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Prenatal and Postpartum Home Visits and Postpartum Contraceptive Use: an analysis of PRAMS data

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By

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B.S., Emory University, 2014

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Abstract

Prenatal and Postpartum Home Visits and Postpartum Contraceptive Use: an analysis of PRAMS data

By Sydney Archer

Introduction: The postpartum period is a time of unmet contraceptive need for many women. Current literature suggests that home visits during pregnancy or after delivery can increase postpartum contraceptive use and decrease barriers to accessing postpartum care and contraception. In the United States, home visitation programs are funded through a mixture of government, private, and nonprofit sources. While a focus of home visitation programs is improving maternal health outcomes, few programs include contraceptive counseling and even fewer provide methods for postpartum contraception in the home. This study aims to investigate the association between prenatal or postpartum home visits and postpartum contraceptive use using a large, nationally representative sample of women.

Materials and Methods: We conducted a secondary cross-sectional analysis using weighted data from the 2012-2015 Phase 7 Pregnancy Risk Assessment and Monitoring Systems Core and Standard Questionnaires. Data were obtained for 141,296 mothers and weighted descriptive statistics and multivariate logistic regression models were used to estimate the association between having a prenatal or postpartum home visit and self-reported postpartum contraceptive use.

Results: Of the 141,296 women in our data set, approximately 17% of pregnant or postpartum women received home visits and 80% of women used postpartum contraception. After controlling for sociodemographic, reproductive-related, and health-related factors, women who received prenatal or postpartum home visits are more likely to use contraception postpartum (adjusted odds ratio 1.077, 95% CI 1.026-1.142, $p=0.01$). Nonwhite women, women with less than a high school education, women with income <$15,000/year, women who received inadequate prenatal care, and those who experienced partner abuse or multiple stressors during pregnancy were statistically less likely ($p<0.05$) to use postpartum contraception in adjusted analyses.

Conclusion: Home visits during pregnancy or after delivery were associated with increased postpartum contraceptive use. Given the benefits of appropriate inter-pregnancy intervals to both mother and baby, home visitation programs could be further strengthened by adding contraceptive counseling and offering a variety of postpartum contraceptive methods in the home, especially to women who are nonwhite, of low socioeconomic status or education level, do not receive adequate prenatal care, or who have multiple stressors during pregnancy.

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Chapter I: Introduction

Women in the United States face many barriers to accessing contraception. Socioeconomic and health systems barriers may disproportionately affect disadvantaged women. Several studies to identify barriers to accessing contraception have been conducted in a variety of populations. Sable and Libbus surveyed low-income women about their beliefs concerning contraceptive acquisition and use, and found cost, need for an annual exam, lack of time, and transportation to be barriers to contraceptive use [1]. In a survey of low-income women in Los Angeles, Radecki and Bernstein found lack of health insurance to be a major barrier to accessing contraception [2]. Frost, Singh, and Finer surveyed a nationally representative sample of women at risk of unintended pregnancy on their contraceptive use patterns over a year. They found some women at risk of unintended pregnancy stopped using a contraceptive method because they had problems accessing or using contraception, difficulty paying for it, or did not have time for a medical visit [3]. In a survey of women at risk of unintended pregnancy, Silverman, Torres, and Forrest identified quality of care, cost, lack of education about contraceptives, and insurance status as barriers to accessing contraceptive services [4]. Sable, Libbus, and Chiu sampled women in the Missouri area on barriers to uptake and use of contraception. Black women and women without insurance specifically cited transportation to health centers as a barrier to contraceptive use [5]. Clearly, cost, insurance status, and ability to physically access the health care system have the potential to influence a woman's ability to obtain contraception.

It is challenging enough for certain women to obtain contraception when they are trying to prevent pregnancy. In the postpartum period, it can be even more difficult to obtain contraception while coordinating the challenges that come with motherhood. The American College of Obstetricians and Gynecologists (ACOG) report as many as 40% of women do not even attend a postpartum visit, with even lower attendance among women with low resources [6]. In a 24-month long cohort study of postpartum women in Texas, Potter et al., identified explicit financial and health systems barriers to receiving preferred methods of contraception. Women facing barriers to accessing their preferred method were more likely to be younger, single, have two children, want no more children, and be born in the US than women who did not report a barrier [7]. In a subgroup analysis of postpartum women who received an educational long-acting reversible contraception (LARC) script conducted by Zerden et al., women who were interested in using LARC, but did not receive a LARC method, reported financial concerns, missing their postpartum visits, and being told they needed to come back for another visit, as reasons for non-use [8]. Henderson et al. conducted a qualitative study of postpartum patients to examine perceptions of low-income women with respect to barriers to postpartum care, as well as preferences for timing and location of the visits and receipt of contraception. Most women desired a visit earlier than 6 weeks. Some women mentioned home visits as an option that could reduce their barriers to care [9]. Simmons, Edelman, Li, Yanit, and Jensen conducted a randomized controlled trial of low-income postpartum women who desired LARC, where the intervention group received telephone contact including contraceptive education, facilitation of

insurance coverage, and aide finding childcare, transportation, and appointment scheduling. Despite the intervention, they found no difference in LARC use among women who received the intervention and those who did not. A large proportion of the women in the intervention group said they were too busy to come to the doctor's office even with childcare and transportation arranged [10]. In order to increase the number of women who receive comprehensive postpartum care, including contraceptive counseling, barriers to receiving postpartum care must be reduced.

Even when women have the time, energy, and resources to attend their postpartum visits, it is unclear whether each patient receives adequate postpartum contraceptive counseling. Coleman-Minahan, Aiken, and Potter conducted a prospective cohort study of women in Texas and found prenatal and postpartum contraceptive counseling to be infrequent and vary by sociodemographics. [11]. Postpartum education about contraceptive use varies widely with respect to timing, location, and intensity across the United States and the world [12]. ACOG has recently redefined what should be addressed in a comprehensive postpartum visit, including mood and emotional well-being; infant care and feeding; sexuality, contraception, and birth spacing; sleep and fatigue; physical recovery from birth; chronic disease management; and health maintenance [6]. It is difficult to imagine all these topics can be adequately covered in one short visit; therefore, ACOG recommends postpartum care to be an ongoing process [6]. Providers should be encouraged to incorporate ACOG's

new recommendations as well as follow evidence-based practices for contraceptive counseling.

Some researchers are interested in alternative models of providing evidence-based postpartum care and postpartum contraception. In a review done by Cheng, Fowles, and Walker, the authors reviewed postpartum care practices from around the globe. Home visits conducted by health care professionals are provided in all northern and western European countries [13]. Postpartum care in the Netherlands may include a one-week home care program as well as care for children, mothers, and even housework, while postpartum care in Norway can be delivered in maternity centers where mothers and newborns are taken care of by health care professionals [13]. In the United States, home visitation programs vary widely by state, but have shown promise in improving postpartum care, contraceptive use, and maternal and neonatal outcomes. The Health Resources & Services Administration's Maternal and Child Health Bureau runs the Maternal, Infant, and Early Childhood Home Visiting (MIECHV) programs. These are government funded evidence-based programs designed to improve maternal and child health, prevent child abuse and neglect, encourage positive parenting, and promote child development and school readiness through regular planned home visits from health, social service, and child development professionals [14]. Each MIECHV program must be supported by evidence which is reviewed by the Home Visiting Evidence of Effectiveness (HomVEE). According to the Home Visiting Evidence of Effectiveness Review: Executive Summary, of the 18 approved home visitation programs, 3 programs did not measure maternal health

outcomes, 11 found favorable maternal health outcomes, and 6 programs did not find favorable or unfavorable maternal health outcomes [15]. A few programs demonstrated positive effects of home visitation programs on decreasing rapid repeat births; however, the majority of programs that measured maternal health outcomes measured mental health indicators such maternal depression, the parenting stress index, and maternal substance use [14]. Data on home visitation programs outside of MIECHV approved curricula are more difficult to obtain. A 7-year follow-up from a randomized controlled trial of women who received home visits by nurses during and after pregnancy through the Nurse-Family Partnership (NFP), conducted by Olds et al., found women who had home nurse visits had longer interpregnancy intervals, fewer cumulative subsequent births per year, and longer relationships with current partners, as well as reduced their use of welfare and food stamps [16]. Shah and Austin performed a cross-sectional analysis of 2007-2008 PRAMS data from Virginia and found women who received a home visit during pregnancy were 87.5% less likely to have a low birth weight infant, 4.5 times more likely to initiate breastfeeding, and 39 times more likely to use contraceptives postpartum [17]. Melnick et al. conducted a randomized controlled trial of home-based hormonal contraceptive dispensing for women at risk of unintended pregnancy and found women who were able to receive hormonal contraception in the home had fewer days not covered by effective contraception during the months following birth [18]. A small pilot randomized controlled trial conducted by Uhm, Pope, Schmidt, Bazella, and Perriera randomized postpartum women to office or home insertion of an etonogestrel implant. They found home insertion of implants to be more time

efficient and equally safe as office insertion of implants. The participants reported a preference for home insertion visits and women who received a home visit for implant insertion trended toward increased implant uptake [19]. Among women with a drug or alcohol problem, home visits decreased failure to use postpartum contraception [20]. Teens who received postpartum home visits by nurse-midwives showed reduced adverse neonatal events and improved contraceptive outcomes [21]. Jacob-Files et al. explored public health nurses' perceptions about home-based contraceptive dispensing becoming a routine part of public health nurse practice. They found, overall, nurses believed dispensing of hormonal contraceptives in the home was safe and in their scope of practice with the right training and support [22].

Many barriers to accessing adequate postpartum care and contraception have been identified. Home visitation programs show promise in addressing some of these barriers. Although several in-depth studies have been conducted on a small scale or in a certain population, data are lacking for the United States as a whole. This study aims to evaluate the relationship between receiving a prenatal or postpartum home visit and postpartum contraceptive use, to add to the current literature.

Chapter II: Manuscript

Prenatal and Postpartum Home Visits and Postpartum Contraceptive Use: an analysis of PRAMS data

Sydney Archer, BS, Kristin M. Wall, PhD, Melissa Kottke, MD MPH MBA

Abstract

Introduction: The postpartum period is a time of unmet contraceptive need for many women. Current literature suggests that home visits during pregnancy or after delivery can increase postpartum contraceptive use and decrease barriers to accessing postpartum care and contraception. In the United States, home visitation programs are funded through a mixture of government, private, and nonprofit sources. While a focus of home visitation programs is improving maternal health outcomes, few programs include contraceptive counseling and even fewer provide methods for postpartum contraception in the home. This study aims to investigate the association between prenatal or postpartum home visits and postpartum contraceptive use using a large, nationally representative sample of women. Materials and Methods: We conducted a secondary cross-sectional analysis using weighted data from the 2012-2015 Phase 7 Pregnancy Risk Assessment and Monitoring Systems Core and Standard Questionnaires. Data were obtained for 141,296 mothers and weighted descriptive statistics and multivariate logistic regression models were used to estimate the association

between having a prenatal or postpartum home visit and self-reported postpartum contraceptive use. Results: Of the 141,296 women in our data set, approximately 17% of pregnant or postpartum women received home visits and 80% of women used postpartum contraception. After controlling for sociodemographic, reproductive-related, and health-related factors, women who received prenatal or postpartum home visits are more likely to use contraception postpartum (adjusted odds ratio 1.077, 95% CI 1.026-1.142, p=0.01). Nonwhite women, women with less than a high school education, women with income <$15,000/year, women who received inadequate prenatal care, and those who experienced partner abuse or multiple stressors during pregnancy were statistically less likely ($p<0.05$) to use postpartum contraception in adjusted analyses. Conclusion: Home visits during pregnancy or after delivery were associated with increased postpartum contraceptive use. Given the benefits of appropriate inter-pregnancy intervals to both mother and baby, home visitation programs could be further strengthened by adding contraceptive counseling and offering a variety of postpartum contraceptive methods in the home, especially to women who are nonwhite, of low socioeconomic status or education level, do not receive adequate prenatal care, or who have multiple stressors during pregnancy.

Introduction

The WHO identifies postpartum women among those with the greatest unmet need for family planning services [23]. In the United States, one in three women become pregnant before the recommended 18-month interpregnancy interval [24]. The American College of Obstetricians and Gynecologists (ACOG) currently

advises women to avoid interpregnancy intervals shorter than 6 months, and to be counseled on the risks and benefits of becoming pregnancy sooner than 18 months after delivery [25]. Women who are inadequately covered by a contraceptive method after delivery are at increased risk for short interpregnancy intervals and unplanned pregnancies, which can put both mother and baby at risk for poor health outcomes [25]. Despite the increased opportunities to interact with the health care system, postpartum women often do not receive services and resources to increase birth spacing and reduce unintended pregnancies [23, 26].

Home health care visits during pregnancy or after delivery provide an avenue to access the health care system outside the conventional in-office prenatal and postpartum visit structure. Home visits may increase postpartum contraceptive use and increase interpregnancy intervals [16, 19, 27-29]. Visits to the home prior, during, or after pregnancy can also decrease barriers to accessing postpartum care and contraception [1-5, 16, 18-21, 27-29]. Home visits decreased the cost of services for women, reduced barriers such as finding childcare and obtaining transportation, reduced waiting times and delays associated with obtaining appointments, and circumvented the limited times that prenatal and postpartum services were available [1-5]. Postpartum home visits have also been shown to improve contraceptive outcomes among teenage mothers and mothers with alcohol or drug problems [20, 21]. A study done by Jacob-Files et al. assessed the ability and willingness of health workers to provide hormonal contraception in the home and found that with training and support, health

workers feel it is feasible to add dispensing hormonal contraceptives at home to their scope of practice [22].

Current research into home visitation programs varies widely by state and type of home visitation program. In the United States, there has been no previous research into the effects of home visitation programs on contraceptive use at a national or multi-state level. To address the lack of information about this relationship, we report the results of a cross-sectional analysis using Pregnancy Risk Assessment Monitoring System data, which is, to the best of our knowledge, the first attempt to characterize the effects of prenatal or postpartum home visits on contraceptive use on the national level. This study aims to investigate the association between prenatal or postpartum home visits and postpartum contraceptive use using a large, nationally representative sample of women. To our knowledge, this will be the first study to examine this association using a multi-state analytic dataset.

Methods

Study design. We conducted a secondary cross-sectional analysis from the CDC's 2012-2015 Phase 7 Pregnancy Risk Assessment and Monitoring System (PRAMS) Core and Standard Questionnaires. PRAMS is a population-based risk factor surveillance system designed to monitor maternal characteristics, behaviors, and experiences prior to, during, and after delivering a live-born infant [30]. PRAMS uses mixed-methods surveys and then links questionnaires with birth certificate data [31]. Each year, approximately 1300 to 3400 women who recently gave birth are sampled from eligible birth certificates in a participating state or territory.

Women are contacted by mail between 2-4 months after delivery and the survey data collection cycle lasts approximately 2-3 months; if a survey is not completed, telephone contact is attempted after the last questionnaire is sent and continues for 2-3 weeks. Subpopulations of women including mothers of low-birth-weight infants, those living in high-risk geographic areas, and racial/ethnic minority groups are oversampled; statistical weighting schemes allow for representative state-level estimates [32]. Data were obtained from 41 states and territories.

Exposure of interest. The exposure variable, whether a woman received a prenatal and/or postpartum home visit, was defined by answering yes or no to "During your most recent pregnancy, did a home visitor come to your home to help you prepare for your new baby?" and yes or no to "Since your new baby was born, has a home visitor come to your home to help you learn how to take care of yourself or your new baby?".

Outcome of interest. The outcome variable, whether a woman used birth control postpartum, was defined by answering yes or no to "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 using birth control pills, condoms, withdrawal, or natural family planning.". If yes, women then selected what method or methods of birth control they were using from the following: tubes tied or blocked (female sterilization), vasectomy (male sterilization), birth control pill, condoms, injection (Depo-Provera®), contraceptive implant (Implanon®), contraceptive path (OrthoEvra®) or vaginal ring (NuvaRing®), IUD (including

Mirena® or ParaGard®), natural family planning (including rhythm method), withdrawal (pulling out), not having sex (abstinence), and other (Table A).

Covariates. Demographic, reproductive, and health-related covariates were obtained from national PRAMS data and birth certificate variables. Maternal age was recoded as ≤24, 25-29, 30-34, and ≥35. Maternal race was recoded as white, black, and other. Maternal education was recoded as less than high school, high school, and greater than high school. Household income was recoded as $0-$15,000, $15,001-$37,000, $37,001-$79,000, and $79,001 or more. The number of previous live births a woman has had was collapsed into 0, 1, and ≥2. The number of weeks a woman breastfed was recoded as didn't breastfeed, breastfed <1 week, breastfed >1 week, and breastfeeding now. The number of previous pregnancy terminations was collapsed to 0 and ≥1. The Kessner index, an index to measure adequacy of prenatal care utilizing the month prenatal care begins and the number of prenatal visits, was collapsed to adequate prenatal care and less than adequate prenatal care [33]. Feeling depressed since birth was collapsed to never, rarely, sometimes, and often/almost always/always. Other covariates retained the format they had in the PRAMS questionnaire. Covariates included in our analysis were chosen based on previous analyses that have demonstrated relationships between sociodemographic factors such as income, age, race/ethnicity, pregnancy intendedness, payment source, health status, education, stressors, marital status, prenatal care, postpartum care, and postpartum contraceptive use [7, 34-38].

Data analyses. Mothers who had data for whether they received a home prenatal or postpartum health care visit and for whether they used birth control in the postpartum period were included in our analysis. Mothers who were missing data for either the exposure or the outcome were excluded from the analysis, n=6,451. Weighted descriptive statistics and multivariate logistic regression models were used to estimate the association between having a prenatal or postpartum home visit and self-reported postpartum contraceptive use. All statistical analyses performed using SAS 9.4 and using PROC SURVEY procedures to account for the weighted complex survey design.

The exposure, outcome, and all covariates were categorical or converted to categories. The distribution of postpartum contraceptive method use was described using counts and frequencies, and the exposure and covariates of interest were described stratified by the outcome of interest. Bivariate relationships between the covariates and the exposure of interest and between the covariates and the outcome were assessed using Chi-square tests. Interaction terms were examined including income, urban versus rural location, type of insurance, and the Kessner Index (none were significant interaction terms by the Breslow-Day test). Breastfeeding status was considered as an *a priori* confounder. Because we made multiple comparisons, the p-value for selection criteria into the model was Bonferroni-adjusted $p<0.0024$ ($P=0.05$ was divided by the number of significant covariates in the model at the $p=0.05$ level, 21, to yield the Bonferroni-adjusted p-value). Covariates were included in the model as confounders only if they were associated with both the exposure of interest and

the outcome of interest at the new significance value. Multicollinearity was assessed by examining the Variance Inflation Factor and conditional indices, and no covariates exceeded a VIF>10.

The PRAMS weighting process was utilized. Analysis weights are constructed by multiplying the sampling, nonresponse, and noncoverage components of the weight. The sampling weights range from 1 to 211. Each state uses sampling fractions dependent on state populations and covariate prevalence, for example a sampling fraction of 1 in 1 would be used for a very low birth weight strata in a small state and a sampling fraction of 1 in 211 would be used for a normal birth weight, nonminority strata in a highly populated state. Nonresponse adjustment factors are the ratios of the sample size in that category to the number of respondents in the category and are used to compensate for groups of women who tend to respond at lower rates. Noncoverage weights are constructed by comparing frame files for a year of births to the calendar year birth tape that states provide to CDC and are used to avoid problems that occur during frame construction [31].

Ethics. The proposal for use of the CDC PRAMS Phase 7 2012-2015 dataset was approved by PRAMS Working Group. The PRAMS methodologies and protocols are approved by the CDC institutional review board as well as institutional review boards at the state level. Each written survey includes an informed consent document and each telephone survey includes a verbal reading of the informed consent document. In states with mandatory reporting laws, a separate version of

the survey that excludes questions on physical abuse is used. Minors who have given birth are considered emancipated and able to give informed consent [32].

Results

Approximately 17.26% of the 141,296 women in the 2012-2015 PRAMS Dataset reported having a home visitor during pregnancy or after pregnancy, and 79.86% of women reported using contraception postpartum. In bivariate analyses, women who had a prenatal or postpartum home visit were more likely to be younger, nonwhite, have a lower education level, be unmarried, have a lower income, have Medicaid or be uninsured, have had no previous live births, have breastfed, have less than adequate prenatal care, be abused during pregnancy, have multiple stressors during pregnancy, reported depression since birth, and be of an underweight or obese BMI (Table B). In bivariate analyses, women who used postpartum birth control were more likely to be younger, white, more highly educated, unmarried, of middle income, have had one previous live birth, not be breastfeeding at the time of the survey, have had adequate prenatal care, and be of normal or overweight BMI. Women who did not use postpartum birth control were more likely to be uninsured, have undergone infertility treatment, had one or more previous pregnancy terminations, experienced abuse during pregnancy, and have had multiple stressors during pregnancy (Table B).

After multivariate logistic analysis, the adjusted odds of using postpartum contraception among those who had a prenatal or postpartum home visit versus did not were 1.077 (95% CI 1.016-1.142, p=0.0123). Women who were 30-34, ≥35, nonwhite, had less than a high school education, made <$15,000/year, were

uninsured, lived in urban locations, had no previous live births, were breastfeeding at the time of the survey, had intended to have their pregnancies sooner, had received infertility treatment, received inadequate prenatal care, experienced abuse during pregnancy, experienced ≥3 stressors during pregnancy, or were underweight were significantly less likely ($p<0.0024$) to use postpartum contraception (Table C).

There were significant differences in postpartum contraceptive use among certain demographic groups. Black women (aOR 0.808, 95% CI 0.752-0.870, $p <0.0001$) and women who fall into other (aOR 0.785, 95% CI 0.738-0.834, $p <0.0001$) were significantly less likely to use postpartum contraception than women who are white. Women with a high school (aOR 1.168, 95% CI 1.080-1.262, $p <0.0001$) or greater than high school education (aOR 1.331, 95% CI 1.231-1.439, $p <0.0001$) were significantly more likely to use postpartum contraception than women with less than a high school education. Women who made $15,001-$37,000 (aOR 1.159, 95% CI 1.086-1.236, $p<0.0001$) or $37,001-$79,000 (aOR 1.212, 95% CI 1.117-1.315, $p<0.0001$) were significantly more likely to use postpartum contraception than women who made less than $15,000 per year. Women who were uninsured (aOR 0.655, 95% CI 0.578-0.741, $p<0.0001$) were significantly less likely to use postpartum contraception than women who had Medicaid insurance

Certain reproductive factors such as pregnancy intention, pregnancy timing, and experiences during and after pregnancy affected the likelihood of women using postpartum contraception. Women who were breastfeeding at the time of the

survey (aOR 0.890, 95% CI 0.828-0.956, p<0.0001) were significantly less likely to use postpartum contraception than women who didn't breastfeed. Women who intended to have their pregnancies later (aOR 1.378, 95% CI 1.296-1.466, p<0.0001) or did not intend to have a pregnancy (aOR 1.467, 95% CI 1.326-1.623, p <0.0001) were significantly more likely to use postpartum contraception; however, women who intended to have pregnancies sooner (aOR 0.772, 95% CI 0.728-0.819, p<0.0001) were significantly less likely to use postpartum contraception. Women who received less than adequate prenatal care (aOR 0.859, 95% CI 0.821-0.900, p<0.0001) were significantly less likely to use postpartum contraception than women who have received adequate prenatal care. Women who experienced abuse during pregnancy (aOR 0.612, 95% CI 0.533-0.702, p<0.0001) were significantly less likely to use postpartum contraception than women who did not experience abuse during pregnancy. Women who experience 3-5 (aOR 0.791, 95% CI 0.743-0.841, p<0.0001) or ≥6 (aOR 0.661, 95% CI 0.599-0.729, p<0.0001) stressors during pregnancy were significantly less likely to use postpartum contraception than women who experience zero stressors during pregnancy. Women who had an underweight BMI (aOR 0.749, 95% CI 0.676-0.0.830, p<0.0001) were significantly less likely to use postpartum contraception than women who had a normal BMI.

Discussion

In this multi-state dataset, we found that home visits were associated with increased postpartum contraceptive use. Other key factors associated with postpartum contraceptive use included insurance status, maternal race, level of

education, income, quality of prenatal care, and number of stressors experienced during pregnancy.

We found women who identified as uninsured were significantly less likely to use postpartum contraception compared to women who had Medicaid. In the United States, women of low socioeconomic status and women who are minorities are disproportionately uninsured; these same groups have disproportionately higher risk factors for ill health, including not receiving prenatal care [39]. The high cost of contraceptives has been repeatedly reported to be a key barrier to access, as well as a factor that influences which types of contraception women choose [40, 41]. Several large studies have found relationships between insurance status, copays, and women's use of contraception. In a survey of 26,674 women aged 18-44, Culwell and Feinglass evaluated the relationship between insurance status and use of prescription contraceptives. They found a significantly higher proportion of insured women reported use of prescription contraceptives (54% vs 45%) and women without health insurance were 30% less likely to report using prescription contraceptives [42]. Marshall, Schmittdiel, Chandra, Calhoun, and Raine-Bennett conducted a retrospective cohort study of 39,142 women aged 19-29 to examine the relationship between copayment amount and pharmacy-dispensed contraceptive adherence, which found women with a copayment had a 9% increased risk of nonadherence compared to women without a copayment [43]. Carlin, Fertig, and Dowd found the removal of cost-sharing for prescription contraceptives due to the Affordable Care Act was associated with greater use of prescription contraceptives, especially long-term methods [44]. Our data shows

that insurance status continues to be a factor that affects contraceptive use, even in the postpartum period. Regardless of insurance status, every woman deserves the right to fulfill her reproductive goals in the manner of her choosing.

As is already well established in current literature, we found that nonwhite women, women with less than a high school diploma, an income of <$15,000/year, or who received inadequate prenatal care were significantly less likely to use postpartum contraception than their white counterparts and counterparts with more education, higher income, or adequate prenatal care [45, 46]. Evidence suggests women who are disadvantaged may be less able to share in the benefits that come from obtaining and effectively using contraceptives, including participating in the workforce, enhancing their education, and subsequent outcomes including income, family stability, mental health and happiness, and children's well-being [45, 47].

We found factors related to a woman's physical and emotional health during pregnancy were associated with her likelihood of using postpartum contraception. If a woman experienced abuse during pregnancy, she was statistically less likely to use postpartum contraception. Previous literature has shown that women who experienced intimate partner violence (IPV) during pregnancy were more likely to miss prenatal appointments or initiate prenatal care later in pregnancy [48]. The PRAMS questionnaire asks each woman about stressors she experienced during the year before her child was born including relationship issues, financial trouble, and family matters. If a woman reported experiencing 3 or more of these stressors, she was significantly less likely to use

postpartum contraception. Providers at all levels should be aware of women who experience hardships during their pregnancies and recognize those patients may be at risk of receiving less than adequate care.

The American College of Obstetricians and Gynecologists (ACOG) aims to optimize postpartum care by shifting the ideology of care in the postpartum period from an isolated visit at 6 weeks to an ongoing process that includes a postpartum visit within 3 weeks of birth and multiple visits as needed to assess physical, social, and psychological well-being [49]. ACOG considers contraception and birth spacing integral parts of comprehensive postpartum care. Home visitation programs may contact women during this critical time period, opening an opportunity to augment the postpartum experience for women, especially in disadvantaged populations.

Visits to the home prior, during, or after pregnancy have been shown to increase postpartum contraceptive use, increase interpregnancy intervals, reduce subsequent pregnancies, and decrease barriers to accessing postpartum care and contraception [1-5, 16, 18-21, 27-29]. The United States government supports evidence-based home visitation programs. The Maternal, Infant, and Early Childhood Home Visiting (MIECHV) Programs are federally funded programs to support at-risk mothers and their families during the prenatal and postpartum period with early interventions [14]. Depending on the program, “at-risk” can mean at risk for adverse maternal and/or child health outcomes, or it can mean women who are low-income, on Medicaid, are adolescent mothers, are at risk for substance abuse, or have mental health issues, etc. Each MIECHV program must

be supported by evidence which is reviewed by the Home Visiting Evidence of Effectiveness (HomVEE). According to the Home Visiting Evidence of Effectiveness Review: Executive Summary, of the 18 approved home visitation programs, three programs did not measure maternal health outcomes, 11 found favorable maternal health outcomes, and 6 programs did not find favorable or unfavorable maternal health outcomes [15]. A few programs found positive effects of home visitation programs on decreasing rapid repeat births; however, the majority of programs that measured maternal health outcomes measured mental health indicators such maternal depression, the parenting stress index, and maternal substance use [14]. No program directly provides postpartum contraceptive services; however, many programs aide patients by providing maternal education and referrals to resources in the community for any health-related concerns [14]. Home visiting programs may offer the chance for long term relationships with the health care system that families may otherwise be unable to access; however, the lack of explicit emphasis on postpartum health and postpartum contraception in these programs leaves a large area for improvement. Adding more comprehensive postpartum care to established home visiting programs may be a huge opportunity to improve maternal and child health and enhance reproductive justice, especially among at-risk women.

Considering both ACOG's renewed emphasis on comprehensive postpartum care, including sexuality, contraception, and birth spacing, and the nearly 40% of women who do not attend a postpartum visit, alternative delivery methods for

postpartum care, which take into account socioeconomic and health systems barriers to care, should be explored [6].

Strengths of our analyses include the national dataset and large sample size. The PRAMS questionnaire covers a broad range of variables allowing us to explore multiple possible interaction terms and identify and control for confounding variables. To our knowledge, this is the first national study to evaluate the relationship between home visits and postpartum contraceptive use. Due to the complex sampling and weighting strategies of PRAMS, the results of our study are likely generalizable to mothers of live-born infants in the United States.

Our findings should be interpreted in the context of the survey design. Our data is cross-sectional so the temporality between postpartum home visits and postpartum contraception is unclear. Many PRAMS survey covariates are self-reported, so information bias is possible, particularly differential misclassification bias of the outcome by the exposure. There is the potential for misclassification of the outcome as women may not recall if they used a postpartum contraceptive method. The misclassification may be differential by the exposure because women who received home visits were more likely to have more socioeconomic and educational disadvantages, as well as experience more stressors. These women might be less health literate and struggling with more stress, and therefore be less able to accurately recollect their postpartum contraceptive use. Any sensitive topics such as abuse, alcohol or drug use, and mental health are subject to social desirability bias. The PRAMS methodology

assumes women have a stable home, reachable by mail or phone, so women with unstable housing are likely underrepresented.

Conclusions

Home visits during pregnancy or after delivery were associated with increased postpartum contraceptive use. Given the benefits of appropriate inter-pregnancy intervals to both mother and baby, home visitation programs could be further strengthened by adding contraceptive counseling and offering a variety of postpartum contraceptive methods in the home, especially to women who are nonwhite, of low socioeconomic status or education level, do not receive adequate prenatal care, or who have multiple stressors during pregnancy.

References

1. Sable, M.R. and M.K. Libbus, *Beliefs concerning contraceptive acquisition and use among low-income women*. J Health Care Poor Underserved, 1998. **9**(3): p. 262-75.
2. Radecki, S.E. and G.S. Bernstein, *Use of clinic versus private family planning care by low-income women: access, cost, and patient satisfaction.* Am J Public Health, 1989. **79**(6): p. 692-7.
3. Frost, J.J., S. Singh, and L.B. Finer, *U.S. women's one-year contraceptive use patterns, 2004.* Perspect Sex Reprod Health, 2007. **39**(1): p. 48-55.
4. Silverman, J., A. Torres, and J.D. Forrest, *Barriers to contraceptive services.* Fam Plann Perspect, 1987. **19**(3): p. 94-7, 101-2.
5. Sable, M.R., M.K. Libbus, and J.E. Chiu, *Factors affecting contraceptive use in women seeking pregnancy tests: Missouri, 1997.* Fam Plann Perspect, 2000. **32**(3): p. 124-31.
6. McKinney, J., et al., *ACOG Committee Opinion No. 736: Optimizing Postpartum Care.* Obstet Gynecol, 2018. **132**(3): p. 784-785.

7. Potter, J.E., et al., *Barriers to Postpartum Contraception in Texas and Pregnancy Within 2 Years of Delivery*. Obstet Gynecol, 2016. **127**(2): p. 289-96.

8. Zerden, M.L., et al., *Barriers to Receiving Long-acting Reversible Contraception in the Postpartum Period*. Womens Health Issues, 2015. **25**(6): p. 616-21.

9. Henderson, V., et al., *Understanding Factors Associated with Postpartum Visit Attendance and Contraception Choices: Listening to Low-Income Postpartum Women and Health Care Providers*. Matern Child Health J, 2016. **20**(Suppl 1): p. 132-143.

10. Simmons, K.B., et al., *Personalized contraceptive assistance and uptake of long-acting, reversible contraceptives by postpartum women: a randomized, controlled trial*. Contraception, 2013. **88**(1): p. 45-51.

11. Coleman-Minahan, K., A.R.A. Aiken, and J.E. Potter, *Prevalence and Predictors of Prenatal and Postpartum Contraceptive Counseling in Two Texas Cities*. Womens Health Issues, 2017. **27**(6): p. 707-714.

12. Lopez, L.M., et al., *Education for contraceptive use by women after childbirth*. Cochrane Database Syst Rev, 2015(7): p. CD001863.

13. Cheng, C.Y., E.R. Fowles, and L.O. Walker, *Continuing education module: postpartum maternal health care in the United States: a critical review*. J Perinat Educ, 2006. **15**(3): p. 34-42.

14. Health Resources and Services Administration. *Home Visiting*. 04/2018; Available from: https://mchb.hrsa.gov/maternal-child-health-initiatives/home-visiting-overview.

15. Sama-Miller, E., Akers, L. Mraz-Esposito, A., Zukiewicz, M., Avellar, S., Paulsell, D., and Del Grosso, P, *Home Visiting Evidence of Effectiveness Review: Executive Summary*. 2018, Office of Planning, Research and Evaluation, Administration for Children and Families, U.S. Department of Health and Human Services. : Washington, DC.

16. Olds, D.L., et al., *Effects of nurse home visiting on maternal and child functioning: age-9 follow-up of a randomized trial.* Pediatrics, 2007. **120**(4): p. e832-45.

17. Shah, M.K. and K.R. Austin, *Do home visiting services received during pregnancy improve birth outcomes? Findings from Virginia PRAMS 2007-2008*. Public Health Nurs, 2014. **31**(5): p. 405-13.

18. Melnick, A.L., et al., *Randomized Controlled Trial of Home-Based Hormonal Contraceptive Dispensing for Women At Risk of Unintended Pregnancy*. Perspect Sex Reprod Health, 2016. **48**(2): p. 93-9.

19. Uhm, S., et al., *Home or office etonogestrel implant insertion after pregnancy: a randomized trial.* Contraception, 2016. **94**(5): p. 567-571.

20. Turnbull, C. and D.A. Osborn, *Home visits during pregnancy and after birth for women with an alcohol or drug problem*. Cochrane Database Syst Rev, 2012. **1**: p. CD004456.

21. Quinlivan, J.A., H. Box, and S.F. Evans, *Postnatal home visits in teenage mothers: a randomised controlled trial.* Lancet, 2003. **361**(9361): p. 893-900.

22. Jacob-Files, E., et al., *Should Home-Based Contraceptive Dispensing become a Routine part of Public Health Nurse Practice? Review of Nurse Perceptions.* Public Health Nurs, 2015. **32**(6): p. 702-10.

23. World Health Organization, *Programming Strategies for Postpartum Family Planning*. 2013: Geneva, Switzerland.

24. Gemmill, A. and L.D. Lindberg, *Short interpregnancy intervals in the United States*. Obstet Gynecol, 2013. **122**(1): p. 64-71.

25. *Obstetric Care Consensus No. 8: Interpregnancy Care.* Obstet Gynecol, 2019. **133**(1): p. e51-e72.

26. MCHIP, *Statement for Collective Action for Postpartum Family Planning*. 2012.

27. Kitzman, H., et al., *Effect of prenatal and infancy home visitation by nurses on pregnancy outcomes, childhood injuries, and repeated childbearing. A randomized controlled trial.* JAMA, 1997. **278**(8): p. 644-52.

28. Olds, D.L., *Prenatal and infancy home visiting by nurses: from randomized trials to community replication.* Prev Sci, 2002. **3**(3): p. 153-72.

29. Olds, D.L., et al., *Effects of nurse home-visiting on maternal life course and child development: age 6 follow-up results of a randomized trial.* Pediatrics, 2004. **114**(6): p. 1550-9.

30. Suellentrop, K., et al., *Monitoring progress toward achieving Maternal and Infant Healthy People 2010 objectives--19 states, Pregnancy Risk*

Assessment Monitoring System (PRAMS), 2000-2003. MMWR Surveill Summ, 2006. **55**(9): p. 1-11.

31. Centers for Disease Control, *PRAMS Methodology*. 2018.
32. Shulman, H.B., et al., *The Pregnancy Risk Assessment Monitoring System (PRAMS): Overview of Design and Methodology*. Am J Public Health, 2018. **108**(10): p. 1305-1313.
33. Kotelchuck, M., *An evaluation of the Kessner Adequacy of Prenatal Care Index and a proposed Adequacy of Prenatal Care Utilization Index*. Am J Public Health, 1994. **84**(9): p. 1414-20.
34. Bengiamin, M.I., J.A. Capitman, and M.B. Ruwe, *Disparities in initiation and adherence to prenatal care: impact of insurance, race-ethnicity and nativity*. Matern Child Health J, 2010. **14**(4): p. 618-24.
35. Braveman, P., et al., *Barriers to timely prenatal care among women with insurance: the importance of prepregnancy factors*. Obstet Gynecol, 2000. **95**(6 Pt 1): p. 874-80.
36. Chandler, D., *Late entry into prenatal care in a rural setting*. J Midwifery Womens Health, 2002. **47**(1): p. 28-34.
37. Oduyebo, T., et al., *Factors Associated with Postpartum Use of Long-Acting Reversible Contraception*. Am J Obstet Gynecol, 2019.
38. Potter, J.E., et al., *Factors associated with prenatal care use among peripartum women in the Mother-Infant Rapid Intervention at Delivery study*. J Obstet Gynecol Neonatal Nurs, 2009. **38**(5): p. 534-43.

39. Ebrahim, S.H., et al., *Overcoming social and health inequalities among U.S. women of reproductive age - challenges to the nation's health in the 21st century*. Health Policy, 2009. **90**(2-3): p. 196-205.

40. Sonfield, A., Hasstedt, K., Gold, R. , *Moving Forward: Family Planning in the Era of Health Reform*. 2014, Guttmacher Institute: New York.

41. Gariepy, A.M., et al., *The impact of out-of-pocket expense on IUD utilization among women with private insurance.* Contraception, 2011. **84**(6): p. e39-42.

42. Culwell, K.R. and J. Feinglass, *The association of health insurance with use of prescription contraceptives.* Perspect Sex Reprod Health, 2007. **39**(4): p. 226-30.

43. Marshall, C., et al., *The Relationship Between Prescription Copayments and Contraceptive Adherence in a New-user Cohort.* Med Care, 2018. **56**(7): p. 577-582.

44. Carlin, C.S., A.R. Fertig, and B.E. Dowd, *Affordable Care Act's Mandate Eliminating Contraceptive Cost Sharing Influenced Choices Of Women With Employer Coverage.* Health Aff (Millwood), 2016. **35**(9): p. 1608-15.

45. Guttmacher Institute, *Contraceptive Use in the United States*. 2018.

46. Whiteman, M., Curtis, K., Hillis, S., Zapata, L., D'Angelo, D.V., Farr, S.L., Zhang, Y., Barfield, W., Marchbanks, P., Robbins, C.L., *Contraceptive Use Among Postpartum Women - 12 States and New York City, 2004-2006*, in *MMWR Weekly*. 2009, CDC.

47. Sonfield, A., Hasstedt, K., Kavanaugh, M., Anderson, R., *The Social and Economic Benefits of Women's Ability to Determine Whether and When to Have Children*. 2013, Guttmacher Institute.

48. Alhusen, J.L., et al., *Intimate partner violence during pregnancy: maternal and neonatal outcomes*. J Womens Health (Larchmt), 2015. **24**(1): p. 100-6.

49. *ACOG Committee Opinion No. 736: Optimizing Postpartum Care*. Obstet Gynecol, 2018. **131**(5): p. e140-e150.

50. U.S. Department of Health and Human Services, *Nurse-Family Partnership (NFP)*. Home Visiting Evidence of Effectiveness 2016 [cited 2019 04/15/2019]; Available from: https://homvee.acf.hhs.gov/Effects/1/Nurse-Family-Partnership--NFP-/14/Maternal-Health/1/4/#1.

51. U.S. Department of Health and Human Services, *Child First*. Home Visiting Evidence of Effectiveness 2011 [cited 2019 04/15].

Tables

Table A: Distribution of Methods of Postpartum Contraception

Postpartum Contraceptive Methods	N (%*)
Tubes tied or blocked (female sterilization)	11,968 (7%)
Vasectomy (male sterilization)	3,523 (2%)
Birth Control Pills	28,040 (18%)
Condoms	37,907 (24%)
Injection (Depo-Provera®)	11,420 (7%)
Contraceptive implant (Implanon®)	6,106 (4%)
Contraceptive path (OrthoEvra®) or Vaginal ring (NuvaRing®)	2,221 (1%)
IUD** (including Mirena® or ParaGard®)	18,321 (11%)
Natural family planning (including rhythm method)	5,130 (3%)
Withdrawal (pulling out)	18,682 (12%)

Not having sex (abstinence)	13,067 (8%)
Other	3,636 (2%)
Total	160,021
*%s represent the percentage of method as a part of the total number of methods, method uses are not mutually exclusive **IUD = intrauterine device	

Table B: Bivariate Analysis Between Exposure and Covariates using Chi-Square Tests

	Home Visit – Yes N (%)	**Home Visit – No N (%)**	**Postpartum Contraception Use - Yes N (%)**	**Postpartum Contraception Use – No N (%)**
COVARIATES				
Demographic Variables				
Maternal Age				
≤24	11,122 (23%)	28,796 (77%)	33,275 (81%)	7,441 (19%)
25-29	8,135 (16%)	32,709 (84%)	33,955 (82%)	7,628 (18%)
30-34	7,223 (15%)	31,757 (85%)	31,304 (79%)	8,325 (21%)
≥35	4,426 (15%)	18,088 (85%)	6,247 (72%)	16,648 (28%)
Maternal Race				
White	15,849 (15%)	67,907 (85%)	68,950 (80%)	16,205 (20%)
Black	7,273 (26%)	16,312 (74%)	18,913 (78%)	5,181 (22%)
Other	6,399 (20%)	23,600 (80%)	23,060 (75%)	7,422 (25%)
Hispanic Ethnic Group				
Yes	5,301 (21%)	15,811 (79%)	17,136 (79%)	4,223 (21%)
No	24,223 (17%)	91,679 (83%)	93,538 (79%)	24,508 (21%)

Maternal Education				
Less than High School	6,181 (26%)	13,908 (74%)	15,936 (77%)	4,495 (23%)
High School	8,588 (19%)	26,493 (81%)	28,566 (79%)	7,264 (21%)
Greater than High School	15,628 (14%)	69,830 (86%)	69,374 (80%)	17,472 (20%)
Marital Status				
Married	14,401 (13%)	69,988 (87%)	67,846 (79%)	17,946 (21%)
Other	16,436 (23%)	40,882 (77%)	46,915 (80%)	11,558 (20%)
Income				
$0-$15,000	9,497 (27%)	19,359 (73%)	23,170 (78%)	6,310 (22%)
$15,001-$37,000	8,151 (19%)	25,863 (81%)	28,321 (81%)	6,382 (19%)
$37,001-$79,000	4,429 (12%)	23,467 (88%)	23,055 (81%)	5,346 (19%)
$79,001 or more	4,115 (11%)	23,333 (89%)	21,857 (78%)	6,006 (22%)
Method of Payment				
Medicaid	14,883 (24%)	37,382 (76%)	42,608 (80%)	10750 (20%)
Private Insurance	9,120 (13%)	47,688 (87%)	46,396 (80%)	11304 (20%)
Uninsured	778 (21%)	2018 (79%)	2103 (71%)	756 (29%)
Indian Health Service	69 (16%)	315 (84%)	311 (80%)	81 (20%)
Champus/ Tricare	268 (8%)	1895 (92%)	1757 (80%)	438 (29%)
Other Government	317 (22%)	1027 (78%)	1096 (78%)	269 (22%)
Other	247 (13%)	1109 (87%)	1102 (76%)	277 (24%)
Location				
Rural	5,665 (16%)	25,102 (84%)	25,420 (82%)	5,972 (18%)
Urban	12,045 (17%)	46,830 (83%)	47,412 (79%)	12,346 (21%)
Reproductive Factors				
Previous Live Births				
0	15,003 (21%)	42,570 (79%)	46,440 (79%)	12,250 (21%)
1	7,998 (15%)	36,187 (85%)	36,048 (80%)	8,867 (20%)
2+	7,719 (15%)	31,789 (85%)	31,933 (79%)	8,258 (21%)
Breast Feeding				
Didn't Breastfeed	4,342 (17%)	15,119 (83%)	15,788 (81%)	3,793 (19%)
Breastfed <1 Week	1,030 (20%)	3,220 (80%)	3,440 (80%)	845 (20%)

Breastfed >1 Week	11,113 (18%)	35,776 (82%)	38,382 (81%)	8,793 (19%)
Breastfeeding Now	13,574 (16%)	55,067 (84%)	54,291 (78%)	14,667 (22%)
Pregnancy Intention				
Later	8,055 (20%)	24,006 (80%)	27,198 (84%)	5,417 (16%)
Sooner	4,038 (16%)	15,313 (84%)	14,162 (72%)	5,594 (28%)
Then	10,644 (15%)	46,286 (85%)	46,295 (79%)	11,623 (21%)
Did Not Want Then or Any Time	2,289 (20%)	7,153 (80%)	7,765 (81%)	1,790 (19%)
Was Not Sure	5,203 (19%)	16,543 (81%)	17,696 (79%)	4,494 (21%)
Infertility Treatment				
Yes	594 (17%)	1,988 (83%)	1,422 (52%)	1,251 (48%)
No	25,282 (18%)	90,408 (82%)	94,941 (80%)	24,087 (20%)
Previous Pregnancy Termination				
0	21,921 (17%)	78,434 (83%)	81,985 (80%)	20,037 (20%)
1+	8,692 (17%)	31,287 (83%)	31,621 (77%)	9,202 (23%)
Kessner Index				
Adequate Prenatal Care	19,495 (16%)	76,003 (84%)	78,176 (80%)	18,836 (20%)
Less than Adequate Prenatal Care	11,413 (20%)	35,348 (80%)	37,009 (77%)	10,806 (23%)
Factors Affecting Health				
Abuse During Pregnancy				
Yes	1,163 (26%)	2,442 (75%)	2,596 (70%)	1,102 (30%)
No	29,325 (17%)	108,079 (83%)	111,548 (79%)	28,293 (21%)
Presence of Stressors				
0	7,127 (14%)	32,923 (86%)	32,461 (80%)	8,213 (20%)
1-2	11,978 (16%)	46,167 (84%)	47,442 (80%)	11,684 (20%)
3-5	8,763 (21%)	25,449 (79%)	27,529 (78%)	7,321 (22%)
≥6	2,937 (27%)	6,391 (73%)	7,250 (75%)	2,272 (25%)
Alcohol Use, Last 3 Months of Pregnancy				
Yes	2,103 (16%)	8,013 (84%)	8,069 (78%)	2,222 (22%)
No	28,560 (17%)	102,421 (83%)	106,116 (79%)	27,127 (21%)

Depressed Since Birth				
Never	10.911 (16%)	43,263 (84%)	43,165 (79%)	11,455 (21%)
Rarely	9,365 (16%)	36,560 (84%)	37,644 (81%)	8,723 (19%)
Sometimes	7,419 (20%)	23,113 (80%)	24,828 (79%)	6,520 (21%)
Often/Almost Always/Always	2,996 (22%)	7,815 (78%)	8,950 (77%)	2, 720 (23%)
Medical History of Depression				
Yes	4,731 (24%)	10.841 (76%)	12,658 (79%)	3,255 (21%)
No	25,559 (16%)	98,617 (84%)	100,503 (79%)	25,753 (21%)
BMI* (kg/m^2)				
Underweight (<18.5)	1,438 (20%)	4,474 (80%)	4,694 (76%)	1,352 (24%)
Normal (18.5-24.9)	13,619 (17%)	51,776 (84%)	53,058 (80%)	13,401 (20%)
Overweight (25.0-29.9)	6,997 (17%)	26,004 (83%)	26,969 (80%)	6,625 (20%)
Obese (≥30)	7,176 (18%)	24,562 (82%)	25,659 (79%)	6,762 (21%)
*BMI = Body Mass Index				

Table C: Adjusted associations between home visits/covariates and postpartum contraceptive use

	Adjusted Odds Ratio	**95% Confidence Interval**		**p-value**
EXPOSURES				
Home Visit				
No	Ref			
Yes	1.077	1.016	1.142	0.0123
COVARIATES				
Demographic Variables				
Maternal Age				
≤24	Ref			
25-29	1.010	0.947	1.077	0.7626
30-34	0.828	0.772	0.889	**<0.0001**
≥35	0.606	0.560	0.656	**<0.0001**
Maternal Race				
White	Ref			
Black	0.808	0.752	0.870	**<0.0001**
Other	0.785	0.738	0.834	**<0.0001**

Hispanic Ethnic Group				
Yes	1.084	1.017	1.155	0.0133
No	Ref			
Maternal Education				
Less than High School	Ref			
High School	1.168	1.080	1.262	**<0.0001**
Greater than High School	1.331	1.231	1.439	**<0.0001**
Marital Status				
Married	Ref			
Other	1.088	1.027	1.153	0.0042
Income				
$0-$15,000	Ref			
$15,001-$37,000	1.159	1.086	1.236	**<0.0001**
$37,001-$79,000	1.212	1.117	1.315	**<0.0001**
$79,001 or more	1.146	1.046	1.256	0.0035
Method of Payment				
Medicaid	Ref			
Private Insurance	1.028	0.965	1.095	0.3974
Uninsured	0.655	0.578	0.741	**<0.0001**
Indian Health Service	1.810	0.635	5.161	0.2873
Champus/Tricare	0.938	0.778	1.131	0.5043
Other Government	0.784	0.648	0.947	0.0118
Other	0.631	0.541	0.737	**<0.0001**
Location				
Rural	1.153	1.097	1.211	**<0.0001**
Urban	Ref			
Reproductive Factors				
Previous Live Births				
0	Ref			
1	1.209	1.149	1.272	**<0.0001**
2+	1.168	1.102	1.238	**<0.0001**
Breast Feeding				
Didn't Breastfeed	Ref			
Breastfed <1 Week	0.946	0.826	1.084	0.4262
Breastfed >1 Week	1.016	0.945	1.092	0.6736
Breastfeeding Now	0.890	0.828	0.956	**0.0014**
Pregnancy Intention				
Later	1.378	1.296	1.466	**<0.0001**
Sooner	0.772	0.728	0.819	**<0.0001**
Then	Ref			
Did Not Want Then or Any Time	1.467	1.326	1.623	**<0.0001**
Was Not Sure	1.050	0.982	1.123	0.1504

Infertility Treatment				
Yes	0.338	0.297	0.384	**<0.0001**
No	Ref			
Previous Pregnancy Termination				
0	Ref			
1+	0.892	0.852	0.934	**<0.0001**
Kessner Index				
Adequate Prenatal Care	Ref			
Less than Adequate Prenatal Care	0.859	0.821	0.900	**<0.0001**
Factors Affecting Health				
Abuse During Pregnancy				
Yes	0.612	0.533	0.702	**<0.0001**
No	Ref			
Presence of Stressors				
0	Ref			
1-2	0.984	0.935	1.035	0.5307
3-5	0.791	0.743	0.841	**<0.0001**
≥6	0.661	0.599	0.729	**<0.0001**
Alcohol Use, Last 3 Months of Pregnancy				
Yes	0.912	0.847	0.982	0.0146
No	Ref			
Depressed Since Birth				
Never	Ref			
Rarely	1.101	1.047	1.157	**0.0002**
Sometimes	1.010	0.953	1.071	0.741
Often/Almost Always/Always	0.990	0.903	1.085	0.8299
Medical History of Depression				
Yes	1.116	1.033	1.207	0.0054
No	Ref			
BMI* (kg/m^2)				
Underweight (<18.5)	0.749	0.676	0.830	**<0.0001**
Normal (18.5-24.9)	Ref			
Overweight (25.0-29.9)	1.040	0.987	1.097	0.1400
Obese (≥30)	0.945	0.895	0.998	0.0422
*BMI = Body Mass Index				

Chapter III: Summary, Public Health Implications, Possible Future Directions

The postpartum period is a critical time in the life of a woman, her child, and her family. There are many reasons why women do not attend their prenatal or postpartum appointments. Home visitation programs offer women an additional point of access with the health care system, especially for women with socioeconomic barriers to accessing care. Established home visitation programs throughout the public and private sector have a unique opportunity to include postpartum contraceptive counseling in their curricula, with the aim of increasing postpartum contraceptive initiation and adherence, and consequently improve maternal health outcomes such as short interpregnancy intervals and preterm births [49].

Home visitation programs vary widely across the public and private sector. The United States Government currently supports the Maternal, Infant, and Early Childhood Visiting Programs. States can choose between government-approved curricula that focus on improving maternal and child health outcomes [14]. Currently, each approved curricula must "demonstrate measurable improvement in at least four of the following six benchmark domains: improvement in maternal and newborn health, reduction in child injuries, abuse, and neglect, improved school readiness and achievement, reduction in crime or domestic violence, improved family economic self-sufficiency, improved coordination and referral for other community resources and supports" [14]. While one of the aims of MIECHV programs is improving maternal health, there are no standard indicators for maternal wellbeing across the approved curricula. For example, the Child First program measures parental stress indices and psychiatric and depressive symptoms, while the Nurse-Family Partnership measures specific pregnancy-related outcomes such as number of months between birth or first and second child and number of subsequent pregnancies with short intervals [50, 51].

Considering ACOG's renewed focus on improving maternal health care in the postpartum period, including emphasis on contraception and birth spacing, I feel programs who deliberately contact women during the postpartum period should consider addressing these topics either by providing contraceptive counseling and contraceptive services in the home, or at minimum providing contraceptive education and referrals to providers as needed. This is especially important for programs who connect with women who are at high risk of unintended

pregnancy, including women of color and women of low socioeconomic status or little education. Home visitation programs could target women at risk of not using postpartum contraception and possibly increase postpartum contraceptive initiation and/or adherence.

Future directions for this research include assessing the current level of maternal health care offered in the home across the United States as well as assessing the feasibility of including standardized contraceptive counseling and/or offering contraceptive methods in home visitation programs. Ideally, a home-based prenatal and postpartum care curriculum could be easily implemented through the variety of current home visitation programs.