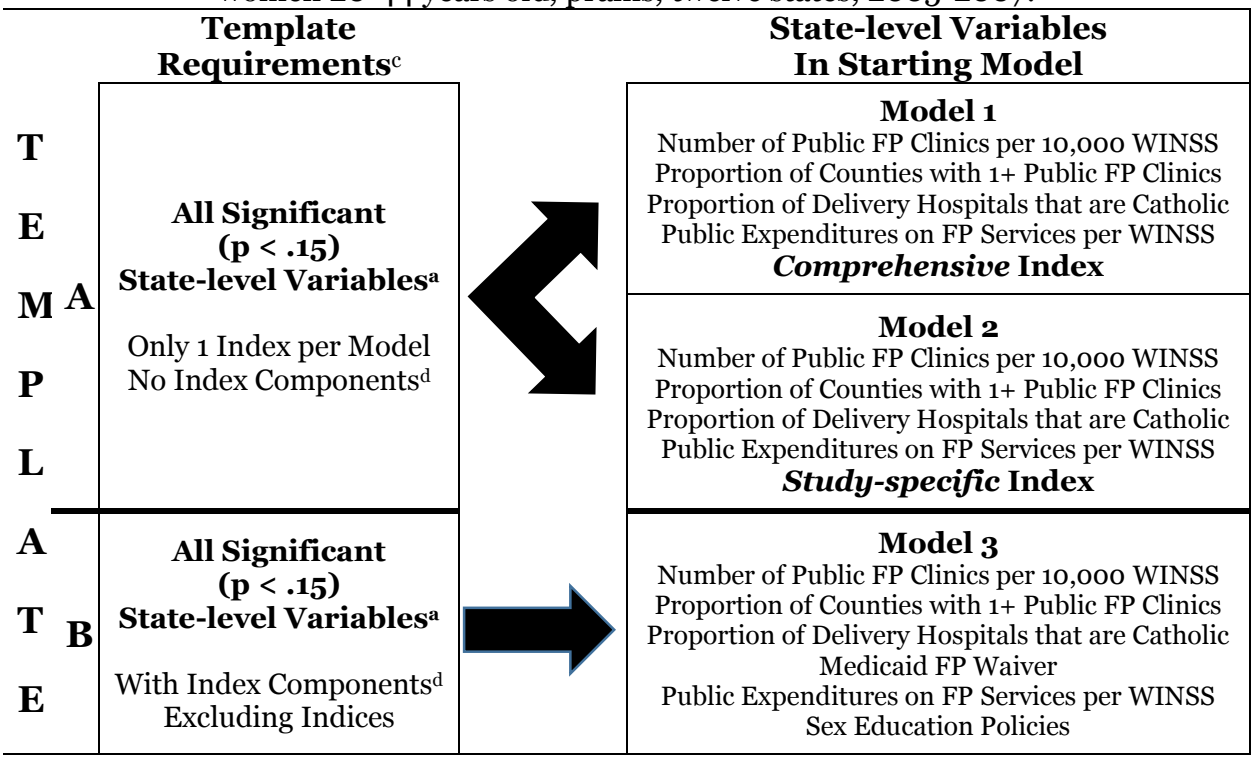
Based on the unadjusted analysis of *Effective* Method PP use (Table XXXVIII), our multilevel modeling needed to accommodate eight state-level variables (all significant at $p < .15$), which included both of the indices, and two stand-along components of the indices (Medicaid FP Waiver and Sex Education Policies). To meet our modeling criteria of testing the indices separately and without component variables, as well as testing the component variables without an index, we again used our model templates and needed three starting models as with *Any* Method PP use.

Figure 8 lists the three templates' requirements and shows the state-level variables we included in the three corresponding starting models. Models 1 and 2, identical other than the index variable included, excluded the two stand-alone component variables, but included the other four significant state-level variables. Model 3 omitted the indices, but included the two component variables and the other four significant state-level variables. All models included the six individual-level variables in the main PRAMS final *Effective* Method PP use multivariable model (Table XXXII).

Table XLII documents the modeling results. In Models 1 and 2, which tested the indices (one per model) without the component variables, neither index was significant. And in Model 3, which tested the component variables (Medicaid FP Waiver and Sex Education Policies) without the indices, neither component was significant. However, these models did identify three other state-level variables that were significantly associated with *Effective* Method PP use, each in more than one model.

In Model 1, which included the *Comprehensive* index, three of the five state-level variables were initially significant (Table XLII, Part A): Number of Public FP Clinics per 10,000 WINSS (OR: 1.20), Proportion of Counties with One or More Public FP Clinics

Figure 8. State-level variables[a] in starting multilevel models[b] based on templates[c] for ***Effective*** method postpartum contraceptive use among low income, sexually active women 20-44 years old, prams, twelve states, 2005-2007.



[a] Significant (p < .15) state-level variables were: Number of Public FP Clinics per 10,000 WINSS, Proportion of Counties with 1+ (One or More) Public FP Clinics, Proportion of Delivery Hospitals that are Catholic, Medicaid FP Waiver, Public Expenditures ($$) on FP Services per WINSS, Sex Education Policies, *Comprehensive* Index, and *Study-specific* Index.

[b] Individual level variables included in all models were: Ethnicity/race, Marital Status, Number of Live Births, Pregnancy Intention, PNC Talk BC and Well-baby Visit.

[c] See Figure 6 for Template details.

[d] Significant stand-alone variables that were also components of both indices included: Medicaid Waiver for FP Services and Sex Education Policies.

TABLE XLII

MULTILEVEL, MULTIVARIABLE LOGISTIC REGRESSION MODELING[a,b]
ODDS RATIOS FOR STATE-LEVEL VARIABLES
EFFECTIVE METHOD POSTPARTUM CONTRACEPTIVE USE
LOW INCOME, SEXUALLY ACTIVE WOMEN, 20-44 YEARS OLD
PRAMS, TWELVE STATES, 2005-2007

Part A: Models 1 & 1a One index, no components	**Model 1** Variables Significant at p < .15 with *Comprehensive* Index No Index Components		**Model 1a** Variables Significant at p < .05 in Model 1 Included	
State-level Variables	**OR[c]**	**95% CI[c]**	**OR[c]**	**95% CI[c]**
Number of Public FP Clinics per 10,000 WINSS				
Low	*Ref*		*Ref*	
Med/High	**1.20**	**1.00-1.43**	**1.26**	**1.11-1.43**
Proportion of Counties with One or More Public FP Clinics				
Low	*Ref*		*Ref*	
High	**0.83**	**0.71-0.96**	**0.86**	**0.75-0.99**
Proportion of Delivery Hospitals that are Catholic				
Low	**1.36**	**1.14-1.63**	**1.37**	**1.21-1.56**
Med/High	*Ref*		*Ref*	
Public Expenditures on FP Services per WINSS				
Low	*Ref*			
Med/High	1.13	0.90-1.43		
***Comprehensive* Index of RH-Friendly Policies**				
Low	*Ref*			
Med/High	0.95	0.76-1.20		

TABLE XLII (continued)
MULTILEVEL, MULTIVARIABLE LOGISTIC REGRESSION MODELING[a,b]
ODDS RATIOS FOR STATE-LEVEL VARIABLES
EFFECTIVE METHOD POSTPARTUM CONTRACEPTIVE USE
LOW INCOME, SEXUALLY ACTIVE WOMEN, 20-44 YEARS OLD
PRAMS, TWELVE STATES, 2005-2007

Part B: Models 2 & 2a One index, no components	**Model 2** Variables Significant at p < .15 with *Study-specific* Index No Index Components		**Model 2a** Variables Significant at p < .05 in Model 2 Included	
State-level Variables	**OR[c]**	**95% CI[c]**	**OR[c]**	**95% CI[c]**
Number of Public FP Clinics per 10,000 WINSS				
Low	*Ref*		*Ref*	
Med/High	**1.22**	**1.02-1.45**	**1.28**	**1.12-1.46**
Proportion of Counties with One or More Public FP Clinics				
Low	*Ref*			
High	0.85	0.70-1.03		
Proportion of Delivery Hospitals that are Catholic				
Low	**1.34**	**1.12-1.59**	**1.36**	**1.20-1.54**
Med/High	*Ref*		*Ref*	
Public Expenditures on FP Services per WINSS				
Low	*Ref*			
Med/High	1.07	0.85-1.33		
***Study-Specific* Index of RH-Friendly Policies**				
Low	*Ref*			
Med/High	1.02	0.83-1.25		

TABLE XLII (continued)
MULTILEVEL, MULTIVARIABLE LOGISTIC REGRESSION MODELING[a,b]
ODDS RATIOS FOR STATE-LEVEL VARIABLES
EFFECTIVE METHOD POSTPARTUM CONTRACEPTIVE USE
LOW INCOME, SEXUALLY ACTIVE WOMEN, 20-44 YEARS OLD
PRAMS, TWELVE STATES, 2005-2007

Part C: Models 3 & 3a No Index, Two Components	**Model 3** Variables Significant at p < .15 with *Study-specific* Index		**Model 3a** Variables Significant at p < .05 in Model 3 Included	
State-level Variables	**OR[c]**	**95% CI[c]**	**OR[c]**	**95% CI[c]**
Number of Public FP Clinics per 10,000 WINSS				
Low	*Ref*			
Med/High	1.25	0.94-1.66		
Proportion of Counties with One or More Public FP Clinic				
Low	*Ref*		*Ref*	
High	**0.83**	**0.73-0.96**	**0.82**	**0.69-0.97**
Proportion of Delivery Hospitals that are Catholic				
Low	**1.37**	**1.15-1.63**	**1.42**	**1.25-1.61**
Med/High	*Ref*			
Medicaid Family Planning Waiver				
Yes	0.92	0.73-1.16		
No	*Ref*			
Public Expenditures on FP Services per WINSS				
Low	*Ref*			
Med/High	1.13	0.89-1.44		
Sex Education Policies				
BCM Req	0.96	0.77-1.19		
Mandate/None	*Ref*			

[a] Individual level variables included in all models were: Ethnicity/race, Marital Status, Number of Live Births, Pregnancy Intention, PNC Talk BC and Well-baby Visit.

[b] See individual-level variable results in Table LII, Appendix E.

[c] **Bold are significant at p < .05.**

(OR: 0.83) and Proportion of Delivery Hospitals that are Catholic (OR: 1.36). Although Number of Public FP Clinics per 10,000 WINSS was just significant (CI: 1.00-1.43; p-value: 0.0440), we included it in a reduced model (Model 1a) along with the other two significant variables. In Model 1a, all three variables remained significant (Table XLII, Part A). Compared to the full model, in this reduced model the Number of Public FP Clinics per 10,000 WINSS had a slight increase in the OR (from 1.20 to 1.26) with a more highly significant association (CI: 1.11-1.43; p-value = 0.0005). Proportion of Counties with One or More Public FP Clinics showed a slight decrease in the OR (0.83 to 0.86) and a CI closer to one (0.75-0.99), but retained its association in the opposite direction from our hypothesis. The OR for Proportion of Delivery Hospitals that are Catholic remained essentially the same (1.36 to 1.37), but had a slightly tighter CI (1.21-1.56).

In Model 2, which substituted the *Study-specific* index for the *Comprehensive* Index, we found only two significant state-level variables (Table XLII, Part B), both of which were also significant in Model 1: Number of Public FP Clinics per 10,000 WINSS (OR: 1.22; CI: 1.02-1.45) and Proportion of Delivery Hospitals that are Catholic (OR: 1.34; CI: 1.12-1.59). In the reduced model that included only these two state-level variables (Model 2a), both remained significant with a slightly higher OR (1.28) and narrower CIs (1.12-1.46) for Number of Public FP Clinics per 10,000 WINSS and, as in Model 1a, an OR that was essentially the same (1.37) for Proportion of Delivery Hospitals that are Catholic with a tighter CI (1.21-1.56).

When we ran Model 3 (Table XLII, Part C), the fullest model with six state-level variables, including the two stand-alone components, but no index, we also found two significant state-level variables, but a different pairing than Model 2: Proportion of

Counties with One or More Public FP Clinics and Proportion of Delivery Hospitals that are Catholic (Table XLII, Part C). When we re-ran the model with only these two variables (Model 3a), both remained significant. From Model 3 to Model 3a, the OR for Proportion of Counties with One or More Public FP Clinics was almost the same (0.83 to 0.82), but had a slightly wider CI (0.73-0.96 to 0.69-0.97), while the OR for Proportion of Delivery Hospitals increased (1.37 to 1.42) and the CI was narrower (1.15-1.63 to 1.25-1.61). Of note this was the highest OR for Proportion of Delivery Hospitals that are Catholic.

Across the three multilevel models, the association of the six individual-level variables with *Effective* Method PP use remained relatively stable (Table LI, Appendix D). However, when we compared these multilevel results to those of the main PRAMS final individual-level multivariable model (Table XXX), we identified two changes in significance from individual-level to multilevel models.

Although the ORs comparing *Effective* Method PP use in 'Three' vs. 'Two' (referent) live births were essentially the same for the individual-level model [1.29 (Table XXX)] and the multilevel models [ORs: 1.28 or 1.29 (Table LI, Appendix D)], wider confidence intervals in the multilevel modeling made the association non-significant [CI: 0.98 to 1.69 (Table LI, Appendix D)], even though it was significant in the individual-level model [CI: 1.04-1.61 (Table XXX)]. And, in reverse the same phenomenon occurred when comparing the significance of the association between Unwanted vs. Mistimed (referent) pregnancies and *Effective* Method PP use. In this case the ORs were again more-or-less the same [individual-level model OR: 1.26 (Table XXX) vs. multilevel models ORs: 1.26 or 1.27 (Table LI, Appendix D)]; however, with narrower CIs in the multilevel analysis, this association went from non-significant in the

individual-level model [CI: 0.97-1.65 (Table XXX)] to significant in all final multilevel models [CI: 1.01-1.57/1.02-1.58/1.02-1.58/ (Table LI, Appendix D)].

Table XLIII summarizes the significance of the state-level variables included in the multilevel multivariable modeling of *Effective* Method PP use. Of the eight variables included in the modeling, only three were ever significant, and all three remained significant in two or more models. While the reduced version of the first starting model had three significant state-level variables, the reduced versions of the other two starting models (Models 2 and 3) had only two.

Not shown in Table XLIII are the five state-level variables that were significant in the unadjusted analyses, but were not significant in any of the starting multivariable models (see Table XXXIX). The two indices (*Comprehensive* and *Study-specific*) were not significant in the models without the two stand-alone component variables (Models 1 and 2), and the two component variables (Medicaid FP Waiver, Sex Education Policies) were not significant in the model without an index (Model 3). Although in all three models, Public Expenditures on FP Services per WINSS was never significant.

Unlike Public Expenditures, the other three state-level variables that were included in all three starting models were significant in two or all three models. The Proportion of Counties was significant in two models, as was Number of Public FP Clinics per 10,000 WINSS, while the Proportion of Delivery Hospitals that are Catholic was significant in all three models.

TABLE XLIII

ASSOCIATION OF STATE-LEVEL VARIABLES IN MULTILEVEL MODELS[a]
EFFECTIVE METHOD POSTPARTUM CONTRACEPTIVE USE SUMMARY
LOW INCOME, SEXUALLY ACTIVE WOMEN, 20-44 YEARS OLD
PRAMS, TWELVE STATES, 2005-2007

Starting Model Description[a]	Model	ORs and 95% CI Significant State-level Variables[b]: Number of FP Clinics per 10,000 WINSS	Proportion of Counties with One or More Clinics	Proportion of Delivery Hospitals that are Catholic
All Significant Variables (5) ($p < .15$) One Index per Model *Excludes* Component Variables	Model 1 with *Comprehensive* Index	1.20 1.00-1.43	0.83 0.71-0.96	1.36 1.14-1.63
	Model 1a Only Model 1 Significant Variables	**1.26 1.11-1.43**	**0.86 0.75-0.99**	**1.37 1.21-1.56**
	Model 2 with *Study-Specific* Index	1.22 1.02-1.45	NS[c]	1.34 1.12-1.59
	Model 2a Only Model 2 Significant Variables	**1.28 1.12-1.46**	Not Included	**1.36 1.20-1.54**
All Significant Variables (6) ($p < .15$) - Excluding Indices -	Model 3 No Index	NS	0.83 0.73-0.96	1.37 1.15-1.63
	Model 3a Only Model 3 Significant Variables	Not Included	**0.82 0.69-0.97**	**1.42 1.25-1.61**

[a] All models included the individual-level variables significant in the final main PRAMS multivariable model: Ethnicity/race, Marital Status, Number of Live Births, Pregnancy Intention, PNC Talk BC and Well-baby Visit. Results of these two variables are not summarized here.

[b] Although Medicaid FP Waiver, Public Expenditures on FP Services per WINSS, Sex Education Policies, *Comprehensive* Index, and *Study-specific* Index were significant in the unadjusted analyses, they are not shown here as they were not significant in any starting or final models. See Table XXXIX for the state-level variables included in each model.

[c] NS: Not Significant at $p < .05$.

[d] Because neither indices or the stand-alone component variables were significant in the modeling, we did not need to test models with an index and components.

5.5.5 Comparison of Multilevel Modeling of *Any* and *Effective* Method Postpartum Contraceptive Use

As seen in Table XLIV, despite their disparate starting points (three vs. eight significant state-level variables), both *Any* and *Effective* Method PP use each had three state-level variables associated with its use in a multilevel, multivariable analysis, but none were the same. The three state-level variables associated with *Any* Method PP use modeling included one Financial Barrier/Facilitator (Public Expenditures for FP Services per WINSS), and two Personal Barriers/Facilitators (*Comprehensive* Index and *Study-specific* Index). All three variables associated with *Effective* Method PP use were Structural Barriers/Facilitators – Number of Public FP Clinics per 10,000 WINSS, Proportion of Delivery Hospitals that are Catholic, and Proportion of Counties with One or More Public FP Clinics. The three state-level variables not associated with either *Any* or *Effective* Method PP use (Religious Refusals Policy, Medicaid FP Waiver, and Sex Education Policies) differed in their Barrier/Facilitator type (Table XLIV), but were similar in that they were stand-alone variables that were also components of the indices.

Unlike *Any* Method modeling, which had only one significant variable per model, and no variable significant in more than one model (Table XLI), *Effective* Method PP contraceptive use had up to three variables significant in one model, and all three variables were significant in more than one model (Table XLIII). Specifically, Number of Clinics per 10,000 WINSSS and Proportion of Counties with One or More FP Clinics were significant in two models, while Proportion of Delivery Hospitals that are Catholic was significant in all three models (Table XLIII).

While the ORs for the three state-level variables associated with *Any* Method PP use in three different models were the same (1.23), the ORs for the three state-level

TABLE XLIV
SUMMARY OF ASSOCIATION OF STATE-LEVEL VARIABLES
FINAL MULTILEVEL MODELS[a]
ANY AND ***EFFECTIVE*** METHOD POSTPARTUM CONTRACEPTIVE USE
LOW INCOME, SEXUALLY ACTIVE WOMEN, 20-44 YEARS OLD
PRAMS, TWELVE STATES, 2005-2007

	***Any* Method PP Use**		***Effective* Method PP Use**	
Variable	**Status in Modeling**[b,c,d]	OR	**Status in Modeling**[b,c,d]	OR[e] Range
Structural Barriers and Facilitators				
Number of Public FP Clinics per 10,000 WINSS	----		Significant in Two Models	1.26 to 1.28
Proportion of Counties with One or More Public FP Clinics	----		Significant in Two Models	0.82[f] to 0.86
Proportion of Delivery Hospitals that are Catholic	----		**Significant in All (3) Models**	1.36 to 1.42
Religious Refusal Policies	NS		----	
Financial Barriers and Facilitators				
Medicaid Family Planning Waiver	----		NS	
Public Expenditures on FP Services per WINSS	Significant in One Model	1.23	NS	
Personal Barriers and Facilitators				
Sex Education Policies (BCM Requirement & Mandate)	----		NS	
Comprehensive Index (of Reproductive Health-Friendly Policies)	Significant in One Model	1.23	NS	
Study-specific Index (of Reproductive Health-Friendly Policies)	Significant in One Model	1.23	NS	

[a] The individual-level variables in the multilevel models included:
For *Any* Method PP use models: Pregnancy Intention and PNC Talk BC
For *Effective* Method PP use models: Ethnicity/race, marital status, number of live births, pregnancy intention, PNC Talk BC, Well-baby Visit

[b] Number of models in which this variable was significant at $p < .05$. For *Any* Method PP use, each was significant in a different model.

[c] NS: Indicates that although variable was significant in the unadjusted analysis, when controlling for other significant state-level factors, it was not significant in any multivariable model.

[d] Cells with dashes (and shaded) indicate variables that were not significant in the unadjusted analysis.

[e] Because significant in more than one final model, this is the range of ORs associated with this variable.

[f] Significant in opposite direction from that hypothesized.

factors associated with *Effective* Method PP use were not the same (Table XL). The final model ORs ranged from 1.16 to 1.22 for Proportion of Counties with One or More FP Clinics, from 1.26 to 1.28 for Number of Clinics per 10,000 WINSSS, and from 1.36 to 1.42 for Proportion of Delivery Hospitals that are Catholic (Table XLIV).

6. DISCUSSION

This research used national (NSFG) and state (PRAMS) survey data to study both *Any* and *Effective* Method postpartum contraceptive use. PP use prevalence at both the national and state levels was calculated; maternal characteristics related to PP use in the two survey populations were compared. In addition, this research used the individual-level, multi-state PRAMS data and state-level data on family planning services and policies to conduct a multi-level analysis to identify state-level factors related to individual-level PP contraceptive use while controlling for individual-level characteristics associated with PP use.

As described in the Methods section, PRAMS and the NSFG are two very different surveys; however, we found two broad similarities between the NSFG and PRAMS study populations: contraceptive use varied significantly by reported sexual activity, while income was not a significant factor in postpartum contraceptive use. To address the difference in PP contraceptive use by sexual activity, we limited our study populations to women who were sexually active. This was relatively easy for the NSFG study, which has month-to-month information on sexual activity that matches the month-to-month information on contraceptive use. With far more effort, we were able to identify PRAMS respondents who reported they were not sexually active via one of two current contraceptive use questions. Although PP contraceptive use was not significantly different by income, because of our interest in state-level factors that, in all likelihood, would affect lower income women more than higher income women, for both surveys we limited our study population to low-income women. And, for both, we used the same identifier of low-income: a delivery paid by Medicaid.

Unfortunately, although the NSFG is, at its core, a relatively large national data set, using the 2006-2010 data we were ultimately only able to identify 981 low income, sexually active, adult respondents who had a live birth for whom our target month for PP use measurement -- four months -- was within the survey's Method Calendar. On the other hand, even when to reduce the range of the timing of the postpartum measurement we limited our 2005-2007 PRAMS data from twelve states to women who completed the questionnaire between three and five months postpartum, the PRAMS data set included over 13,000 respondents.

In our demographic comparison of the two study populations, we noted three differences. The PRAMS population was somewhat younger and, probably as a consequence, also had more first births, while the proportion Hispanic was much larger in the NSFG population than in the PRAMS population. Because of the magnitude of the Hispanic difference (NSFG: 35%; PRAMS: 21%), we wanted to be sure Hispanic women were not over-represented in our NSFG study population. To do this, we first compared the percent Hispanic among all adult female NSFG respondents (i.e., regardless of income or sexual activity status) who had a qualifying live birth (within method calendar) to the percent Hispanic among adult U.S. births in 2006 (calculated by author from data in Martin et al., 2009) and found very similar proportions (21% vs. 23%, respectively). Next, for both surveys, we compared the difference in the proportion Hispanic between our study population (adult, low income, sexually active) and the total respondent population (adult, regardless of income and sexual activity status). In both surveys, Hispanics were a larger percentage of Medicaid-paid deliveries than all deliveries, and the difference was proportionately almost the same (PRAMS: 21% vs. 12%; NSFG: 35% vs. 21%). Based on these findings we are confident that the proportion

Hispanic among our NSFG low-income study population (35%) did indeed represent the nation as a whole, as the NSFG is designed to do, and that the much smaller proportion Hispanic among our PRAMS study population (21%) represented the demographics of the twelve states included in our multi-state data set and not all fifty states.

6.1 Individual-level Results: Multiple Comparisons

We discuss below the results of our individual-level analyses. We compare the *Any* Method and *Effective* Method PP use results for both the national analysis using the NSFG and the state analysis using PRAMS, as well as compare our findings from both data sets with those of other published studies. Where they exist, we also discuss any differences between the PRAMS main and sensitivity analyses, but do not where the results were essentially the same, such as in the overall prevalence. And, although not originally planned, because of the many differences in the results of the analyses between the two surveys, we also discuss the reasons behind these differences.

6.1.1 Overall Prevalence - *Any* and *Effective* Method Postpartum Contraceptive Use

Despite our efforts to 'create' similar contraceptive measures, we found considerable variation in the prevalence of postpartum contraceptive use between the two survey populations for both *Any* Method (NSFG: 79.4%; PRAMS: 90.8%) and *Effective* Method (NSFG: 54.6%; PRAMS: 71.8%) PP use. These differences in prevalence might be accounted for by two different sample populations (as discussed above), or perhaps by differences in how the information is gathered between the two surveys.

Our PRAMS *Any* Method PP use prevalence (90.8%) was similar to that of a CDC (88.0%) PRAMS analysis (CDC, 2009) of 13 geographic areas (12 states plus NYC, with one different state than ours) and almost the same years (2004-2006), but which included all ages and income levels. Of note in that analysis, New York City (NYC) had a much lower prevalence (78.5%) than any state (87.0%-93.4%). The prevalence in a 2004-2008 PRAMS analysis which included only MO, NY and NYC was 85% (Zapata et al., 2015), while the prevalence in a much earlier (1998-1999) New Mexico study (DePiñeres, 2005) was considerably lower at 78%. The prevalence of *Effective* Method PP use (same definition as ours) in both the CDC (2009) and Zapata (2015) studies at 61.7% and 52.6% respectively, were considerably lower than ours (71.8%), but as already noted, both of these analyses included teens, all income levels and New York City, which at 43.2%, was a clear outlier (CDC, 2009). When CDC's multistate population (CDC, 2009) was limited to women with Medicaid before pregnancy, a population more similar to ours albeit still with teens, *Effective* Method PP use was 67.8%, closer to ours. Some of the remainder of the difference between our prevalence and CDC's might be a result of our efforts to identify method users from write-in responses, and/or our re-classification of sexual activity status based on this same information.

The prevalence of *Any* Method PP use in our NSFG population (79%) was slightly more than the 72% prevalence at three months postpartum that White et al. (2015) observed in their NSFG analysis of all women, without age or income restrictions. We noted the same higher prevalence for *Effective* Method PP use: we calculated a 55% prevalence, while White et al. found only a 47% prevalence. These differences might be partially explained by our later measurement (at four months instead of three), but the

population differences may play more of a role: the White analysis included all women, not just low-income adult women.

Although we have corroborated our NSFG prevalence with other NSFG research, and our PRAMS prevalence with other PRAMS research using similar states, we still cannot explain the rather large difference between the two surveys. Based on our validation of the proportion Hispanic in the NSFG, we know that our PRAMS study population is not representative of the nation as a whole. However, because the prevalence of both *Any* Method and *Effective* Method PP contraceptive use was higher in every state included in our analysis as compared to the NSFG, we cannot simply attribute the higher overall PRAMS prevalence to the specific mix of twelve states either. Yet, it could be that that all twelve states are simply above the national average, these are after all the twelve states that chose to gather additional information on PP use, thus showing more interest in data on contraceptive use than other states, which may be matched by more programmatic efforts to assure access to contraception.

Another possible explanation for the higher PRAMS prevalence is the difference in the population composition. If our multistate PRAMS study population had the same demographic distribution as the NSFG it would have more Hispanics, an older population (20-24 vs. 30+), and a population with more live births. Based on their prevalence, more live births would actually increase the PRAMS prevalence, while more Hispanics and an older population would lower the PRAMS prevalence. Nevertheless, since the PRAMS prevalence among Hispanics and older women are both considerably higher than that of the NSFG overall, more similar proportions of Hispanics and older women could not reduce the PRAMS prevalence to that of the NSFG.

If not population differences, perhaps what and how information is gathered (ascertainment bias) can account for some of the difference in prevalence between the two surveys. As described earlier, PRAMS relies on a one-time self-report, mostly by mailed questionnaire with only two main questions regarding current (at the time the questionnaire is completed) contraceptive use. The NSFG, although also self-reported, and retrospective in nature (four months postpartum could be up to four years before the interview), obtains contraceptive use information via an interviewer and a computer-guided system that documents the method used on a month to month basis, a system that has been well-tested over many cycles of the NSFG.

As already mentioned, another distinction between the two surveys is the timing of the PP use measurement. The NSFG's Method Calendar allows measurement of contraceptive use at any month PP. However, PRAMS only asks about contraceptive use at the time the questionnaire is completed, which varies between two and nine months postpartum. Although we did limit our PRAMS study population to women who responded to the questionnaire between three and five months postpartum, excluding those who responded earlier or later, and chose four months postpartum for the NSFG, a small timing difference remains in the PP use measurement between the two populations.

The overall differences in PP use prevalence were reflected by differences in individual method use. The NSFG population as a whole reported less sterilization and hormonal method use, but higher reliance on condoms and withdrawal. The latter reduced the prevalence difference from 17 percentage points for *Effective* Method PP use (NSFG: 54.6%; PRAMS: 71.8%) to 11 percentage points for *Any* Method PP use (NSFG: 79.4%; PRAMS: 90.8%). However, when we compared the percent distribution

of method type among method users, we noted that approximately the same proportion were sterilized (NSFG: 21.3%; PRAMS: 22.9%), but a smaller proportion used hormonal methods and a larger proportion used condoms and withdrawal among the NSFG respondents than the PRAMS respondents. Our PRAMS data are from twelve states, and although we did not look separately at method type use by state, both CDC (2009) and White (2014) have found wide variation across the states.

6.1.2 **Prevalence and Unadjusted Associations by Maternal Characteristics – *Any* and *Effective* Method Postpartum Contraceptive Use**

Among both the NSFG and PRAMS populations, the set of characteristics associated with *Any* Method PP use differed from those associated with *Effective* Method PP use. Although the PRAMS analysis found fewer maternal characteristics associated with *Any* Method PP use than *Effective* Method PP use, the reverse was true in the NSFG.

In the NSFG and the main PRAMS analyses, ethnicity/race, education, number of live births and pregnancy intention were all associated with *Any* Method PP use ($p < .15$), but age and marital status were not. Interestingly, in the sensitivity sub-population, among these characteristics, pregnancy intention (Intended vs. mistimed) was the only one associated with *Any* Method PP use (OR: 0.40; CI: 0.28-0.58). Cohabiting status was also marginally significant in the NSFG population, but unfortunately PRAMS did not collect this information.

While the NSFG's less sophisticated PNC initiation measure was not associated with *Any* Method PP use, in both PRAMS analyses, the more refined variable, PNC counseling about PP birth control use (PNC Talk BC) was strongly associated with *Any*

Method PP use. In the main PRAMS analysis, the WBV was also associated with *Any* Method PP use, but not in the sensitivity sub-population. However, in the sub-population, postpartum visit attendance (PPV) was strongly associated with *Any* Method PP use (OR: 2.65).

In the NSFG population, pregnancy intention and PNC initiation were significantly associated with *Effective* Method PP use, while cohabiting status and number of live births were only marginally associated. Among the main PRAMS population, we noted considerably more (five) significant associations which included: ethnicity/race (Hispanics vs. NH-whites), marital status, number of live births (one vs. two), pregnancy intention (intended vs. mistimed), as well as the three health care related variables (receipt of PNC counseling about BC, WIC, and the Well-baby Visit) which all increased the odds of *Effective* Method PP use. Marginal associations were found for both age and education. As might be expected, in the sensitivity sub-population, the PPV was also strongly associated with *Effective* method PP use. The only other variation between the PRAMS main and sensitivity sub-population analyses was the lack of association between number of live births and *Effective* Method PP use in the sub-population.

As intriguing as the differences within, and between survey populations are, explaining differences is best done with respect to the adjusted analyses. Although, when completing a more formal backwards elimination as was conducted here, rather than just adjusting for all variables at once, what is initially significant, or marginally significant in the unadjusted analyses can make a difference in what is entered into models. In the next section we discuss in more detail our multivariable findings and compare these with those of other researchers.

6.1.3 **Multivariable Analysis of Maternal Characteristics**

Across the three study populations, the multivariable modeling identified only a few characteristics associated with *Any* Method PP use. The final models for the NSFG and main PRAMS analyses included only two characteristics significantly associated with *Any* Method PP use, while with the addition of the PPV, the final PRAMS sensitivity model included three.

In all three analyses we found that women with an intended pregnancy were less likely to use *Any* Method at four months PP than those with a mistimed pregnancy (NSFG: 0.50; main PRAMS: 0.44; Sensitivity PRAMS: 0.39). Beyond this similarity, additional results differed, mostly due to differences in the data sets themselves, specifically the information collected about pregnancy-related healthcare encounters.

In the main PRAMS analysis, the association of receipt of prenatal care that included a discussion of postpartum birth control increased slightly from the unadjusted (OR: 1.88) to multivariable analysis, where it almost doubled the odds of *Any* Method PP use (OR: 1.97). However, when able to control for the PPV in the sensitivity analysis, the strength of the association of a PNC discussion of contraception postpartum diminished from unadjusted (OR: 1.70) to multivariable analysis (OR: 1.57), while the association with having a PPV remained essentially the same (ORs: 2.65 vs. 2.64). In an *Any* Method PP use analysis of New Mexico PRAMS data, DePiñeres et al. (2005) found a similar adjusted level of association for a PNC talk about contraception (OR: 1.51; 95% CI: 1.06-2.16), as did Zapata et al. (2015) in a three-state analysis (OR: 1.53 CI: 1.29-1.82). In the New Mexico analysis, the adjusted PPV association was slightly higher than ours (OR: 3.06; 95% CI: 2.17-4.31), while Zapata et al. (2015) found a lower odds (OR:

1.64; CI: 1.34-2.00) for PP counseling about BC occurring any time after birth (timing not specific, not necessarily at PPV, could be at time of delivery).

Although significant in the main PRAMS unadjusted analysis, when controlling for the strong association between a PNC discussion of birth control, as well as other covariates, education beyond high school was no longer associated with *Any* Method PP use in the final main PRAMS model. Conversely, in the absence of health care associated variables in the NSFG analysis (PNC initiation was not significant in the unadjusted analysis and PNC BC counseling and the PPV were not available), the results indicated a doubling of the odds of *Any* Method PP use among women who had some education beyond high school compared to those with only a high school education.

In the multivariable modeling of *Effective* Method PP use, we noted a striking difference between the NSFG and PRAMS analyses: both final PRAMS models (main and sensitivity) identified six characteristics associated with *Effective* Method PP use, while the final NSFG model identified only two. Although the large differential is primarily due to the number of variables in the starting models (NSFG: four; PRAMS: nine), proportionally more variables were lost due to a change in significance in the NSFG (2/4) than PRAMS modeling (3/9).

As with *Any* Method PP use, the final *Effective* Method PP use models of both surveys had one characteristic in common: the decreased odds among women with an intended pregnancy compared to a mistimed pregnancy. The only other significant association in the NSFG was timing of PNC initiation. As might be expected (CDC, 2009, Teitler et al., 2012), compared to second trimester PNC initiation, first trimester initiation almost doubled the odds of *Effective* Method PP use, while more unexpectedly, third trimester/no PNC more than tripled the odds of *Effective* Method

PP use (OR: 3.66), although with only 32 respondents this estimate was rather unstable (CI: 1.23 to 10.95). A simple explanation for this finding might be that health care providers may act more aggressively to promote contraceptive use if they are concerned that a woman underutilizes the health care system.

We noted a lack of consistency in the demographic characteristics associated with *Effective* Method PP use across the three analyses. In both PRAMS models, Hispanics had a lower odds of *Effective* Method PP use compared to non-Hispanic whites, and unmarried women (vs. married) had an increased odds of *Effective* Method PP use, but in the NSFG, neither was even marginally significant at the unadjusted stage. The PRAMS models differed with regards to the association between education (only sensitivity PRAMS) and number of live births (only main PRAMS) and *Effective* Method PP use, while in the NSFG analysis neither characteristic was in the final model.

In the final main PRAMS model, compared to women with two live births, women with one live birth had a decreased odds, and women with three live births had an increased odds of *Effective* Method PP use, whereas in the sensitivity analysis, due to lack of significance in the unadjusted analysis, Number of Live Births was not part of the modeling. However, when we ignored this result and added Number of Live Births to the initial sensitivity model, we found that women with three infants were more likely to use an *Effective* Method than women with two live births as in the main analysis, and the other associations were not altered (data not shown).

In the NSFG analysis, education was not associated with *Effective* Method PP use. In both unadjusted PRAMS analyses, we noted a decreased odds of *Effective* Method PP use among women with education beyond high school compared to those with a high school education. Although in the final main PRAMS model this association

did not remain significant, in the sensitivity analysis it actually became stronger from unadjusted to multivariable model (OR: 0.80; CI: 0.63-1.01 to OR: .72; CI: 0.56-0.91). This difference demonstrates the importance of controlling for the PPV which is potentially a major gateway to contraceptive access in the postpartum period. In the main analysis, when unable to control for the PPV, the higher use of the PPV among women with education beyond high school (data not shown) appears to have masked the decreased odds of *Effective* Method PP use, which was not the case in the sensitivity model.

The other two discrepancies centered on health care-encounters. Most notably, in the absence of the PPV in the main analysis, a WBV doubled the likelihood of *Effective* Method PP use; however, the sensitivity analysis revealed that when controlling for the PPV, the WBV was no longer significant. In a Florida PRAMS study (Hernandez, 2012), even without controlling for the PPV, when using a different measure of PP use (our *Effective* methods plus condoms), the WBV was not associated with PP use.

In our main analysis we found an almost doubling of the likelihood of *Effective* Method use among women who had a PNC visit that included a discussion of postpartum BC (OR=1.81; CI: 1.50-2.18); when controlling for the PPV in the sensitivity analysis, PNC counseling remained significant, but the OR was slightly lower with a wider confidence interval (OR: 1.63; CI: 1.25-2.11). The Florida PRAMS analysis (Hernandez et al., 2012) without controlling for the PPV, found an even lower association with PNC counseling than both of these (OR: 1.47; CI: 1.10-1.96), although the confidence intervals are overlapping. However, because they included condoms in their contraceptive measure, any association with a health care visit might be diminished, since condoms do not require a health care provider's intervention.

The dominance of the PPV in the sensitivity analysis, which tripled the odds of *Effective* Method PP use (OR: 3.07; CI: 2.32-4.06) and influenced the strength of the associations of several other variables is in line with the traditional expectation that the PPV is the time and place for promotion of, and access to, PP contraception (Speroff and Mishell, 2008). This dominance is striking, especially when we know some women began their contraceptive use before the PPV (as with immediate PP sterilization). However, despite this strong association and our traditional reliance on the PPV, there still is work to be done in understanding the PPV's role in contraceptive initiation. Henderson et al. (2016) explored what providers are doing during the PPV and what the women want from a PPV and found that women want flexibility related to both timing and site. In addition, it remains to be shown that an earlier PPV, as proposed by Speroff and Mishell (2008) almost ten years ago, would increase earlier uptake of PP contraception.

The dominance of the WBV in the main analysis seems to be due to the absence of the PPV and the high concordance between the two. Without the sensitivity analysis, we would have concluded that the WBV had a considerable effect on the use of PP contraception. Instead, it seems that the WBV was simply a 'marker' for the PPV. In the six-state sub-population, we found that 86.2% of women who had a WBV also had a PPV, while among those who had a PPV, 98.2% had a WBV (data not shown).

On the other hand, our finding that 13.8% of women who had a WBV did not have a PPV, and others, such as an eastern United States convenience sample of women bringing their infant for a 12-month or 24-month WBV that found one-half of the mothers who did not want a pregnancy at the time of the survey were not using contraception (Rosener et al., 2016), indicate the potential for the WBV to play a role in

the uptake of *Effective* Method PP use, especially when two WBVs (3-5 days and one month) are recommended (AAP, 2014) before the 6-week PPV.

Recent publications suggest many avenues for exploration with regards to how the WBV might provide opportunities for increasing PP use. In a convenience sample in a family medicine residency clinic, Fagan et al. (2009) found mothers receptive to discussing, taking advice about, and accepting a prescription for contraception from their infant's provider. In a qualitative study of postpartum women and their care providers, the possibility of contraceptive counseling and/or services during a WBV revealed both pluses (easier, earlier) and a minus (takes away focus on baby) from the women's point of view, and a mostly receptive response from providers, despite some hesitancy with respect to how it would really work (Henderson et al., 2016). In a commentary, Zuckerman (2014) simply encouraged pediatric providers to discuss birth spacing by asking: "When do you plan to have your next baby?" and not start the conversation by asking directly about birth control. In a pilot project, Caskey, at al. (2016) tested the use of CDC's Reproductive Life Plan Tool by pediatric residents during a WBV and found its use feasible and acceptable to the residents, although not without challenges. Of note, acceptance of referrals after the discussion were low.

One consistent finding stands out from all of our analyses: we found a lower odds of PP contraceptive use for those with an intended pregnancy compared to women with a mistimed pregnancy across method types and in both surveys. This could be because women who are only four months postpartum from a pregnancy they reported as mistimed, may be much more motivated to prevent an early repeat pregnancy than those who reported their recent pregnancy as planned (either wanted then or sooner). In addition, perhaps women with a planned pregnancy are under-motivated to pursue PP

contraception because they are happy with their "wanted" infant and may welcome another at any time. In a study of postpartum women's interest in LARC, Tang et al. (2013) found that women who had not been trying to get pregnant were significantly more likely to be interested in LARC than women who had actually been trying to get pregnant. Our finding is important because four months postpartum is too soon for another pregnancy, as reflected in Healthy People 2020's FP-5 objective (ODPHP, 2017) to reduce "pregnancies conceived within 18 months of a previous birth," and indicates a need to address birth spacing among women who plan to continue childbearing. While the practice and policy focus is usually on women with unintended pregnancies, these data suggest that women with an intended pregnancy may be at greater risk than expected, especially in terms of a short inter-pregnancy interval.

6.2 **Multilevel Analysis: Individual- and State-level Variables**

Our multilevel analysis, which set out to identify state-level barriers and facilitators of PP use, while controlling for the individual-level variables identified in our PRAMS multivariable analyses, was the most unique and most challenging part of this research project. With only a few studies of this type related to reproductive health (Kost et al., 2012; Hass-Wilson, 1997; Goodman et al., 2007), we had little background for our analysis, e.g., we had no research to help determine the cutoffs for multi-category and dichotomous variables, nor to provide insight as to how to handle the rather complicated initial results of the Proportion of Delivery Hospitals that are Catholic variable and manage the highly-related indices of RH-Friendly Policies and the self-standing component variables. We discuss below the findings from this analysis and address uncertainties that remain in the Limitations section of this discussion.

6.2.1 **Interpreting the Results: State-level Variables in Multilevel Models**

From our unadjusted analysis (one state-level variable in a multilevel model) of the nine dichotomous state-level variables, we were surprised to find four variables significantly or marginally ($0.5 < p < 0.15$) associated with *Any* Method PP use, even when the magnitude of the associations were relatively low (ORs: 1.20-1.31). Given the relatively small amount of variation in *Any* Method PP use across the states [maximum difference: 5.4 percentage points between outliers; eight states within 2.2 percentage points (Table XLVI)], and the "broadness" of the *Any* Method PP use outcome (wide variation in the time, energy, effort and expense needed to use these methods), we would not have questioned the results if we had found no significant associations.

We were even more surprised to find eight variables significantly or marginally associated with *Effective* Method PP use (Table XXXVIII). With considerably more variation in the prevalence of *Effective* Method PP use across the states [maximum difference: 18.5 percentage points between outliers with the other ten spread somewhat evenly (Table XLVII)] and a much more specific outcome, requiring a health care provider's intervention and often more financial resources, we might have anticipated finding more state-level factors associated with *Effective* Method PP use. However, we did not necessarily expect eight out of nine state-level variables to be significant, even if all had only a slightly higher magnitude of association (ORs: 1.27-1.41) than those for *Any* Method PP use. Of note, the Proportion of Counties with at Least one Public FP Clinic was significant, but in in the opposite direction from our hypothesis. Because it remained significant in the multivariable modeling, we discuss this finding in the context of the modeling results below.

With both of the indices and stand-alone components among the state-level variables significantly associated with *Any* and *Effective* Method PP use, and the high correlation between them, for the multilevel modeling of both outcomes, as planned we utilized multiple starting models. Although serving its purpose of further assessing these inter-related variables separately (the indices without stand-alone components and components without an index), this unorthodox methodology resulted in more than one 'final' model for both outcomes, making the interpretation of the results more challenging. Despite this complication, we feel this methodology best enabled us to properly assess the relationship of all of the state-level variables to both of these outcomes and make appropriate conclusions about their application to efforts to increase postpartum contraceptive use.

Among the three state-level variables significant in the three 'final' *Any* Method PP use models (Public Expenditures for FP Services per WINSS, *Comprehensive* Index, *Study-specific* Index), the presence of the two indices of reproductive health-friendly policies among them seems a natural fit to such a broad outcome. We purposely compared the two highly correlated indices (one is a subset of the other) by simply substituting one for the other in a model with all the other variables the same. With the exact same OR and very similar CIs, we consider the two indices equal measures of the overall reproductive health environment. Although at a relatively low magnitude, the significance of both supports our hypothesis that women in states with a more friendly reproductive health climate are more likely to use contraception during the PP period than women in states with a less friendly environment, specifically they have a 23% (OR 1.23) increased odds of *Any* Method PP use four months after a live birth.

That Public Expenditures for FP Services per WINSS was associated with *Any* Method PP use was somewhat surprising since this outcome includes many methods that are far less dependent on finances than *Effective* Method PP use. However, it was only significant in the model without an index, thus not competing against an index, and had the same level of association as the two indices (OR: 1.23); this suggests that Public Expenditures might simply be taking the place of the policy indices as a gauge of a reproductive health-friendly environment. If this is the case, we would want to interpret the association less as an indication that higher levels of funding increase the odds of *Any* Method PP use, and more in the vein of the two indices, as indicating a more friendly reproductive health environment, in this case as reflected by better financing, increases the odds of with *Any* Method PP use.

Consequently, findings from all three *Any* Method PP use models point to the same conclusion. Women in states with a more friendly reproductive health environment that support access to family planning information and services, are at four months postpartum 23% more likely to use *Any* Method of contraception than women in states with a less friendly environment. Because many of the methods included as part of this outcome do not require a health care provider's intervention or prescription, it is not surprising that none of the more specific factors were associated with *Any* Method PP use. However there could be other more specific factors not included in this study. The implications of this finding for reproductive health advocates is straightforward. Efforts to promote specific policy changes related to RH might not only directly benefit a specific issue, but also might contribute to a more RH-friendly environment that increases *Any* Method PP use.

Even though our three different *Effective* Method PP use starting models included eight state-level variables representing all three barrier/facilitator types, only three structural factors were significant across these models. Proportion of Delivery Hospitals that are Catholic was significant in all three, while Number of Public FP Clinics per 10,000 WINSS and Proportion of Counties with at Least One Public FP Clinic were significant in only two, and not the same two. The lack of consistency of the latter two variables was probably due to both the variation in the variables in the starting models and their relatively weak associations.

Due to this lack of consistency, the three starting models did not converge into one reduced model. Although we could have had only two reduced models, we forced a third, which included all three variables, even though one was just at significance in this particular starting model. Despite ignoring our backwards elimination protocol, the three-variable model is probably the most 'logical' reduced model, in that it included all three variables that remained associated across the three starting models.

Unfortunately, without the convergence of the three models into one, or even two final models, we ended with three final models, all three unchanged in composition from their reduced models (no variables became insignificant). Because the three-variable reduced model allowed each variable to be adjusted for the other two, its final version might be considered the preferred model.

However, we could also justify the two-variable final model with Number of Public FP Clinics per 10,000 WINSS and Proportion of Delivery Hospitals that are Catholic because it was not forced and excludes Proportion of Counties with at Least one Public FP Clinic, which had a relatively weak association (a CI that is very close to 1.0) and a perplexing result. Based on this same reasoning, we discount the model with only

Proportion of Counties and Proportion of Delivery Hospitals. Ultimately, we think the choice of an *Effective* Method PP use model (set of variables) would only be clear if this study was replicated with two major changes: 1) a data set with more states that would assure proper variation across categories; and 2) elimination of the indices and the component variables, which were not significant in multivariable modeling and was the only reason for multiple models. Without the ability to do this, we discuss below all three of the structural factors and their practice implications below.

The importance of Number of Public FP Clinics per 10,000 WINSS, the broadest of the structural facilitators, is the most straightforward, and thus perhaps the easiest to interpret. Unlike for *Any* Method PP use, for *Effective* method use, some type of clinical care is needed for all of these methods, so the finding that women in states with a medium/high (> 7) Number of Public FP Clinics per 10,000 WINSS have a higher odds of *Effective* Method PP use is easy to understand. This measure was readily available to use for this study because FP professionals think that a high level of access to FP clinics is important, and thus Guttmacher tracks it. Unfortunately, Kost et al. (2012) did not use this specific measure of family planning services in their analysis of variation in unintended pregnancy rates, so we have no comparison. But, in this era of real and threatened cuts to FP funding, especially in states with Planned Parenthood clinics, this association is both important and worrisome. RH supporters will need to advocate to maintain clinics and be vigilant to watch for drops in contraceptive use over the next few years that might be the result of the clinic closures.

Understanding the results of Proportion of Counties with One or More Public FP Clinics is not as easy as Number of Public FP Clinics per 10,000 WINSS. According to both the unadjusted and multivariable modeling results, women in states where 99-

100% of their counties had at least one public FP clinic had a lower odds of *Effective* Method PP use than women in states where fewer than 99% of counties had FP clinic. This finding goes in the opposite direction from our hypothesis. However, the finding would not be surprising to Kost, Finer and Singh (2012) who encountered the same phenomenon in their regression analysis of state differences in unintended pregnancy rates and various state-level aggregate measures. They hypothesized that either "states with higher levels of unintended pregnancy made greater efforts to expand access to these services" or "in these states, women in need of services are widely distributed throughout the states."

In our case, with a 'less than 99%' category which included only three states (Missouri, Nebraska and Rhode Island) with proportions that ranged from 26% in NE to 80% in RI and on up to 83% in MO, we offer some explanations of our own. It could be that we are actually measuring an artifact – some other factor that these three states have in common. However, if we are measuring something else, it does not appear to be a combination of any of the other variables. Unlike our original two-state 'high' category of the three-category Proportion of Delivery Hospitals that are Catholic variable, we could not find another variable in which all three of these states were in the same category.

In line with the second explanation of Kost et al. (2012), we also considered how the geography of these three states might account for this unusual result. The plains state of NE probably has a relatively sparse population in many of its 93 counties, so that the 74% of counties (n=69) without a clinic may only mean a few women must go elsewhere. RI on the other hand, is the smallest state in area and has only five counties. This means if one county doesn't have a clinic the percent of counties without a clinic

decreases to 80%, and in such a small state, no one is likely very far from a FP clinic. MO probably lies somewhere in between these two states in its urban/rural status. It has two major urban centers – St. Louis and Kansas City - with large suburban populations (St. Louis and Kansas City) surrounding them (although both have suburban populations extending into other states), and some smaller urban areas, but it also has a considerable amount of sparsely populated rural areas where relatively few women might be affected by the lack of a FP clinic. Of 115 counties, only 19 did not have a clinic.

In all three models we found an increase in the likelihood of *Effective* Method PP contraceptive use in states with a smaller proportion of delivery hospitals that are Catholic. We think it is very plausible that the proportion of delivery hospitals that are Catholic could adversely affect PP use at the state level. Likewise, that this variable has the strongest association of the three state-level variables we identified (ORs: 1.36 to 1.42) makes sense as well. We think this of all of the factors we tested, may be the one that best represents a structural barrier to access to PP contraceptive care, as we can identify multiple pathways through which Catholic healthcare obstructs access. Of the 22% of women who had a tubal ligation in this study by five months postpartum, many probably had it at the time of delivery. However, in states with a high proportion of delivery hospitals owned by Catholic health care entities, this might occur less often. As we have already mentioned, in the study time frame (2005-07) use of immediate postpartum LARC was probably minimal. However, during this time period, women's other contraceptive choices could certainly have been affected by Catholic health care.

The official guidelines for Catholic healthcare, the Bishop's Directives (United States Conference of Catholic Bishops, 2009) provide no options for promotion or provision of effective methods of contraception while women are still in the hospital,

although we know a few sterilizations do occur in Catholic hospitals (Hapenney, 2012; Stulberg, 2014). Catholic health systems that operate "public" clinics that provide prenatal, postpartum and well-baby care cannot provide any of the counseling regarding PP contraception that this study and others have found increase PP use (DePiñeres et al., 2005; Hernandez et al., 2012; Zapata et al., 2015). Lastly, what private providers (obstetrics and gynecology, family planning and pediatrics) associated with a Catholic hospital or health system can say or do in their offices after a patient is discharged from a Catholic hospital may vary, but there is, in all likelihood, some reduction in provision of contraceptive care within these offices.

6.3 **Strengths and Limitations**

To our knowledge, this is the first study that has compared postpartum contraceptive use at the national and state levels. We know of one other study that used the NSFG to look specifically at PP use and interpregnancy intervals (White, et. al, 2015), and the CDC (CDC, 2009; Zapata et al., 2015), and others have published reports on PP use using multistate and one-state (DePiñeres et al., 2005; Hernandez et al., 2012) PRAMS data. As part of this analysis, we compared and documented the two surveys' ability to accurately measure PP use by relevant characteristics and noted the differences between the two, in addition to comparing the results.

In our opinion, the NSFG has a far stronger design and methods for accurately measuring PP use, although the number of adult women we were able to identify resulted in rather limited power to detect differences across maternal demographic and behavioral characteristics. Not limiting the population to low-income women would more than double the sample size. On the other hand, our PRAMS multistate analysis

had power in numbers, but the Phase 5 questionnaire had considerable limitations in its design regarding measurement of PP contraceptive use and related maternal characteristics. In particular, the PRAMS data are extremely convoluted and inexact when it comes to identifying sexual activity (asking women to go through a long list of options and decide to check "not having sex" either as their reason for not using a BCM, or as a BCM they are using) and birth control method use whereas information on both sexual activity and contraceptive use are gathered in detail by the NSFG. PRAMS also has limited ability to identify rapid repeat pregnancies (identified only if pregnant at the time the survey was completed), while every pregnancy is identified in the NSFG, although non-live births are known to be underreported (Jones and Kost, 2007). Lastly, PRAMS has a broad time frame for measurement of PP use, whereas an NSFG researcher can choose any month postpartum.

Both of these surveys rely on self-report, but in different ways and probably with differing degrees of reliability. PRAMS asks respondents to recall phenomena about their pregnancy up to nine months after the birth, and, in most cases, all of this information is gathered via a self-administered written questionnaire, or for delayed responses a phone call. The NSFG conducts a face-to-face interview with every respondent, which incorporates a computer-assisted module for gathering sensitive information. However, respondents provide contraceptive use, sexual activity, and pregnancy information for up to four years prior to the interview although all of this is gathered in a "directed" manner using props and review techniques that have been well tested over the years (Freedman, 1988).

Traditionally, the PPV has been the expected source of information, promotion of, and a prescription for PP contraception (Speroff and Mishell, 2008). However, the

PRAMS Phase 5 questionnaire (CDC, 2017), used during the years of this study, only had a *standard* (optional) question about the PPV. And, unfortunately, only half of the states that used the *standard* method-specific contraceptive question also used the PPV question. So, although we were able to use these six states to conduct a sensitivity analysis that assessed the effect of the PPV on the multivariable results, we were unable to use the PPV variable in our multilevel analysis. And, importantly, in this sub-population the PPV was strongly associated with both *Any* and *Effective* Method PP use. Fortunately, with the PRAMS Phase 7 (2012-2015) questionnaire (CDC, 2017), the PPV question, along with the method-specific question, were no longer optional, but were *Core* (required) questions. As of the Phase 8 (2016) questionnaire (CDC, 2017), states must also ask about a discussion of a birth control method at the PPV because it too has become a *Core* question. With these additions PRAMS is now much better suited to address studies of PP contraception, including sources of information.

Fortunately for this study, the Phase 5 questionnaire had already incorporated the question about a PNC discussion of PP contraception as a *Core* question. However, because we used this refined question about PNC and placed those who reported no PNC into the category with those who reported PNC without counseling, we did not look at PNC initiation separately. Unfortunately, the NSFG, not designed to focus on pregnancy or postpartum behaviors, does not collect any information regarding specific maternal-related behaviors in the postpartum period (other than the monthly contraceptive use information), and only collects the basic PNC initiation information.

A more general weakness of this study is its "dated" time frame of 2005-2010. There is currently much focus on PP contraception generally and PP LARC use in particular, but the dated information limits our ability to contribute to the current

conversation. Provider organizations such as ACOG (2016) are now promoting immediate postpartum LARC, but in our time frame, LARC was probably not a well-known term, and PRAMS did not even have a check box for implants among its contraceptive options (the NSFG did include this option). To obtain any implant information, we had to go through the hand-written comments (typed verbatim). PRAMS did add implants to its method-specific list as of the Phase 6 questionnaire (2009-2011). Lastly, much has changed and will continue to change with an ever changing health care environment, so some of our state-level variables may be less, or perhaps more, relevant now or in the future than they were at the time of the surveys.

The multilevel analysis had five methodological limitations, some more general and others more specific in nature. First, the complex nature of the PRAMS sampling reduced our analysis options. We eventually chose GEE. Second, because it does not have more than one time point from which to control for secular changes, the multilevel analysis did not reach the level of a "true" policy evaluation. Third, the multilevel analysis was observational, and thus only association and not causation can be inferred. Fourth, with a relatively common outcome such as PP use, our measure of association, the odds ratio, is inflated, perhaps more for *Any* than *Effective* Method PP use, which is important to consider with the relatively low estimates of association. And fifth, with somewhat arbitrary category cutoffs (e.g., a Medium/High category of Public Expenditures representing $86 to $279 in FP service expenditures per WINSS), the interpretation of the associations can be muddled/uncertain.

We have discussed in detail in Appendix C the steps and decision-making involved in our choice of a dichotomous Proportion of Delivery Hospitals that are Catholic variable. And, although we could be rightly criticized for choosing the

categorization that went in the hypothesized direction in the unadjusted analysis, we could not predict how this variable would function in our multilevel, multivariable analysis.

Unfortunately, the data for the Proportion of Delivery Hospitals that are Catholic variable, which was the state-level variable most strongly associated with *Effective* Method PP use, post-dates the actual data. With the exception of a couple of states, the hospital data are from 2016, and with many hospital mergers over the past decade the proportion may have differed in 2006. Since, for the most part Catholic health care systems have grown, this might mean we overestimated the proportions for all states, or just some. If it is the latter, than the accuracy of our classification may be altered if it is the former than this would not affect the results.

Lastly, because there is relatively little information available on the sources and timing of postpartum contraceptive information and method prescription (prenatal provider, public family planning clinic, postpartum care, etc.) for low-income women, we may actually not have looked at the most appropriate factors. For example, if low-income women are more likely to obtain their PP family planning services from their prenatal providers than public family planning clinics, our focus on the number of public FP clinics or clinics per county may have missed the mark, while other state-level factors more directly related to prenatal, delivery and postpartum care may have been more appropriate. This may explain why our Catholic variable was stronger than all of the other state-level variables, as it might not only represent barriers to care at the time of the delivery, but also before and after delivery when providers who work within a Catholic system will not or cannot discuss contraception.

6.4 **Research Implications and Recommendations**

We have shown that the NSFG can be used to assess postpartum contraceptive use, and in our opinion it should be used far more often to study postpartum contraceptive use among all age groups and at different times (months) postpartum. Using the 2006-2010 data, White et al. (2015) carried out such a study focused on inter-pregnancy intervals. Combining data from the 2006-2010 and the 2011-2015 surveys would increase the power of any study, although it would diminish the ability to understand the most current situation. In addition, the NSFG could be used to study contraceptive use after pregnancy outcomes other than a live birth as Haider et al. (2014) have done among teens, although there are limitations given the NSFG's known underestimation of these other outcomes (Jones and Kost, 2007).

Of special interest, the NSFG could be an important tool to better understand the "natural history" of postpartum use, that is, to better understand its uptake (who begins to use what contraceptives, at what point in time), and to document the rapid repeat pregnancies that can't be measured well in PRAMS. To increase PP contraceptive use, we need to better understand the factors that increase its use, but to study this we need to better understand the timeline of PP use, as well as the providers and sites where women receive PP contraception.

The PRAMS surveys are a key tool for states to better understand the experiences of women in their states during pregnancy and the postpartum period. However, in this study, we clearly identified the limitations of using early PRAMS questionnaires (Phases 1-6) to measure PP contraceptive use. Fortunately, as of the PRAMS Phase 7 questionnaire (2012-2015) the method-specific contraceptive use question and the PPV became *core* questions, making this information available in many more states. The

addition of the method-specific question not only allows measurement of *Effective* Method PP use in all states, it also allows identification of the sexual activity status of all respondents, and not just those who reported they were not using a contraceptive method. However, this still falls short, as categorizing sexual activity status still requires researchers to do considerable data manipulation and make assumptions that don't assure consistency.

To make PRAMS more user friendly and accurate in measuring PP use among those at risk (sexually active), and more comparable to the NSFG, CDC and the states should consider re-designing the contraceptive use-related questions to remove 'not sexually active' from its dueling locations on both the list of reasons for not using a contraceptive method, and as an actual birth control method. The PRAMS questionnaires should ask directly about sexual activity, using a separate question from those that ask about contraceptive use. In addition, although the limitation of the extended time frame for measurement of contraceptive use (3-9 months postpartum), could not be addressed without fundamentally changing how PRAMS is conducted, after careful review, changes could be made that would improve its usefulness in understanding a participating state's PP use and the factors associated with it.

As to our state-level policy analysis, we have demonstrated that the individual-level data from PRAMS (risk/protective factors and PP use outcome) can be combined with state-level data to provide observational information about state-level factors associated with *Effective* method PP use while controlling for maternal characteristics known to be associated with PP use. Due to the lack of variation in *Any* Method PP use across the states, we would not recommend repeating the *Any* Method analysis. On the other hand, to confirm this study's findings, or to identify new barriers to or facilitators

of *Effective* Method PP use, we would recommend follow-up studies that utilize these and other state-level factors and perhaps other methods.

Of the variables that might be the focus of future multilevel research on *Effective* Method PP use, we are most interested in the Proportion of Delivery Hospitals that are Catholic. Even though the hospital information post-dates the PRAMS data, we think the results are strong enough that additional exploration is warranted. In fact, the discordance in the years of the data is one of the most important reasons to further explore the influence of Catholic hospitals; another is the recent focus on LARC.

Immediate postpartum LARC especially calls for other assessments of Catholic delivery hospitals as a structural barrier. It is clear that that for individual women a Catholic hospital would impede uptake of immediate PP LARC. But, a better understanding of how the prevalence of Catholic hospitals affects uptake at a state-level is needed. These are not health care agencies that would just do poorly at, or neglect to promote immediate PP LARC. These are health care entities that have as part of their operating directives, to neither promote, nor provide any form of contraception, other than natural family planning.

We would first recommend descriptive studies that provide more information about the variation in Catholic health care across the states that might have differing effects on *Effective* Method PP use. Because we do not know if our twelve states are representative of the range of Catholic hospitals in the other 38 states, using more contemporaneous data than used in this study, researchers should identify the proportion of delivery hospitals that are Catholic in every state.

A study of the influence of Catholic health care at the state level should also include variations on its measurement, such as the proportion of OB beds or the

proportion of deliveries that are in a Catholic institution. For this first time look at this information, we chose to use the data most readily available. However, we did obtain obstetrics bed information from the state of Missouri (personal communication), and found that the proportion of OB beds and the proportion of delivery hospitals that are Catholic are very similar, but this may not be the case in every state. Catholic out-patient care could also be studied to better understand its influence on contraceptive use.

States that have a high proportion of Catholic delivery hospitals (perhaps at the level of our Medium/High cutoff of 7%) should assess how Catholic health care is affecting access to postpartum contraception in their state, in particular, LARC. States, or reproductive health advocates should document the options offered to low-income women who choose, or must use, Catholic facilities that do not encourage or provide access to postpartum contraception. They should evaluate access to immediate PP LARC in these hospitals, as well as access to LARC at 4-5 weeks postpartum in associated hospital outpatient clinics, if immediate LARC is not available as per ACOG recommendations (2016). Just as states have addressed the Medicaid reimbursement issues for immediate PP LARC to get more provider buy-in (Batra and Bird, 2015; Kroelinger et al., 2015; Moniz et al., 2015; Rodriguez et al., 2014), these same state agencies and/or advocates may need to address access for Medicaid recipients if their states have a strong Catholic health care presence.

In two articles describing use of implementation science to assess the roll-out of immediate PP LARC via a LARC Learning Community (Kroelinger et al., 2015; Rankin et al., 2016), neither mentioned any review by the Learning Community of the effect of Catholic hospitals on a state's roll out of immediate PP LARC, so we do not know if this has been discussed. And, likewise in articles describing research related to Medicaid

efforts to assure access to immediate PP LARC, none of the articles (Batra and Bird, 2015; Kroelinger et al., 2015; Moniz et al., 2015; Rodriguez et al., 2014) mention the implications of Catholic hospitals that will never participate. Therefore, states and RH advocates must take the level of Catholic health care into account in any evaluation efforts and consider ways to serve women who otherwise will not be served in Catholic institutions.

6.5 **Conclusions**

This study provides very important information with respect to the ways the NSFG and PRAMS can contribute to the research and practice focus on postpartum contraceptive use, including immediate PP use of LARC. We have discussed additional ways the NSFG can be exploited to further our knowledge of the 'natural history' of PP use and identified ways the PRAMS survey could be improved to better measure postpartum contraceptive use. We also demonstrated an association, albeit of a relatively small magnitude, between a positive reproductive health climate in a state and *Any* Method PP use, and between public FP clinic availability (Number of Clinics per 10,000 WINSS) as well as the presence of Catholic delivery hospitals in a state (Proportion of Delivery Hospitals that are Catholic) and *Effective* Method PP use. We think further exploration of the relationship between Catholic hospitals and the uptake of PP contraception is especially important given the current push for immediate PP LARC. In this day and age of ever-changing policies, lack of support for RH issues, and a general uncertainty at the national level, tracking state-level policies and their impact becomes even more important (Mallampati et al., 2017); this study demonstrates one methodology that can be used to measure the impact.

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APPENDICES

APPENDIX A

TABLE XLV

PREVALENCE (PERCENT) OF ***ANY*** METHOD POSTPARTUM CONTRACEPTIVE USE[a,b]
BY MATERNAL DEMOGRAPHICS BY STATE
LOW INCOME, SEXUALLY ACTIVE WOMEN, 20-44 YEARS OLD, PRAMS, TWELVE STATES, 2005-2007

Variables	AR	FL	MI	MS	MO	NE	NY	NC	OR	RI	SC	WV
N[a]	2471	445	984	329	390	1432	625	776	1785	1102	1344	1321
Total Population	90.0	88.3	89.9	93.7	89.7	90.3	90.2	92.7	93.3	90.4	91.4	91.9
Age												
20-24	89.1	87.0	91.8	**92.1**	87.0	90.3	91.0	93.1	**94.4**	89.7	**91.2**	**89.4**
25-29	91.1	88.4	88.1	**92.7**	90.9	89.3	90.5	92.7	**95.6**	89.9	**95.4**	**95.8**
30+	90.9	90.5	88.0	**99.5**	94.5	91.8	88.7	91.7	**88.5**	92.1	**86.7**	**92.7**
Ethnicity/Race												
Hispanic	90.5	89.4	88.1	----	**66.0**	**93.7**	94.9	92.2	**91.2**	91.2	87.8	----
NH Black	91.3	89.9	86.0	**90.9**	**96.2**	**92.0**	91.0	93.3	**85.3**	91.7	91.2	**96.0**
NH White	89.5	86.7	90.9	**97.4**	**89.7**	**88.7**	88.2	93.4	**95.2**	91.1	92.5	**91.7**
NH Other	87.5	82.8	94.1	----		**88.1**	81.7		**90.8**	90.4	88.0	----
Education												
< HS	**87.7**	84.4	**84.4**	94.4	82.9	90.8	91.5	92.1	92.3	89.0	91.4	88.9
HS/GED	**89.1**	88.1	**90.3**	92.0	90.7	88.3	88.3	92.0	93.0	91.3	93.1	94.1
> HS	**94.0**	92.0	**94.1**	95.4	93.0	91.6	90.7	94.1	95.1	90.5	91.0	90.2
Marital Status												
Married	89.8	87.7	91.1	95.1	91.6	90.3	89.1	90.8	92.8	90.4	90.3	91.0
Not Married	90.2	88.8	89.0	92.9	88.1	90.4	90.9	94.3	93.8	90.4	92.1	92.9
Number of Live Births												
One	**85.5**	83.7	90.5	**91.0**	**87.1**	87.0	93.6	**89.0**	93.7	90.0	**89.3**	**89.7**
Two	**91.4**	92.2	87.6	**90.3**	**91.9**	93.3	90.0	**96.6**	93.7	88.6	**88.9**	**92.1**
Three	**94.4**	94.1	93.5	**100**	**83.7**	90.5	86.9	**92.7**	94.4	94.6	**95.3**	**95.5**
Four +	**88.9**	85.2	90.0	**98.1**	**96.2**	90.1	89.3	**90.5**	90.5	88.8	**96.5**	**91.8**

[a] Ns are unweighted, while percentages are based on weighted data (not shown). Blank cells are too small to be shown.
[b] **Bold type indicates the variable is significantly different across the categories.**

Appendix A (continued)

TABLE XLVI

PREVALENCE (PERCENT) OF ***EFFECTIVE*** METHOD POSTPARTUM CONTRACEPTIVE USE[a,b]
BY MATERNAL DEMOGRAPHICS BY STATE
LOW INCOME, SEXUALLY ACTIVE WOMEN, 20-44 YEARS OLD, PRAMS FROM TWELVE STATES, 2005-2007

Variables	AR	FL	MI	MS	MO	NE	NY	NC	OR	RI	SC	WV
N	2471	445	984	329	390	1432	625	776	1785	1102	1344	1321
Total Population	72.3	64.8	69.3	83.3	76.7	71.6	66.5	76.1	73.1	71.9	77.8	75.0
Age												
20-24	72.0	64.1	71.1	**78.6**	73.0	74.1	**73.5**	**79.6**	74.2	**77.4**	79.5	73.8
25-29	72.9	66.7	69.1	**82.6**	77.6	69.6	**63.7**	**68.4**	74.1	**71.6**	79.8	75.5
30+	72.4	64.2	65.4	**96.6**	85.3	69.2	**59.1**	**78.4**	69.8	**62.9**	70.8	77.4
Ethnicity/Race												
Hispanic	**56.5**	56.5	74.5	75.0	64.8	71.7	65.4	**66.1**	**66.9**	74.6	62.1	60.5
NH Black	**78.3**	62.3	72.1	83.4	87.5	75.6	67.1	**79.8**	**71.4**	69.2	80.4	82.9
NH White	**74.1**	73.1	67.7	81.9	75.1	71.3	68.0	**79.7**	**77.6**	71.3	78.7	74.4
NH Other	**57.1**	80.7	58.6	100	89.4	68.3	56.3	**72.2**	**67.3**	58.4	71.8	43.8
Education												
< HS	68.2	66.6	68.0	79.0	76.0	71.2	66.4	75.4	70.9	**74.0**	75.2	**76.3**
HS/GED	72.7	64.5	71.4	84.8	78.7	71.5	70.5	75.0	77.3	**75.8**	81.8	**78.1**
> HS	76.7	64.3	67.1	84.2	72.8	71.4	64.7	78.0	69.9	**65.7**	77.0	**68.6**
Marital Status												
Married	70.0	60.3	**62.8**	79.7	71.7	**66.5**	**58.0**	**72.0**	**67.1**	**67.2**	**71.6**	72.4
Not Married	74.7	68.6	**73.5**	85.5	80.8	**76.8**	**71.3**	**79.65**	**78.6**	**74.3**	**81.8**	77.5
Number of Live Births												
One	**67.4**	**50.7**	**69.5**	**69.7**	72.1	**65.2**	67.7	69.7	**65.0**	70.8	77.1	**67.4**
Two	**70.8**	**71.4**	**64.4**	**84.3**	78.7	**76.9**	68.5	79.1	**77.8**	73.1	73.2	**75.3**
Three	**81.1**	**78.7**	**79.5**	**95.9**	74.1	**73.6**	58.6	75.6	**75.5**	72.6	84.6	**82.0**
Four +	**72.6**	**69.6**	**67.9**	**91.3**	85.2	**69.6**	70.7	84.1	**76.0**	72.3	79.5	**83.2**

[a] Ns are unweighted, while percentages are based on weighted data (not shown). Blank cells are too small to be shown.
[b] **Bold type indicates the variable is significantly different across the categories.**

Appendix A (continued)

TABLE XLVII

COMPARISON OF PERCENT DISTRIBUTION OF MATERNAL DEMOGRAPHICS
LOW INCOME, SEXUALLY ACTIVE WOMEN, 20-44 YEARS OLD
PRAMS, SIX STATES, AND PRAMS, TWELVE STATES, 2005-2007

	PRAMS Six States			PRAMS Twelve States		
Variables	N[a]	Percent[a]	95% CI	N[a]	Percent[a]	95% CI
Age						
20-24	3467	47.6	46.57-49.8	6012	47.0	45.5-48.5
25-29	2244	31.3	29.3-33.3	4011	31.1	29.7-32.5
30+	1542	21.1	19.4-23.0	2981	21.9	20.7-23.2
Ethnicity/Race						
Hispanic	929	17.8	16.0-19.7	2382	20.6	19.4-22.0
NH Black	4401	21.3	19.6-23.2	3094	20.7	19.6-21.9
NH White	1604	58.5	56.3-60.7	6329	55.6	54.1-57.1
NH Other	162	2.4	1.8-3.2	1012	3.0	2.6-3.6
Education						
< HS	1698	27.4	25.4-29.5	3430	28.4	27.0-29.8
HS/GED	3139	40.9	38.8-43.0	5313	40.7	39.2-42.2
> HS	2308	31.7	29.7-33.8	4117	30.9	29.6-32.3
Marital Status						
Married	3290	41.7	39.6-43.8	5883	43.1	41.6-44.6
Not Married	3942	58.3	56.2-60.4	7099	56.9	55.4-58.4
Number of Live Births						
One	2475	30.4	28.5-32.4	4211	31.1	29.7-32.5
Two	2221	33.1	31.0-35.1	3998	32.6	31.2-34.0
Three	1460	20.5	18.8-22.3	2656	20.7	19.5-21.9
Four +	1051	16.0	14.4-17.7	2084	15.7	14.6-16.8

[a] Ns are unweighted, while percentages are based on weighted data.

Appendix B

TABLE XLVIII

ODDS RATIOS[a] AND P-VALUES FROM UNADJUSTED ANALYSES
MULTI-CATEGORY STATE-LEVEL VARIABLES IN MULTILEVEL MODELS[b]
ANY AND ***EFFECTIVE*** METHOD POSTPARTUM CONTRACEPTIVE USE
LOW INCOME, SEXUALLY ACTIVE WOMEN, 20-44 YEARS OLD
PRAMS, TWELVE STATES, 2005-2007

		***Any* Method PP Use**		***Effective* Method PP Use**	
Variables		OR[b]	p-value	OR[b]	p-value
Structural Barriers and Facilitators					
Number of Public FP Clinics per 10,000 WINSS, 3 Categories					
Low	(4.6-6.3)	0.89	.4584	**0.73**	**0.0001**
Medium	(7.2-7.9)	Ref		Ref	
High	(11.06-17.75)	0.92	.6067	0.91	0.3379
Low	(4.6-6.3)	Ref		Ref	
High	(11.06-17.75)	1.04	.7158	**1.26**	**0.0475**
Original - Proportion of Delivery Hospitals that are Catholic, 3 Categories					
Low	**(< 8%)**	0.98	0.9048	1.21	0.0521
Medium	**(8-17)**	Ref		Ref	
High	(> 17%)	1.23	0.1361	**1.31**	**0.0017**
Low	**(<8)**	Ref		Ref	
High	(> 17%)	1.25	0.1743	1.09	0.3076
Alternate - Proportion of Delivery Hospitals that are Catholic, 3 Categories					
Low	**(< 7%)**	1.18	0.2642	**1.48**	**0.0000**
Medium	**(7-17)**	Ref		Ref	
High	(> 17%)	**1.29**	**0.0495**	**1.34**	**0.0001**
Low	(< 7)	0.91	0.5952	1.10	0.1277
High	(> 17%)	Ref		Ref	
Religious Refusal Policies (Contraception & Sterilization), 3 Categories					
None		1.25	0.0517	1.16	0.1438
Either Refusal		Ref		Ref	
Both Refusals		1.12	0.3357	1.26	0.1055
None		Ref		Ref	
Both Refusals		0.89	0.2764	1.09	0.5018

Appendix B (continued)

TABLE XLVIII (continued)
ODDS RATIOS[a] AND P-VALUES FROM UNADJUSTED ANALYSES
MULTI-CATEGORY STATE-LEVEL VARIABLES IN MULTILEVEL MODELS[b]
ANY AND ***EFFECTIVE*** METHOD POSTPARTUM CONTRACEPTIVE USE
LOW INCOME, SEXUALLY ACTIVE WOMEN, 20-44 YEARS OLD
PRAMS, TWELVE STATES, 2005-2007

	***Any* Method PP Use**		***Effective* Method PP Use**	
Variables	OR[b]	p-value	OR[b]	p-value
Personal (Acceptability and Attitude) Barriers and Facilitators				
Sex Education Policies, 4 Categories				
BCM Req. + Mandate	1.06	0.7881	**1.41**	**0.0001**
BCM Requirement	1.24	0.1256	**1.31**	**0.0032**
Mandate Only	0.97	0.8388	1.08	0.5459
None	Ref		Ref	
Sex Education Policies, 3 Categories (Note: Revised based on 4-category results above.)				
BCM Req. + Mandate	0.86	0.4895	1.07	0.3115
BCM Requirement Only	Ref		Ref	
Mandate Only or None	0.80	0.0906	**0.78**	**0.0018**
***Comprehensive* Index of RH-Friendly Policies, 3 Categories**				
Low (LE 10)	**0.76**	**0.0091**	**0.71**	**0.0000**
Medium (30)	Ref		Ref	
High (GE 40)	0.98	0.8814	0.84	0.1459
Low (LE 10)	Ref		Ref	
High (GE 40)	1.29	0.0648	1.20	0.1388
***Access-specific* Index of RH-Friendly Policies, 3 Categories**				
Low (LE 10)	0.75	0.0781	**0.72**	**0.0000**
Medium (20)	Ref		Ref	
High (GE 30)	0.96	0.8129	0.86	0.2213
Low (LE 10)	Ref		Ref	
High (GE 30)	**1.28**	**.0326**	1.20	0.1615
***Study-specific* Index of RH Friendly Policies, 3 Categories**				
Low (< 0)	**0.74**	**0.0052**	**0.73**	**0.0000**
Medium (0-10)	Ref		Ref	
High (30)	0.95	0.7008	0.91	0.3721
Low (< 0)	Ref		Ref	
High (30)	**1.29**	**.0471**	**1.25**	**0.0456**

Appendix B (continued)

TABLE XLVIII (continued)
ODDS RATIOS[a] AND P-VALUES FROM UNADJUSTED ANALYSES
MULTI-CATEGORY STATE-LEVEL VARIABLES IN MULTILEVEL MODELS[b]
ANY AND ***EFFECTIVE*** METHOD POSTPARTUM CONTRACEPTIVE USE
LOW INCOME, SEXUALLY ACTIVE WOMEN, 20-44 YEARS OLD
PRAMS, TWELVE STATES, 2005-2007

		***Any* Method PP Use**		***Effective* Method PP Use**	
Variables		OR[b]	p-value	OR[b]	p-value
Financial Barriers and Facilitators					
Public Expenditures on FP Services per WINSS, 3 Categories					
Low	(51.1-69.3)	0.81	0.0870	**0.68**	**0.0001**
Medium	(86.5-100)	Ref		Ref	
High	(101 +)	1.03	0.8145	0.86	0.1769
Low	(51.1-69.3)	Ref		Ref	
High	**(101 +)**	**1.27**	**0.0310**	**1.26**	**0.0218**

[a] The OR and 95% CI are from a separate multilevel model with only that state-level variable, but all individual-level variables in the final main *Any* Method (Pregnancy Intention and PNC Talk BC) or *Effective* Method Ethnicity/race, marital status, number of live births, pregnancy intention, PNC Talk BC, Well-baby Visit) PP use multivariable model.

[b] **Bold are significant at p < .05**
[c] This OR was in the opposite direction from that hypothesized.

Appendix C

A Detailed Examination of the Multi-Category Versions of the Proportion of Delivery Hospitals that are Catholic Variable

We hypothesized that women who lived in states with a smaller proportion of delivery hospitals that are Catholic would be more likely to use PP contraception than women in states with a larger proportion. As noted in 4.3.2, because we found two equally justified options for the cutoff between the low and medium categories (see Table XV), we created two three-category versions of the Proportion of Delivery Hospitals that are Catholic with different cutoffs ('Original' and 'Alternate'). As we did for all of the other multi-category variables, to identify categories that were similar with respect to their odds of PP contraceptive use and could be combined, we put both versions separately into multilevel models of both outcomes, although we focused on the *Effective* Method PP use results.

With 'Medium' as the referent, we found discordant results that supported and refuted our hypothesis. As seen in Table XLVIII, Appendix B, for both versions, the ORs comparing *Effective* Method PP use between the 'Low' and 'Medium' (referent) categories identified an increased odds of *Effective* Method PP use among women in states with a 'Low' proportion of Catholic hospitals compared to women in states with a 'Medium' proportion, supporting our hypothesis, although the OR was only marginally significant for the 'Original' version. However, when comparing *Effective* Method PP use between the 'High' and 'Medium' (referent) categories, for both versions we also found a significantly increased odds of *Effective* Method PP use among women living in states with a 'High' proportion of Catholic delivery hospitals, thus refuting our hypothesis.

Appendix C (continued)

Given the contradictory directions of these associations -- women in states with both low and high proportions of Catholic hospitals had a higher odds of *Effective* Method PP use than women in states in the mid-range -- we explored the possibility that the 'High' category, with only two states, might have in common other factors that increase the use of *Effective* Method PP use, and this is what we were erroneously measuring. These could be factors that we have measured in one of our other variables, or something we had not measured. In our review of the two states, Missouri and Oregon were in the same category for several other state-level variables. In this study, with a relatively small number of states, misrepresentation of a state-level variable category was always a risk, with a two-state category this variable was particularly at risk.

Given both the contradictory results from the three-category versions, and the still unanswered questions about the low to medium cutoff, we created three dichotomous versions of the variable. As seen in Figure 9 below, one maintained the original two-state 'High' category, while the other two did not.

Figure 9. Transformation of Catholic hospital variables from three categories to two.

Variable Name	Original Categorization		Variable Name	New Categorization
Proportion of Delivery Hospitals that are Catholic	Low: < 8% Medium: 8-17% High: > 17%	→	Version 1:	Low/Medium: LE 17 High: > 17
Alternate Proportion of Delivery Hospitals that are Catholic	Low: < 7% Medium: 7-17% High: > 17%	→	Version 2:	Low: < 8 Medium/High: 8 +
		→	Version 3:	Low: < 7 Medium/High: 7 +

Appendix C (continued)

Version 1 combined the 'Low' and 'Medium' categories, even though they differed significantly in both the 'Original' and 'Alternate' three-category variables, and left the two-state 'High' category stand on its own (Figure 9). Version 2 and Version 3 addressed the possible "misrepresentation" of the high category by combining the 'Medium' and 'High' categories even though these categories also had significant differences in *Effective* Method PP use. To address the question of the cutoff for the 'Low' to 'Medium' categories, Version 2 used the higher cutoff for the 'Low' category (<8%), which is the same as the 'Original' three-category variable and Version 3 used the lower (< 7%) cutoff, matching that of the 'Alternate' three-category variable. The state and population distribution for these three dichotomous versions are shown in Table XLIX below.

Our next step was to put all three dichotomous versions separately into multilevel models of both *Any* and *Effective* Method PP use. The results of these analyses are seen

TABLE XLIX
DISTRIBUTION OF STATES AND RESPONDENTS BY CATEGORY
POTENTIAL DICHOTOMOUS CATHOLIC HOSPITAL VARIABLES
LOW INCOME, SEXUALLY ACTIVE WOMEN, 20-44 YEARS OLD
PRAMS, TWELVE STATES, 2005-2007

Variable & Categorization		# of States	States	# Women	Weighted Percent
Version 1 - Proportion of Delivery Hospitals that are Catholic					
Low/Med	(<= 17%)	10	AR/FL/MI/MS/NE/NY/NC/RI/SC/WV	10829	**86.97**
High	(> 17%)	2	MO/OR	2175	**13.03**
Version 2 - Proportion of Delivery Hospitals that are Catholic					
Low	(< 8)	5	FL/MS/NC/RI/SC	3996	**38.32**
Med/High	(8+)	7	AR/MI/MO/NE/NY/OR/WV	9008	**61.68**
Version 3 - Proportion of Delivery Hospitals that are Catholic					
Low	(< 7)	4	MS/NC/RI/SC	3551	**27.66**
Med/High	(7+)	8	AR/FL/MI/MO/NE/NY/OR/WV	9453	**72.34**

Appendix C (continued)

in Table L below. Versions 1 and 3 were associated with *Effective* Method PP use. However, Version 1 like the three-category versions, had an OR in the opposite direction than hypothesized, indicating women in states with a higher proportion of Catholic delivery hospitals had a greater odds of PP use than women in states with a lower proportion of Catholic delivery hospitals. Version 3 had the largest and most significant OR (OR: 1.41; CI: 1.24-1.60), indicating a greater odds of *Effective* Method PP use for women in states with a 'Low' proportion of Catholic delivery hospitals than those in states with a 'Medium/High' proportion, as we hypothesized (Table XXXV). Based on these findings we chose to use Version 3 for our multilevel analysis.

TABLE L

ODDS RATIOS[a] AND CONFIDENCE INTERVALS FROM UNADJUSTED ANALYSES DICHOTOMOUS CATHOLIC HOSPTIAL VARIABLES IN MULTILEVEL MODELS[b]
ANY AND ***EFFECTIVE*** METHOD POSTPARTUM CONTRACEPTIVE USE
LOW INCOME, SEXUALLY ACTIVE WOMEN, 20-44 YEARS OLD
PRAMS, TWELVE STATES, 2005-2007

		***Any Method* Use**		***Effective Method* Use**	
Variables		OR[a]	95% CI[a]	OR[a]	95% CI[a]
Version 1 - Proportion of Delivery Hospitals that are Catholic					
Low/Med	(<= 17%)	0.81[c]	0.63-1.05	**0.82**[c]	**0.70-0.95**
High	(> 17%)	Ref		Ref	
Version 2 - Proportion of Delivery Hospitals that are Catholic					
Low	**(< 8%)**	0.94	0.72-1.23	1.14	0.95-1.36
Med/High	(8+%)	Ref		Ref	
Version 3 - Proportion of Delivery Hospitals that are Catholic					
Low	**(< 7%)**	1.12	0.84-1.50	**1.41**	**1.24-1.60**
Med/High	(7+%)	Ref		Ref	

[a] The OR and 95% CI are from a model that included all individual-level variables in the final main *Any* Method (Pregnancy Intention and PNC Talk BC) or *Effective* Method (Ethnicity/race, marital status, number of live births, pregnancy intention, PNC Talk BC, Well-baby Visit) PP use multivariable model.

[b] **Bold are significant at p < .05.**

[c] This OR was in the opposite direction from that hypothesized.

APPENDIX D

TABLE LI

PEARSON'S[a] CORRELATION COEFFICIENTS[b] FOR DICHOTOMOUS STATE-LEVEL VARIABLES
PRAMS, TWELVE STATES, 2005-2007 AND STATE-LEVEL VARIABLES FROM VARIOUS SOURCES

State-level Variables	# Public FP Clinics per WINSS	% Counties With 1 + FP Clinic	% Delivery Hospitals Catholic	Religious Refusals Policy	Medicaid FP Waiver	Public $ on FP per WINSS	Sex Education Policies	*Compre-hensive* Index	*Study-specific* Index
Number of Public FP Clinics per WINSS	**1.0**	0.186	0.143	-0.467	0.431	**0.507**	***0.640***	0.332	0.015[b]
Proportion of Counties with 1+ FP Clinics		**1.0**	-0.125	-0.064	0.241	***0.615***	-0.058	0.059	-0.374
Proportion of Delivery Hospitals Catholic			**1.0**	0.041	0.389	-0.095	0.285	0.424	0.304
Religious Refusals Policy				**1.0**	-0.105	0.002[b]	0.052	0.243	0.464
Medicaid FP Waiver					**1.0**	0.427	0.132	0.270	-0.084
Public $ on FP Services per WINSS						**1.0**	0.282	0.436	0.126
Sex Education Policies							**1.0**	**0.805**	***0.637***
Comprehensive Index								**1.0**	**0.791**
Study-specific Index									**1.0**

[a] When Pearson's Correlation is run on two dichotomous variables, it becomes a Phi coefficient as is appropriate for dichotomous variables.
[b] These coefficients are not statistically significant at $p < .05$. All other coefficients are statistically significant at $p < .001$.

APPENDIX E

TABLE LII

MULTILEVEL, MULTIVARIABLE LOGISTIC REGRESSION MODELING
ODDS RATIOS FOR INDIVIDUAL-LEVEL VARIABLES
EFFECTIVE METHOD POSTPARTUM CONTRACEPTIVE USE
LOW INCOME, SEXUALLY ACTIVE WOMEN, 20-44 YEARS OLD
PRAMS, TWELVE STATES, 2005-2007

Part A: Models 1 & 1a	**Model 1** Variables Significant at p < .15 + *Comprehensive* Index No Index Components		**Model 1a** Variables Significant at p < .05 in Model 1 Included	
Individual-level Variables	**OR[a]**	**95% CI**	**OR[a]**	**95% CI**
Ethnicity Race				
Hispanic	**0.69**	**0.58-0.82**	**0.69**	**0.58-0.82**
NH Black	0.88	0.66-1.16	0.87	0.66-1.16
NH White	*Ref*		*Ref*	
NH Other	0.78	0.57-1.08	0.79	0.57-1.08
Marital Status				
Married	*Ref*		*Ref*	
Not Married	**1.52**	**1.38-1.66**	**1.52**	**1.38-1.66**
Number of Live Births				
One	**0.74**	**0.56-0.98**	**0.74**	**0.55-0.98**
Two	*Ref*		*Ref*	
Three	1.28	0.97-1.69	1.28	0.98-1.69
Four +	1.07	0.81-1.41	1.07	0.81-1.42
Pregnancy Intention				
Intended	**0.60**	**0.52-0.69**	**0.60**	**0.52-0.70**
Mistimed	*Ref*		*Ref*	
Unwanted	**1.28**	**1.02-1.59**	**1.27**	**1.02-1.58**
PNC Talk Birth Control				
Yes	**1.77**	**1.49-2.10**	**1.78**	**1.50-2.11**
No	*Ref*		*Ref*	
Well-Baby Visit				
Yes	**1.95**	**1.14-3.33**	**1.95**	**1.14-3.35**
No	*Ref*		*Ref*	

APPENDIX E (continued)

TABLE LII (continued)
MULTILEVEL, MULTIVARIABLE LOGISTIC REGRESSION MODELING
EFFECTIVE METHOD POSTPARTUM CONTRACEPTIVE USE
ODDS RATIOS FOR INDIVIDUAL-LEVEL VARIABLES[a,b]
LOW INCOME, SEXUALLY ACTIVE WOMEN, 20-44 YEARS OLD
PRAMS, TWELVE STATES, 2005-2007

Part B: Models 2 & 2a	**Model 2** Variables Significant at p < .15 + *Study-specific* Index No Index Components		**Model 2a** Variables Significant at p < .05 in Model 2 Included	
Individual-level Variables	**OR[a]**	**95% CI**	**OR[a]**	**95% CI**
Ethnicity Race				
Hispanic	**0.69**	**0.58-0.81**	**0.69**	**0.57-0.83**
NH Black	0.88	0.67-1.16	0.87	0.65-1.16
NH White	*Ref*		*Ref*	
NH Other	0.78	0.57-1.08	0.79	0.58-1.08
Marital Status				
Married	*Ref*		*Ref*	
Not Married	**1.51**	**1.38-1.66**	**1.52**	**1.38-1.67**
Number of Live Births				
One	**0.74**	**0.56-0.98**	**0.74**	**0.55-0.98**
Two	*Ref*		*Ref*	
Three	1.28	0.97-1.69	1.28	0.98-1.69
Four +	1.07	0.81-1.41	1.08	0.82-1.42
Pregnancy Intention				
Intended	**0.60**	**0.52-0.69**	**0.60**	**0.52-0.70**
Mistimed	*Ref*		*Ref*	
Unwanted	**1.28**	**1.02-1.59**	**1.27**	**1.02-1.58**
PNC Talk Birth Control				
Yes	**1.77**	**1.49-2.10**	**1.77**	**1.49-2.10**
No	*Ref*		*Ref*	
Well-Baby Visit				
Yes	**1.95**	**1.14-3.32**	**1.96**	**1.14-3.37**
No	*Ref*		*Ref*	

APPENDIX E (continued)

TABLE LII (continued)
MULTILEVEL, MULTIVARIABLE LOGISTIC REGRESSION MODELING
EFFECTIVE METHOD POSTPARTUM CONTRACEPTIVE USE
ODDS RATIOS FOR INDIVIDUAL-LEVEL VARIABLES
LOW INCOME, SEXUALLY ACTIVE WOMEN, 20-44 YEARS OLD
PRAMS, TWELVE STATES, 2005-2007

Part C: Models 3 & 3a	**Model 3** Variables Significant at p < .15 + *Comprehensive* Index		**Model 3a** Variables Significant at p < .05 in Model 3 Included	
Individual-level Variables	**OR[a]**	**95% CI**	**OR[a]**	**95% CI**
Ethnicity Race				
Hispanic	**0.70**	**0.57-0.85**	**0.67**	**0.56-0.81**
NH Black	0.88	0.67-1.16	0.88	0.65-1.18
NH White	*Ref*		*Ref*	
NH Other	0.79	0.57-1.10	0.78	0.57-1.08
Marital Status				
Married	*Ref*		*Ref*	
Not Married	**1.51**	**1.38-1.66**	**1.51**	**1.37-1.66**
Number of Live Births				
One	**0.74**	**0.56-0.98**	**0.74**	**0.55-0.98**
Two	*Ref*		*Ref*	
Three	1.28	0.97-1.69	1.29	0.98-1.69
Four +	1.07	0.81-1.41	1.07	0.81-1.40
Pregnancy Intention				
Intended	**0.60**	**0.52-0.69**	**0.60**	**0.52-0.70**
Mistimed	*Ref*		*Ref*	
Unwanted	**1.27**	**1.02-1.59**	**1.26**	**1.01-1.57**
PNC Talk Birth Control				
Yes	**1.77**	**1.49-2.10**	**1.78**	**1.50-2.11**
No	*Ref*		*Ref*	
Well-Baby Visit				
Yes	**1.95**	**1.14-3.33**	**1.94**	**1.13-3.31**
No	*Ref*		*Ref*	

[a] **Bold are significant at p < .05.**
[b] See results of state-level variables included in models in Table XLII.

APPENDIX F

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Scientific Publications:

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