View metadata, citation and similar papers at core.ac.uk

brought to you by CORE

provided by VCU Scholars Compass

Virginia Commonwealth University
VCU Scholars Compass

Theses and Dissertations

Graduate School

2010

The Association between Prenatal Care Content and Quality with Preterm Birth and Maternal Postpartum Health Behaviors

Susan Cha
Virginia Commonwealth University

Follow this and additional works at: http://scholarscompass.vcu.edu/etd


Part of the Epidemiology Commons

© The Author

Downloaded from
http://scholarscompass.vcu.edu/etd/2079

This Thesis is brought to you for free and open access by the Graduate School at VCU Scholars Compass. It has been accepted for inclusion in Theses and Dissertations by an authorized administrator of VCU Scholars Compass. For more information, please contact libcompass@vcu.edu.

Master of Public Health Research Project

The Association between Prenatal Care Content and Quality with Preterm Birth and Maternal Postpartum Health Behaviors

by

Susan Cha

Derek A. Chapman, Ph.D

Department of Epidemiology and Community Health
Master of Public Health Program
MPH Research Project: EPID 691

Virginia Commonwealth University
Richmond, Virginia

Month/Year
May 2010

Table of Contents

Acknowledgements

I would like to express my deepest gratitude to my graduate advisor, Dr. Derek Chapman, whose invaluable experience and guidance has supported the progression of this project from inception to completion. His extensive knowledge of maternal and child health issues and dedication to the work at the state health department is inspiring.

It is also my pleasure to thank Caroline Stampfel whose expertise, patience, and encouragement helped me to overcome many obstacles throughout the course of this semester.

Lastly, I would like to thank my family and Kinley for their love, support, and understanding.

Abstract

Background: Health policies that seek to improve pregnancy outcomes focus on increasing the availability and access to prenatal care (PNC) services based on studies that support an association between insufficient PNC and adverse birth outcomes. These studies employ PNC utilization indices that measure the adequacy of PNC use, but these indices fail to account for the content or specific components of PNC. **Objectives:** The purpose of this study was to utilize PRAMS and birth certificate data to evaluate the content and quality of PNC in Virginia, and its impact on preterm birth and maternal postpartum health behaviors. **Methods:** Data was from the 2007 Virginia Pregnancy Risk Assessment Monitoring System (PRAMS). This population-based data is representative of all Virginia women who have had a live birth recently and included 1,236 female participants. **Results:** Inadequate PNC was associated with nearly a three-fold increase in risk of low birth weight (OR = 2.8, 95% CI = 1.5, 5.2), but not preterm birth. Women with adequate plus PNC were more likely to deliver infants who were preterm (OR = 10.2, 95% CI = 4.3, 24.4) and low birth weight (OR = 6.3, 95% CI = 4.2, 9.4). After adjusting for method of payment, income, and reported problems during pregnancy, women with lower income and no private insurance were more likely to have inadequate PNC (OR = 1.4, 95% CI = 0.5, 4.1) and (OR = 8.8, 95% CI = 1.3, 59.8), respectively. Provider discussions were not different based on adequacy of PNC. In addition, among women who received adequate PNC, those whose providers discussed postpartum birth control use were 4.5 times more likely to use birth control after delivery compared to women who did not receive education (95% CI=1.7, 11.8). **Conclusion:** The lack of strong associations between adequacy of PNC and birth outcomes indicate that there are other factors (intergenerational, stress, cultural) that may play a more prominent role in predicting maternal and infant health.

Introduction

Preterm Birth

Preterm birth is the birth of an infant at least three weeks before the due date (<37 completed weeks of gestation)[1] and is one of the leading causes of infant deaths in the U.S.[2] Preterm births account for more than a third of all infant deaths.[1] U.S. preterm birth rates have risen more than 20% between 1990 and 2006[3] with more than half a million infants born premature every year.[1] Although the overall national infant mortality rate has declined over the past decades from 26.0 to 6.9 deaths per 1,000 live births in 1960 to 2000, respectively, the U.S. continues to rank poorly in the world for infant deaths.[2] According to a 2009 report released by the March of Dimes, Virginia was graded "D" for its state preterm birth rate which was 60% higher than the Health People 2010 goal.[4] Since 2005, Virginia's preterm birth rate has remained greater than 12%, exceeding the national objective of 7.6%.[4]

Premature infants are at increased risk for having learning disabilities, cerebral palsy, respiratory problems, hearing and visual loss, and death.[5] Premature infants are also at higher risk for developing chronic health conditions into their adulthood such as coronary artery disease[5], hypertension[6-8], or diabetes.[9] Prior research indicates that women are at greatest risk for premature delivery based on: use of tobacco[10], alcohol[11] or drugs[12], medical conditions (ex: diabetes, uterus/cervix/placenta complication)[13,14], limited individual resources (ex: education, income, insurance)[5], pregnancy intent[15], physical abuse[5], and inadequate prenatal care (PNC)[16,17]. Although differences in these factors may help to explain racial/ethnic differences in birth outcomes, black women are still disproportionately affected by preterm birth and low birth weight even with adequate PNC, high education or income equal to white women.[18] Despite efforts by the federal and state government to improve public maternal and child health through

direct health care services and enabling programs[19], the overall black-white gap for adverse birth outcomes continues to widen.[20]

Adequacy of prenatal care

Health policies that seek to improve pregnancy outcomes focus on increasing the availability and access to prenatal care (PNC) services based on extant studies that support an association between insufficient PNC and adverse birth outcomes.[21] For example, studies have shown that inadequate PNC is a risk factor for preterm delivery and low birth weight.[22-24] These studies employ PNC utilization indices that measure the adequacy of PNC use, taking into consideration the month of PNC initiation, number of PNC visits, and gestational age at delivery.[21, 25]

One of the most commonly used indices, Kotelchuck's Adequacy of Prenatal Care Utilization (APNCU) index[26], attempts to characterize PNC utilization based on two dimensions – adequacy of initiation (timing of initiation of PNC) and adequacy of received services (the frequency of PNC visits once care has begun). Women are assigned to one of four groups: inadequate, intermediate, adequate, and adequate plus (or intensive care).[26] Inadequate care is defined as PNC beginning after the fourth month or making less than 50% of expected visits. Intermediate care is PNC that begins in the fourth month and receiving between 50-79% of expected visits. Adequate care is defined as PNC beginning in the fourth month and completing 80-109% of expected visits. Adequate plus or intensive care is PNC that begins in the fourth month and completing 110% or more of expected visits.[26]

Comprehensive PNC includes risk assessments, treatment for medical conditions, and education; it can help to identify high-risk pregnancies early in gestation and lead to risk reduction interventions.[27] Barriers to receiving adequate PNC ranges from demographic to

psychosocial factors. Maternal risk factors associated with inadequate PNC are: race/ethnicity (African American or Hispanic), young age, low education attainment, marital status (unmarried), low income, high parity, geographic location (inner cities or rural areas), and maternal attitudes (ambivalence, PNC not valued, unintended pregnancy).[27-29] Other barriers are system-related and are often beyond the control of pregnant mothers (e.g. lack of transportation, difficulty obtaining child care, language or cultural incompatibility between patients and providers, and lack of insurance or health provider).[29]

Prenatal care visits give health care professionals opportunities to educate mothers on promoting good health behaviors during pregnancy and after delivery. Previous studies have shown that adequate PNC leads to the adoption of healthy behaviors during pregnancy (e.g. substance cessation)[30] and postpartum (e.g. breast feeding, smoking cessation, well-child visits)[23, 31]. Although PNC adequacy indices have been adopted and used in many studies to predict pregnancy outcomes[21,32], these indices fail to account for the content or components of PNC.[29,34] The quantity of visits is not a reliable proxy for the quality of PNC, and fewer visits do not necessarily place women at increased risk for adverse perinatal outcomes.[33] Thus, studies that utilize these PNC adequacy indices are unable to examine differences in the quality of PNC based on the types of services received.

Content of adequate prenatal care

Health promotion education is an important content of prenatal care that can lead to positive changes in maternal behaviors associated with adverse birth outcomes. For example, one study found that smoking cessation counseling was associated with reductions in maternal smoking.[35] Prenatal interventions focused on specific behaviors such as nutritional intake, substance use, and general health promotion have been associated with positive behavioral

change.[36-38] However, one study reported on the content of initial prenatal visits and found that although medical history, physical examination, and laboratory tests were common, behavioral risk assessment, health promotion and education occurred at a lower rate.[39] In addition, a study that surveyed 24,000 women through the Pregnancy Risk Assessment Monitoring System (PRAMS) found that although women reported that their health care providers talked about some topics related to pregnancy, there were low rates of preventive counseling on domestic violence, seat belt use, illegal drug use, and HIV risk.[40]

Finding the criteria for determining appropriate content of PNC remains an important public health issue.[24] Previous examinations of the National Maternal and Infant Health Survey indicated that a third of women reported receiving no advice on alcohol, tobacco, or drug use during their initial prenatal visit; nearly half did not receive information on positive postpartum health behaviors such as breast-feeding.[41] Clinicians focus primarily on immediate biomedical issues and may refer patients to childbirth classes, nutritional, or social services for counseling which may not be covered by insurance or is inaccessible due to transportation difficulties.[42] Assessing the content of PNC, using PRAMS data, can help to enhance current knowledge of pregnancy outcomes and improve the quality of PNC despite inadequate indices.

Study Objectives

The purpose of this study is to utilize PRAMS and birth certificate data to evaluate the content and quality of prenatal care in Virginia, and its impact on preterm birth and maternal postpartum health behaviors. Specifically, the following research questions will be addressed:

1. To what extent does Kotelchuck's Adequacy of Prenatal Care Utilization (APNCU) predict preterm birth?
2. Which population groups are at increased risk for inadequate prenatal care?

3. Does the proportion of women receiving specific components of prenatal care vary based on the quality (as measured by the APNCU)?
4. What is the association between content and adequacy of prenatal care and maternal postpartum health behaviors?

Methods

Pregnancy Risk Assessment Monitoring System (PRAMS)

The Centers for Disease Control and Prevention established the Pregnancy Risk Assessment Monitoring System to collect national data on maternal behaviors that influence pregnancy outcomes. Participating states conduct annual population-based surveillance of health behaviors during pregnancy through early postpartum life by sampling 1,300-3,400 women who have had a recent live birth drawn from the state's birth certificate file.[43] Women from some groups are oversampled in order to ensure adequate sampling of high risk populations. Selected women are contacted by mail and telephone to participate. Data collection protocols and instruments are standardized for all states to allow comparability. A more detailed description of PRAMS methodology is mentioned elsewhere.[44]

Study Population

The study population was selected from a de-identified Virginia Pregnancy Risk Assessment Monitoring System (PRAMS) dataset and included variables from the state live birth certificate data for 2007. These population-based data are representative of all Virginia women who had a live birth recently. Virginia PRAMS is an important source for evaluating maternal characteristics of inadequate PNC and its relation to adverse maternal and birth outcomes. The questionnaire included information on maternal demographic information (e.g. race/ethnicity, education, age, insurance, and income), problems experienced during pregnancy (e.g. diabetes,

hypertension), health behaviors during and after pregnancy (e.g. smoking, infant sleep position), physical abuse, and pregnancy intention.[45] The PRAMS questionnaire also included questions on didactic components of PNC; for example, women reported whether their providers discussed health topics relevant to their most recent pregnancy (e.g. alcohol use, HIV test, early labor). Birth outcomes (e.g. preterm birth and low birth weight) and adequacy of PNC were obtained from the state live birth certificate data. This study was reviewed and approved by the Institutional Review Board of Virginia Department of Health.

The analysis dataset consisted of 1,245 records representing 102,342 resident live births in Virginia. The study population's weighted percentages for race/ethnicity, education, age, and insurance during prenatal care were: 61.8% white non-Hispanic, 19.5% black non-Hispanic, 11.6% Hispanic, and 6.9% other non-Hispanic; 12.1% with < high school education, 31.7% with high school education, and 56.3% with > high school education; 0.6% < 18 years of age, 84.5% aged 18-34 years, and 14.8% aged 35+ years; 20.8% Medicaid, 43.2% private insurance, 8.6% Tricare, 3.9% no insurance, 3.4% other, and 20.1% two or more sources.

Statistical Analysis

In order to address the extent to which the APNCU index predicts preterm birth, the exposure of interest was prenatal care adequacy (categorized into four care groups; inadequate, intermediate, adequate, and adequate plus) and the outcome of interest was preterm birth, dichotomized as "term" or "preterm" (defined as less than 37 weeks completed gestation using the clinicians estimate of gestation from the birth certificate record). Maternal characteristics of PNC groups were assessed for the second study objective; women in adequate and intermediate PNC groups were combined to yield three care groups (inadequate/intermediate, adequate, and adequate plus) for analysis. Next, the association between content of care (measured by whether

women reported that their providers discussed health topics that were related to pregnancy during their PNC visits) and adequacy of PNC was evaluated. Lastly, content of care on postpartum behaviors by adequacy of PNC addressed the last study objective.

Descriptive statistics such as unweighted frequencies and weighted percentages were generated to summarize appropriate exposures, outcomes, and potential confounders. Complex sample procedures were used to analyze the PRAMS data. Separate logistic regression models provided crude and adjusted risk estimates to determine factors associated with specific outcomes (e.g. birth outcomes and PNC adequacy groups). Variables considered as potential confounders were maintained in regression models if they showed statistical significance based on the unadjusted odds ratio and 95% confidence intervals. All analyses were conducted using SAS 9.2.

Results

Among women who received inadequate prenatal care, 6.2% of live births were preterm. The lowest rate of preterm births was found for women with intermediate PNC (1.9%) and adequate PNC (2.9%). Women who received adequate plus PNC had the highest rate of preterm birth (23.2%). Compared to women with adequate PNC, women with adequate plus PNC were more likely to have preterm births (OR = 10.2, 95% CI = 4.3, 24.4). The risk for preterm births among women with inadequate or intermediate PNC was not significantly different than women with adequate care (see Table 1). Post hoc analyses of low birth weight by adequacy groups showed that compared to women with adequate PNC, women with inadequate and adequate plus PNC were significantly more likely to give birth to low birth weight infants (OR = 2.8, 95% CI = 1.5, 5.2) and (OR = 6.3, 95% CI = 4.2, 9.4), respectively.

A total of 1,236 female Virginia residents were categorized as having received inadequate (9.6%), intermediate (10.5%), adequate (52.4%), and adequate plus (27.5%) PNC according to the APNCU index. Among the inadequate/intermediate group, 57% were white non-Hispanic, 24% were black non-Hispanic, 10% were Hispanic, and 9% were classified as other races non-Hispanic. Most women who received inadequate or intermediate PNC reported completing up to 12 years of education or more (81%) and were between 18-34 years of age (87%). The majority of women with inadequate or intermediate PNC reported having some form of insurance during PNC (82.5%) and almost 40% reported having lower income (<$20,000). Among women with inadequate or intermediate PNC, 75% reported using alcohol or tobacco during their pregnancy and 40% reported that their pregnancies were mistimed or unwanted. See Table 2 for the distribution of maternal characteristics among other APNCU groups.

Population groups with maternal characteristics that increased the risk for receiving inadequate/intermediate and adequate plus PNC were assessed. After adjusting for method of payment, income, and reported problems during pregnancy, women with no insurance, Tricare, other, and two or more forms of payment for PNC were significantly more likely to have inadequate/intermediate PNC than women with private insurance (see Table 3). In fact, women with no insurance had the highest risk of receiving inadequate/intermediate PNC (AOR = 8.8, 95% CI = 1.3, 59.8). Conversely, women who reported experiencing problems during pregnancy (e.g. preeclampsia, preterm labor, gestational diabetes, etc.) were significantly less likely to have inadequate PNC (OR=0.5, 95% CI = 0.3, 0.8). Compared to women with high income, women with low income were significantly more likely to have adequate plus PNC (OR = 2.1, 95% CI = 1.1, 4.0).

The proportion of women receiving specific components of prenatal care did not vary

based on the quality (as measured by the APNCU index). During prenatal care visits, women reported receiving education from providers on smoking (70-74%), breastfeeding (84-87%), alcohol (61-74%), seatbelts (48-51%), birth control after pregnancy (79-81%), medicine use during pregnancy (86-94%), illegal drugs (62-63%), screening for birth defects (89-91%), early labor (79-87%), HIV tests (78-80%), and physical abuse (40-48%)(see Table 4 and Figure 1). There were no significant differences between women who received health education during prenatal visits and women who did not receive education for risk of having inadequate or adequate plus PNC (see Table 5).

Women reported the following positive health behaviors following the birth of infants: breastfeeding (75-86%), placing infants on their backs to sleep (64-66%), always securing infants in a car seat (99-100%), not exposing infants to smoke (92-93%), taking infants to a well baby check-up (94-99%), and using birth control after delivery (77-87%). In contrast, the majority of women reported that their infants slept on a bed with someone (63-69%). The distribution of maternal postpartum behaviors by APNCU groups is shown in Table 6 and Figure 2. However, overall, the proportion of maternal postpartum behaviors also did not vary by prenatal care quality (see Table 7).

There was not a strong association between content and maternal postpartum health behaviors by adequacy of prenatal care. Responses regarding breastfeeding, smoking, and birth control were assessed. Among women who received inadequate/intermediate prenatal care, women who received education on smoking during pregnancy during their prenatal visits were more likely to expose their infants to smoke postpartum ($p<0.001$). There were no other significant differences found for women with inadequate/intermediate prenatal care. Among women with adequate prenatal care, women who received education on postpartum birth control

use were more likely to report using birth control since delivery (OR = 4.5, 95% CI = 1.7, 11.8). There were no other significant differences found for women with adequate care. No differences were found for women with adequate plus care (see Table 8).

Discussion

Inadequate prenatal care was associated with nearly a three-fold increase in risk of low birth weight (OR = 2.8, 95% CI = 1.5, 5.2), but not preterm birth. While this contradicts most studies that found inadequate PNC to be associated with preterm birth,[46, 48, 49] some studies have found no association.[50, 51] In fact, a study conducted in the UK found when comparing women with reduced number of prenatal visits to those in standard of care, there were no significant differences between the two groups for variables relating to pregnancy related hypertensive disorders, labor, maternal morbidity, or perinatal morbidity. However, post hoc analyses in the current study still showed a strong association between low birth weight and prenatal care adequacy. Women with adequate plus PNC were more likely to delivery infants who were preterm (OR = 10.2, 95% CI = 4.3, 24.4) and low birth weight (OR = 6.3, 95% CI = 4.2, 9.4) which is consistent with earlier studies[46, 47] given that women who exceed the number of recommended prenatal visits are generally a high-risk population for birth complications whose pregnancies are more closely monitored by their respective physicians. The lack of association between prenatal care adequacy and preterm birth may be due to advances in medicine and technology which allow women to delay pregnancy even if they seek care late. However, the association between prenatal care adequacy and low birth weight would suggest that late-entry prenatal care prevents the potential time spent by practitioners on addressing risky maternal health behaviors (e.g., smoking) that have a large impact on gestational weight.

Method of payment, income, and reported problems during pregnancy were associated with less than adequate care and adequate plus care. After adjusting for those potential confounders, women with lower income and no private insurance were more likely to have inadequate PNC (OR = 1.4, 95% CI = 0.5, 4.1) and (OR = 8.8, 95% CI = 1.3, 59.8), respectively. Previous studies have demonstrated that lower socioeconomic status is associated with increased risk for infant mortality, LBW, and prematurity.[52, 53] Differential exposures to adverse and protective events that occur during pregnancy (e.g. maternal SES, maternal health behaviors, utilization of prenatal care, and stressors) may help to explain birth outcomes. For example, Lumey *et al*.[54] evaluated the effects of maternal intrauterine undernutrition on offspring birth weights in a cohort of women who were born during a war-induced famine.

As expected, women exposed to intrauterine undernutrition in the third trimester had the lowest birth weight compared to exposed women in the first or second trimesters. However, women exposed to famine during the first trimester had secondborn infants that weighed 252 g less than their firstborn siblings (95% CI = -419, -85) and thirdborn infants that weighed 419 g less (95% CI = -926, 87) even after adjusting for trimester of maternal intrauterine exposure, maternal birth weight, smoking during pregnancy, and gender of infants in sibling pairs. There were no abnormal patterns in offspring birth weights after maternal intrauterine exposure in the second or third trimester. Thus, exposures and experiences during critical developmental periods in utero or early life may impact future reproductive potential. Similarly, Lu *et al*.[55] proposed a broad life-course health development model which provides a longitudinal account of the interplay of biological social, behavioral, and psychological protective and risk factors in producing adverse birth outcomes.

Provider discussions were not different based on adequacy of PNC in the current study. The lack of significant difference in content of care (education received during prenatal visits) between adequacy groups indicates that receiving PNC alone may not be sufficient for making an impact on birth outcomes. Intergenerational factors and chronic stress as experienced by the women in the inadequate group (who were more likely to be poor and less likely to be insured before delivery) may explain the significant increased risk for low birth weight infants. A growing body of research suggests that a woman's reproductive potential is viewed as the product of her developmental trajectory over her life course.[55-57] In other words, factors occurring throughout a woman's developmental lifetime, not just during the perinatal period, can alter the quality of the intrauterine and postnatal environment for her children, thereby impacting their health.[55]

Perhaps one of the most compelling evidence for this is found in a social mobility study that was conducted half a century ago in Aberdeen, Scotland where authors found that low birth weight and perinatal mortality rates were related to the social class of infants' fathers and maternal grandfathers. [59-62] For example, women who were born into a lower social class had lower rates of perinatal mortality and low birth weight infants if they married into a higher social class than if they married within the lower social class. Even more intriguing was how these upwardly mobile women (women born of lower class but marries into higher social class) had higher rates of perinatal mortality and low birth weight infants compared to women who were born into the highest class. Studies of social mobility have indicated that both the condition under which a mother is born and grows up and the conditions under which her pregnancies occur are important determinants of her reproductive success.[57] Furthermore, many suggest that

it may take more than a single generation to equalize adverse birth outcomes brought on by socioeconomic and intergenerational health disparities.[55, 57]

Although the current study found that among women who received adequate PNC, those whose providers discussed postpartum birth control use were 4.5 times more likely to use birth control after delivery compared to women who did not receive education (95% CI=1.7, 11.8), overall, there were no significant differences in postpartum maternal behavior among the adequacy groups. This general lack of significant difference in content of care on postpartum maternal behaviors among various adequacy groups indicates that the current traditional model of PNC may not be sufficient to bring about behavioral change. As a substitute to the standard model, a nurse-midwife named Sharon Schindler Rising proposed a novel idea in 1998 – change prenatal care from individual-based care to a group care model called CenteringPregnancy.

The CenteringPregnancy model has grown in popularity and enthusiasm over the last decade despite its fairly recent emergence as an alternative to current standard of care. There is a widespread recognition to improve traditional models of prenatal care to achieve the Healthy People 2020 goals of increasing use and reducing pronounced racial/ethnic disparities in pregnancy outcomes.[63, 64] The Centering Pregnancy model incorporates three components of prenatal care – health assessment, education, and group support.[65] In addition, pregnant participants are encouraged to take responsibility for themselves and their pregnancies through self-efficacy skills. Groups of 8-12 low-risk women (similar gestational ages) meet for self-care skills, facilitated discussions, support network, and standard physical health assessments by practitioners.

There are many differences in the delivery of care, content of care, and total hours of prenatal visits between traditional and group models of prenatal care. In group care, eight to ten

women can efficiently receive full comprehensive care in one room for up to two hours.[66] By contrast, efficiency in traditional care is marked by scheduling patients at 10-15 minute intervals with variable wait times, fragmented services, and inadequate/inconsistent patient education that depends on the provider, time left in the visit, and patient-initiated queries.[66] Average times and length of visits are limited by provider schedules for women who choose traditional prenatal care; however, schedules of group visits are available for pregnant women at their initial sessions. Lastly, the cumulative time spent with providers differs significantly between the two models of care. In group care, the total time spent by providers and patients throughout pregnancy is approximately 900 minutes; on the other hand, for traditional care, the total provider/patient time is approximately 210 minutes.

Since its inception, several studies have been conducted to evaluate the impact of Centering Pregnancy on maternal and infant health, feasibility and receptiveness among pregnant women, particularly those at higher-risk for experiencing adverse pregnancy outcomes. Most of the earlier studies demonstrated that women in group care have higher appreciation/satisfaction and less inadequate prenatal care than women in traditional care groups.[63, 65-67] Women participating in group care also had significantly better knowledge related to pregnancy and general health than women who received traditional prenatal care.[66, 69] Several studies, including a randomized-control intervention, found that Centering groups had significantly lower incidences of preterm and low birth weight infants than comparison groups.[66, 70, 71] Postpartum health behaviors were also found to be improved among women who were in group care; for example, Centering groups had significantly higher proportions of breastfeeding initiation,[66] less repeat pregnancy at six months postpartum,[68] increased use of condoms, less unprotected sex,[68] and lower incidence of sexually transmitted diseases.[68]

Some limitations to this study include small sample size and potential biases. Small sample size may have limited the precision of the estimates of effect. In addition recall bias may be present a maternal postpartum behaviors were reported by women during interviews. Information on content of prenatal care was also based on self-report; thus, non-differential misclassification bias, if present, could have diluted risk estimates. Despite the limitations, several strengths of the study were: cohort design, external validity, and use of birth certificate data. Given that PRAMS data is population-based and randomly obtains participants for interviews, the results are generalizable to all female Virginia residents who had a live birth recently. Collecting information (e.g. birth outcomes) longitudinally allow cohort studies to infer causal relationships and associations between variables of interest. Lastly, the supplemental use of birth certificate data in addition to self-report PRAMS data to determine prenatal care adequacy and birth outcomes increases reliability of information and reduces risk for recall bias or misclassification bias.

Conclusion

The life-course perspective helps to explain why prenatal care has not consistently and conclusively demonstrated to be effective in preventing adverse birth outcomes. Some argue that it is inconceivable to expect that the period for receiving prenatal care is sufficient to reverse the impact of early life programming and cumulative allostatic load on women's reproductive health.[55] Contextual factors (e.g., intergenerational, stress, cultural) may play a more prominent role in predicting maternal and infant health than simply measuring utilization and adequacy of prenatal care. Funding and support for clinical and public health interventions that are more longitudinal and contextual (e.g. race/ethnicity, SES) is needed. Such interventions may promote protective factors that mitigate risks for adverse health outcomes over a woman's life course.[55]

Policymakers should support greater investments in community health and improving social conditions with the goal of reducing allostatic load over the course of women's lives. Although alternate models of prenatal care such as CenteringPregnancy model have been shown to improve birth outcomes and modify maternal postpartum behavior, these studies have only been able to evaluate self-report data immediately following birth or up to one year postpartum. Future studies should look at the group care model's ability to be effective and sustained in larger institutions for longer periods of time.

References

1. Centers for Disease Control and Prevention. Maternal and infant health research: Preterm birth. http://www.cdc.gov/reproductivehealth/MaternalInfantHealth/PBP.htm. Accessed January 11, 2010.
2. Centers of Disease Control and Prevention. Eliminate disparities in infant mortality. Office of Minority Health and Health Disparities. http://www.cdc.gov/omhd/amh/factsheets/infant.htm. Accessed January 11, 2010.
3. Centers for Disease Control and Prevention. Born a bit too early: recent trends in late preterm births. http://www.cdc.gov/nchs/data/databriefs/db24.htm. Published November 2009. Accessed January 11, 2010.
4. March of Dimes. 2009 premature birth report card. http://www.marchofdimes.com/padpetition/reportcards/english/VA.pdf. Accessed January 11, 2010.
5. March of Dimes. Premature birth. http://www.marchofdimes.com/professionals/14332_1157.asp. Published January 2009. Accessed January 11, 2010.
6. Keijzer-Veen MG, Dulger A, Dekker FW, Nauta J, van der Heijden BJ. Very preterm birth is a risk factor for increased systolic blood pressure at a young adult age. *Pediatr Nephrol.* 2009;0:1-8. http://springerlink.com/content/5280j4364268147r/. Accessed January 19, 2010.
7. Siewert-Delle A, Ljungman S. The impact of birth weight and gestational age on blood pressure in adult life: a population-based study of 49 year-old men. *Am J Hypertens.* 1998;11:946-953.
8. Nuyt AM, Alexander BT. Developmental programming and hypertension. *Curr Opin Nephrol Hypertens.* 2009;18:144-152.
9. Kaijser M, Bonamy AE, Akre O, et al. Perinatal risk factors for diabetes in later life. *Diabetes.* 2009;58:523-526.
10. Pollack H, Lantz PM, Frohna JG. Maternal smoking and adverse birth outcomes among singletons and twins. *Am J Public Health.* 2000;90(3):395–400.
11. O'Leary CM, Nassar N, Kurinczuk JJ, Bower C. The effect of maternal alcohol consumption on fetal growth and preterm birth. *BJOG.* 2009;116:390-400.
12. Almario CV, Seligman NS, Dysart KC, Berghella V, Baxter JK. Risk factors for preterm birth among opiate-addicted gravid women in a methadone treatment program. *Am J Obstet Gynecol.* 2009;201:326.e1-6. doi:10.1016/j.ajog.2009.05.052
13. Rosenbert TJ, Garbers S, Lipkind H, Chiasson MA. Maternal obesity and diabetes as risk factors for adverse pregnancy outcomes: Differences among 4 racial/ethnic groups. *Am J Public Health.* 2005;95:1545-1551.
14. Centers for Disease Control and Prevention. Prematurity. http://www.cdc.gov/features/prematurebirth/. Accessed January 19, 2010.
15. Shah PS. Balkhair T, Ohlsson A, Beyene J, Scott F, Frick C. Intention to become pregnant and low birth weight and preterm birth: A systematic review. *Matern Child Health J.* 2009;200:501.e1-6. doi: 10.1016/j.ajog.2009.02.038
16. Charreire H, Combier E. Poor prenatal care in an urban area: a geographic analysis. *Health Place.* 2009;15:412-419.

17. Krueger PM, Scholl TO. Adequacy of prenatal care and pregnancy outcome. *J Am Osteopath Assoc.* 2000;100:485-492.
18. Ngui E, Cortright A, Blair K. An investigation of paternity status and other factors associated with racial and ethnic disparities in birth outcomes in Milwaukee, Wisconsin. *Matern Child Health J.* 2009;13:467-478.
19. Association of Maternal and Child Health Programs. Maternal and child health pyramid of health services. http://www.amchp.org/AboutTitleV/Documents/MCH_Pyramid_Purple.pdf. Accessed January 19, 2010.
20. Centers for Disease Control and Prevention. Morbidity and Mortality Weekly Report: infant mortality and low birth weight among black and white infants – United States, 1980-2000. http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5127a1.htm. Published July 12, 2002. Accessed January 11, 2010.
21. Alexander GR, Kotelchuck M. Quantifying the adequacy of prenatal care: A comparison of indices. *Public Health Reports.* 1996;111:408-416.
22. Vintzileos AM, Ananth CV, Smulian JC, Scorza WE, Knuppel RA. Prenatal care and black-white fetal death disparity in the United States: Heterogenetiy by high-risk conditions. *Obstet Gynecol.* 2002;99:483-489.
23. Kogan MD, Alexander GR. Social and behavioral factors in preterm birth. *Prenat Neonatal Med.* 1998;3:29-31.
24. Mclaughlin FJ, Altemeier WA, Christensen JC, et al. Randomized trial of comprehensive prenatal care for low-income women: Effect on infant birth weight. *Pediatrics*. 1993;89:128-132.
25. Cox RG, Zhang L, Zotti ME, Graham J. Prenatal care utilization in Mississippi: Racial disparities and implications for unfavorable birth outcomes. *Matern Child Health J.* 2009. doi: 10.1007/s10995-009-0542-6.
26. 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;84:1414-1421.
27. Utah Department of Health. Barriers to adequate prenatal care in Utah. *PRAMS Perspectives*. 1999; 1(1):1-8.
28. Bassani DG, Surkan PJ, Olinto MT. Inadequate use of prenatal services among Brazilian women: the role of maternal characteristics. *Int Perspect Sex Reprod Health.* 2009;35:15-20.
29. Kiely JL, Kogan MD. Prenatal care. Reproductive Health of Women, Centers for Disease Control and Prevention. http://www.cdc.gov/reproductivehealth/ProductsPubs/DatatoAction/pdf/rhow8.pdf. Accessed February 15, 2010.
30. Vonderheid SC, Norr KF, Handler AS. Prenatal health promotion content and health behaviors. *West J Nurs Res.* 2007;29:258–76.
31. Reichman NE, Corman H, Noonan K, Schwartz-Soicher O. Effects of prenatal care on maternal postpartum behaviors. *Review of Economics of the Household*. 2009. doi: 10.1007/s11150-009-9074-5.
32. Bloch JR, Dawley K, Suplee PD. Application of the Kessner and Kotelchuck prenatal care adequacy indices in a preterm birth population. *Public Health Nursing.* 2009;26:449-

459.
33. Walker DS, McCully L, Vest V. Evidenc-based prenatal care visits: When less is more. *J Midwifery Womens Health.* 2001;46(3):146-151.
34. Kilma C, Norr K, Vonderheid S, Hander A. Introduction of CenteringPregnancy in a public health clinic. *J Midwifery Womens Health.* 2009;54:27-34.
35. Malchodi CS, Oncken C, Dornelas EA, et al. The effects of peer counseling on smoking cessation and reduction. *Obstet Gynecol.* 2003;101:504–10.
36. Kramer MS. Nutritional advice pregnancy. *Cochrane Database System Review*. 2000;18:365-369.
37. Manwell LB, Fleming MF, Mundt MP, Stauffacher EA, Barry KL. Treatment of problem alcohol use in women of child-bearing age: Results of a brief intervention trial. *Alcohol: Clinical and Experimental Research.* 2000;24:1517-1524.
38. Windsor RA, Woodby LL, Miller TM, et al. Effectiveness of agency for health care policy and research clinical practice guideline and patient education methods for pregnant smokers in Medicaid maternity care. *Am J Obstet Gynecol.* 2000;182:68-75.
39. Peoples-Sheps MD, Hogan VK, Ng'andu N. Content of prenatal care during the initial workup. *Am J Obstet Gynecol.* 1996;174:220-226.
40. Petersen R, Connelly A, Martin SL, Kupper LL. Preventive counseling during prenatal care: Pregnancy risk assessment monitoring system (PRAMS). *Am J Prev Med.* 2001;20:245-250.
41. Kogan MD, Kotelchuck M, Alexander GR, Johnson WE. Racial disparities in reported prenatal care advice from health care providers. *Am J Public Health.* 1994;84:82-88.
42. Novick G. Women's experience of prenatal care: An integrative review. *J Midwifery Womens Health.* 2009;54:226-237.
43. Centers for Disease Control and Prevention. Pregnancy Risk Assessment Monitoring System (PRAMS): Home. http://www.cdc.gov/prams/. Accessed March 31, 2010.
44. Centers for Disease Control and Prevention. Pregnancy Risk Assessment Monitoring System (PRAMS): Methodology. http://www.cdc.gov/prams/methodology.htm. Accessed March 31, 2010.
45. Virginia Department of Health. Virginia PRAMS questionnaire. http://www.vahealth.org/Prams/Documents/2010/pdf/Phase%205_PRAMS_VA_12_7_EEng1.pdf. Accessed April 2, 2010.
46. Heaman MI, Newburn-Cook CV, Green CG, Elliott LJ, Helewa ME. Inadequate prenatal care and its association with adverse pregnancy outcomes: A comparison of indices. *BMC Pregnancy Childbirth.* 2008. doi:10.1186/1471-2393-8-15.
47. Koroukian SM, Rimm AA. The "adequacy of prenatal care utilization" (APNCU) index to study low birth weight: Is the index biased? *J Clin Epidemiol.* 2002;55:29-305.
48. Gomez-Olmedo M, Delgado-Rodriguez M, Bueno-Cavanillas A, Molina-Font JA, Galvez-Vargas R. Prenatal care and prevention of preterm birth: A case-control study in southern Spain. *EurJ Epidemiol.* 1996;12**:**37-44.
49. Barros H, Tavares M, Rodrigues T. Role of prenatal care in preterm birth and low birthweight in Portugal. *J Public Health Med.* 1996;18:321-328.
50. Reichman NE, Teitler JO. Timing of enhanced prenatal care and birth outcomes in New Jersey's HealthStart program. *Matern Child Health J.* 2005; 9:151-160.
51. Sikorski J, Wilson J, Clement S, Das S, Smeeton N. A randomised controlled trial

comparing two schedules of antenatal visits: the antenatal care project. *BMJ* 1996;312:546-53.
52. Deaths: Final data for 2000, Vol. 50, No. 15. (National vital statistics reports). Hyattsville, MD: National Center for Health Statistics, 2002.
53. Halfon N, Hochstein M. Life-course health development: An integrated framework for developing health, policy, and research. *Milbank Q.* 2002;80:433–479.
54. Lumey LH, Stein AD. Offspring birth weights after maternal intrauterine undernutrition: A comparison within sibships. *Am J Epidemiol.* 1997;146:810-820.
55. Lu MC, Halfon N. Racial and ethnic disparities in birh outcomes: A life-course perspective. *Matern Child Health J.* 2003;7:13-32.
56. Chapman DA, Scott KG. The impact of maternal intergenerational risk factors on adverse developmental outcomes. *Developmental Review.* 2001;21:305-325.
57. Emanuel I. Invited commentary: An assessment of maternal intergenerational factors in pregnancy outcome. *Am J Epidemiol.*1997;146:820-826.
58. Baird D. Preventive medicine in obstetrics. *N Engl J Med.* 1952;246:561-568.
59. Baird D, Dlsley R. Environment and childbearing. *Proc R Soc Med.* 1952;46:53-59.
60. Baird D. The epidemiology of prematurity. *Am J Obstet Gynecol.* 1964;65:909-924.
61. Illsley R. Social class selection and class differences in relation to stillbirths and infant deaths. *Br Med J.* 1955;ll:1523-4.
62. Illsley R, Kincaid JC. Social correlations of perinatal mortality. In: Butler NR, Bonham DG, eds. Perinatal mortality: the first report of the 1958 British Perinatal Mortality Survey. Edinburgh, Scotland: E and S Livingstone Ltd, 1963:270-86.
63. Kilma C, Norr K, Vonderheid S, Hander A. Introduction of CenteringPregnancy in a public health clinic. *J Midwifery Womens Health.* 2009;54:27-34
64. Rising SS, Kennedy HP, Kilma CS. Redesigning prenatal care through Centering Pregnancy. *J Midwifery Womens Health.* 2004;49:398-405.
65. Rising SS. Centering pregnancy: An interdisciplinary model of empowerment. *J Nurse-Midwifery.* 1998;43:46-54.
66. Ickovics JR, Kershaw TS, Westdahl C, et al. Group prenatal care and perinatal outcomes: A randomized controlled trial. *Obstet Gynecol.* 2007;110:330-340.
67. Kennedy HP, Farrell T, Paden R, et al. "I wasn't alone" – A study of group prenatal care in the military. *J Midwifery Womens Health.* 2009;54:176-184.
68. Kershaw TS, Magriples U, Westdahl C, Rising SS, Ickovics JR. Pregnancy as a window of opportunity for HIV prevention: Effects of an HIV intervention delivered within prenatal care. *Am J Public Health.* 2009;99:2079-2087.
69. Baldwin KA. Comparison of selected outcomes of CenteringPregnancy versus traditional prenatal care. *J Midwifery Womens Health.* 2006;51:266-272.
70. Grady M, Bloom K. Pregnancy outcomes of adolescents enrolled in a CenteringPregnancy Program. *J Midwifery Womens Health.* 2004;48:412-420.
71. Ickovics JR, Kershaw TS, Westdahl C, et al. Group prenatal care and preterm birth weight: Results from a match cohort study at public clinics. *Obstet Gynecol*. 2003;102:1051–7.

Tables and Figures

Table 1: Birth outcomes by adequacy of prenatal care (APNCU groups)

	Term/Preterm unwt. n	Preterm wt. %	Term wt. %	Preterm COR (95% CI)	LBW/NBW unwt. n	LBW wt. %	NBW wt. %	LBW COR (95% CI)
Kotelchuck APNCU								
Inadequate	155	6.2	93.8	2.2 (0.8, 5.9)	154	8.3	91.7	*2.8 (1.5, 5.2)
Intermediate	112	1.9	98.1	0.7 (0.2, 2.0)	111	4.3	96.7	1.4 (0.7, 2.7)
Adequate	419	2.9	97.1	**1.0**	548	3.2	96.8	**1.0**
Adequate Plus	550	23.2	76.8	*10.2 (4.3, 24.4)	419	16.9	83.1	*6.3 (4.2, 9.4)

Unwt. = unweighted, Wt. = weighted, COR = crude odds ratio, LBW = low birth weight, NBW = normal birth weight
*statistically significant

Table 2: Maternal characteristics of APNCU groups

	Inadequate/Intermediate		Adequate		Adequate Plus	
Maternal Characteristics	**unwt. n**	**wt. %**	**unwt. n**	**wt. %**	**unwt. n**	**wt. %**
Race/Ethnicity						
Black, NH	77	23.6	110	19.3	149	16.2
Hispanic	50	10.0	49	12.1	50	12.6
Other, NH	266	9.1	32	6.9	41	5.4
White, NH	113	57.3	228	61.7	310	65.8
Education						
< High school	82	19.4	47	10.5	81	9.8
High school	90	33.2	143	30.5	156	33.1
> High school	89	47.4	229	59.0	307	57.1
Age						
<18 years	12	0.4	8	0.9	12	0.3
18-34 years	213	87.3	339	85.7	432	80.1
35+ years	42	12.3	69	13.3	105	19.6
Method of Payment						
Medicaid/FAMIS	26	21.5	36	17.9	61	26.1
Tricare	15	14.0	26	10.3	14	1.8
Self-Pay	10	12.5	5	1.8	5	2.2
Other	8	5.0	7	2.0	8	5.0
2 or more	19	23.1	48	19.7	54	18.9
Private Insurance	26	23.9	119	48.3	146	46.0
Income						
<$20,000	41	39.2	36	16.7	60	28.6
$20,000-$34,999	17	14.4	46	22.9	50	21.0
>$35,000	46	46.4	159	60.5	170	50.3

Reported Problems During Pregnancy						
Diabetes-before pregnancy	4	7.8	5	2.9	11	6.6
Diabetes-during pregnancy	9	13.7	28	14.6	45	17.7
Vaginal bleeding	14	13.1	42	23.1	65	29.6
Kidney or bladder infection	15	32.1	35	24.6	32	10.5
Severe nausea/dehydration	18	24.1	31	18.1	40	14.4
Incompetent cervix	0	0.0	2	0.1	2	1.2
Hypertension	2	2.5	12	6.2	35	8.0
Placenta problems	0	0.0	4	2.1	3	2.2
Early labor	7	3.9	10	6.4	20	6.6
PROM	1	0.3	4	0.2	8	0.7
Blood transfusion	0	0.0	2	1.6	1	1.3
Car accident	1	2.4	0	0.0	1	1.1
Alcohol or Tobacco Use During Pregnancy						
Yes	31	74.6	52	68.8	53	49.9
No	6	25.4	16	31.2	32	50.1
Physical Abuse During Pregnancy						
Yes	11	9.4	9	3.9	14	2.2
No	100	90.6	235	96.1	282	97.8
Pregnancy Intention						
Mistimed/Unwanted	46	39.5	85	43.0	107	37.4
Intended	66	60.5	159	57.0	187	62.6

Table 3: Factors associated with inadequate/intermediate and adequate plus prenatal care

	Inadequate/Intermediate		Adequate Plus
Maternal Characteristics	**COR (95% CI)**	**♦AOR (95% CI)**	**COR (95% CI)**
Race/Ethnicity			
Other, NH	1.4 (0.5, 3.7)		0.7 (0.3, 1.9)
Black, NH	1.3 (0.6, 2.9)		0.8 (0.4, 1.6)
Hispanic	0.9 (0.4, 2.1)		1.0 (0.4, 2.1)
White, NH	**1.0**		**1.0**
Education			
< High school	2.3 (1.0, 5.3)		1.0 (0.4, 2.2)
High school	1.4 (0.7, 2.6)		1.1 (0.6, 2.0)
> High school	**1.0**		**1.0**
Age			
<18 years	0.4 (0.03, 4.4)		0.3 (0.03, 3.5)
18-34 years	**1.0**		**1.0**
35+ years	0.9 (0.4, 2.0)		1.6 (0.8, 2.9)
Method of Payment			
Medicaid/FAMIS	2.4 (1.0, 5.9)	3.3 (1.0, 11.4)	1.5 (0.8, 3.0)
TRICARE	*2.7 (1.1, 7.1)	*4.6 (1.7, 12.6)	*0.2 (0.1, 0.6)
Self-Pay	*13.9 (3.3, 58.3)	*8.8 (1.3, 59.8)	1.3 (0.2, 6.9)
Other	*5.1 (1.2, 21.9)	*7.3 (1.1, 48.3)	2.6 (0.6, 11.6)
2 or more	*2.4 (1.1, 5.4)	*3.1 (1.3, 7.3)	1.0 (0.5, 2.0)
Private Insurance	**1.0**	**1.0**	**1.0**
Income			
<$20,000	*3.1 (1.5, 6.2)	1.4 (0.5, 4.1)	*2.1 (1.1, 4.0)
$20,000-$34,999	0.8 (0.3, 2.0)	0.5 (0.2, 1.2)	1.1 (0.6, 2.1)
>$35,000	**1.0**	**1.0**	**1.0**
Reported Problems During Pregnancy			
Yes	*0.5 (0.3, 0.8)	*0.3 (0.2, 0.7)	1.0 (0.9, 1.1)
No	**1.0**	**1.0**	**1.0**
Alcohol or Tobacco Use During Pregnancy			
Yes	1.3 (0.4, 4.6)		0.5 (0.2, 1.2)
No	**1.0**		**1.0**
Physical Abuse During Pregnancy			
Yes	2.6 (0.8, 7.8)		0.6 (0.2, 2.0)
No	**1.0**		**1.0**
Pregnancy Intention			
Mistimed/unwanted	0.9 (0.5, 1.6)		0.8 (0.5, 1.3)
Intended	**1.0**		**1.0**

♦Adjusted odds ratio for method of payment, income, and reported problems during pregnancy
*statistically significant

Table 4: Distribution of PRAMS content questions by APNCU group

	Inadequate/Intermediate		Adequate		Adequate Plus	
Did a Provider Discuss:	**unwt. n**	**wt. %**	**unwt. n**	**wt. %**	**unwt. n**	**wt. %**
Smoking						
Yes	77	69.8	178	73.3	218	74.2
No	26	30.2	67	26.7	69	25.8
Breastfeeding						
Yes	87	84.4	199	83.7	239	86.7
No	15	15.6	45	16.3	50	13.3
Alcohol use						
Yes	72	60.7	177	73.2	222	74.2
No	30	39.3	66	26.8	68	25.8
Seat belts						
Yes	55	47.9	121	48.9	145	50.9
No	45	52.1	120	51.1	141	49.1
Birth control after pregnancy						
Yes	85	79.9	193	79.1	212	81.4
No	18	20.1	51	20.9	76	18.6
Medicine use during pregnancy						
Yes	92	86.4	227	94.3	259	89.0
No	12	13.6	17	5.7	30	11.0
Illegal drugs						
Yes	70	62.1	147	62.8	182	62.9
No	32	37.9	94	37.2	106	37.1
Screening for birth defects						
Yes	92	89.1	222	90.8	266	88.6
No	9	10.9	22	9.2	24	11.4
Early labor						
Yes	89	84.7	202	86.6	218	78.6
No	14	15.3	42	13.4	70	21.4
HIV test						
Yes	86	80.0	182	78.2	221	79.8
No	16	20.0	62	21.8	67	20.2
Physical abuse						
Yes	52	47.6	96	40.0	110	39.7
No	49	52.4	147	60.0	177	60.3

No significant chi-square values

Table 5: Failure to discuss various health topics by adequacy of prenatal care

*Provider did NOT discuss the following:	Inadequate/Intermediate COR (95% CI)	Adequate Plus COR (95% CI)
Smoking	1.2 (0.6, 2.3)	1.0 (0.6, 1.7)
Breastfeeding	0.9 (0.4, 2.1)	0.8 (0.4, 1.5)
Alcohol use	1.8 (0.9, 3.3)	1.0 (0.6, 1.6)
Seat belts	1.0 (0.6, 1.9)	0.9 (0.6, 1.5)
Birth control after pregnancy	1.0 (0.5, 2.0)	1.0 (0.5, 2.0)
Medicine use during pregnancy	2.6 (1.0, 6.8)	2.0 (0.9, 4.8)
Illegal drugs	1.0 (0.6, 1.9)	1.0 (0.6, 1.7)
Screening for birth defects	1.2 (0.4, 3.4)	1.3 (0.6, 2.9)
Early labor	1.2 (0.5, 2.7)	1.8 (1.0, 3.2)
HIV test	0.9 (0.4, 1.9)	0.9 (0.5, 1.6)
Physical abuse	0.7 (0.4, 1.3)	1.0 (0.6, 1.7)

*Compared to women whose providers discussed the health topics

Table 6: Distribution of maternal postpartum health behaviors by APNCU groups

	Inadequate/Intermediate		Adequate		Adequate Plus	
	unwt. n	wt. %	unwt. n	wt. %	unwt. n	wt. %
Breastfeeding						
Yes	83	85.5	200	81.1	223	75.2
*No	24	14.5	37	18.9	58	24.8
Infant Back Sleep Position						
Yes	75	66.0	167	64.2	188	66.1
*No	31	34.0	70	35.8	81	33.9
Infant Sleeps on Bed with Someone						
*Yes	63	64.9	162	69.1	176	62.5
No	43	35.1	74	30.9	95	37.5
Infant Always in Car Seat						
Yes	106	100.0	231	99.4	270	99.8
*No	0	0.0	1	0.6	3	0.2
Infant Exposed to Smoke						
*Yes	5	7.8	13	6.8	14	7.5
No	99	92.2	222	93.2	256	92.5
Well Baby Checkup						
Yes	100	94.1	233	98.1	268	98.7
*No	6	5.9	4	1.9	4	1.3
Using Birth Control						
Yes	87	77.2	209	87.3	238	84.1
*No	23	22.8	37	12.7	56	15.9

*undesirable postpartum health behaviors

Table 7: Postpartum behavior risks for inadequate/intermediate and adequate plus prenatal care

Maternal Postpartum Behaviors		Inadequate/Intermediate COR (95% CI)	Adequate Plus COR (95% CI)
Breastfeeding			
	Yes	**1.0**	**1.0**
	No	0.7 (0.3, 1.6)	1.4 (0.7, 2.7)
Infant Back Sleep Position			
	Yes	**1.0**	**1.0**
	No	0.9 (0.5, 1.7)	0.9 (0.5, 1.6)
Infant Sleeps on Bed with Someone			
	Yes	0.8 (0.5, 1.5)	0.7 (0.4, 1.3)
	No	**1.0**	**1.0**
Infant Always in Car Seat			
	Yes	**1.0**	**1.0**
	No	*<0.001 (<0.001, <0.001)	0.3 (0.03, 2.9)
Infant Exposed to Smoke			
	Yes	1.2 (0.3, 4.0)	1.1 (0.4, 3.1)
	No	**1.0**	**1.0**
Well Baby Checkup			
	Yes	**1.0**	**1.0**
	No	3.2 (0.8, 13.0)	0.7 (0.1, 4.7)
Using Birth Control			
	Yes	**1.0**	**1.0**
	No	2.0 (1.0, 4.2)	1.3 (0.7, 2.5)

*statistically significant

Table 8: The impact of content of care on positive maternal postpartum behaviors by APNCU groups

Did provider discuss:		Breastfed Postpartum unwt. n (wt. %)	Breastfed Postpartum COR (95% CI)	Infant Not Exposed to Smoke Postpartum unwt. n (wt. %)	Infant Not Exposed to Smoke Postpartum COR (95% CI)	Birth Control Use Postpartum unwt. n (wt. %)	Birth Control Use Postpartum COR (95% CI)
				Inadequate/Intermediate			
Breastfeeding							
	Yes	65 (83.9)	0.9 (0.1, 6.1)				
	No	11 (16.1)	**1.0**				
Smoking							
	Yes			67 (67.7)	*<0.01 (<0.01, <0.01)		
	No			26 (32.3)	**1.0**		
Birth control after pregnancy							
	Yes					66 (79.6)	1.0 (0.2, 4.6)
	No					14 (20.4)	**1.0**
				Adequate			
Breastfeeding							
	Yes	157 (81.3)	0.2 (0.03, 1.7)				
	No	40 (18.7)	**1.0**				
Smoking							
	Yes			161 (73.2)	0.7 (0.1, 3.8)		
	No			59 (26.8)	**1.0**		
Birth control after pregnancy							
	Yes					169 (83.0)	*4.5 (1.7, 11.8)
	No					38 (17.0)	**1.0**
				Adequate Plus			
Breastfeeding							
	Yes	179 (90.1)	2.7 (0.8, 9.1)				
	No	38 (9.9)	**1.0**				
Smoking							
	Yes			188 (74.9)	1.2 (0.2, 6.4)		
	No			61 (25.1)	**1.0**		
Birth control after pregnancy							
	Yes					169 (79.8)	0.4 (0.1, 1.6)
	No					63 (20.2)	**1.0**

*statistically significant

Figure 1: Prenatal care education NOT discussed by providers by APNCU

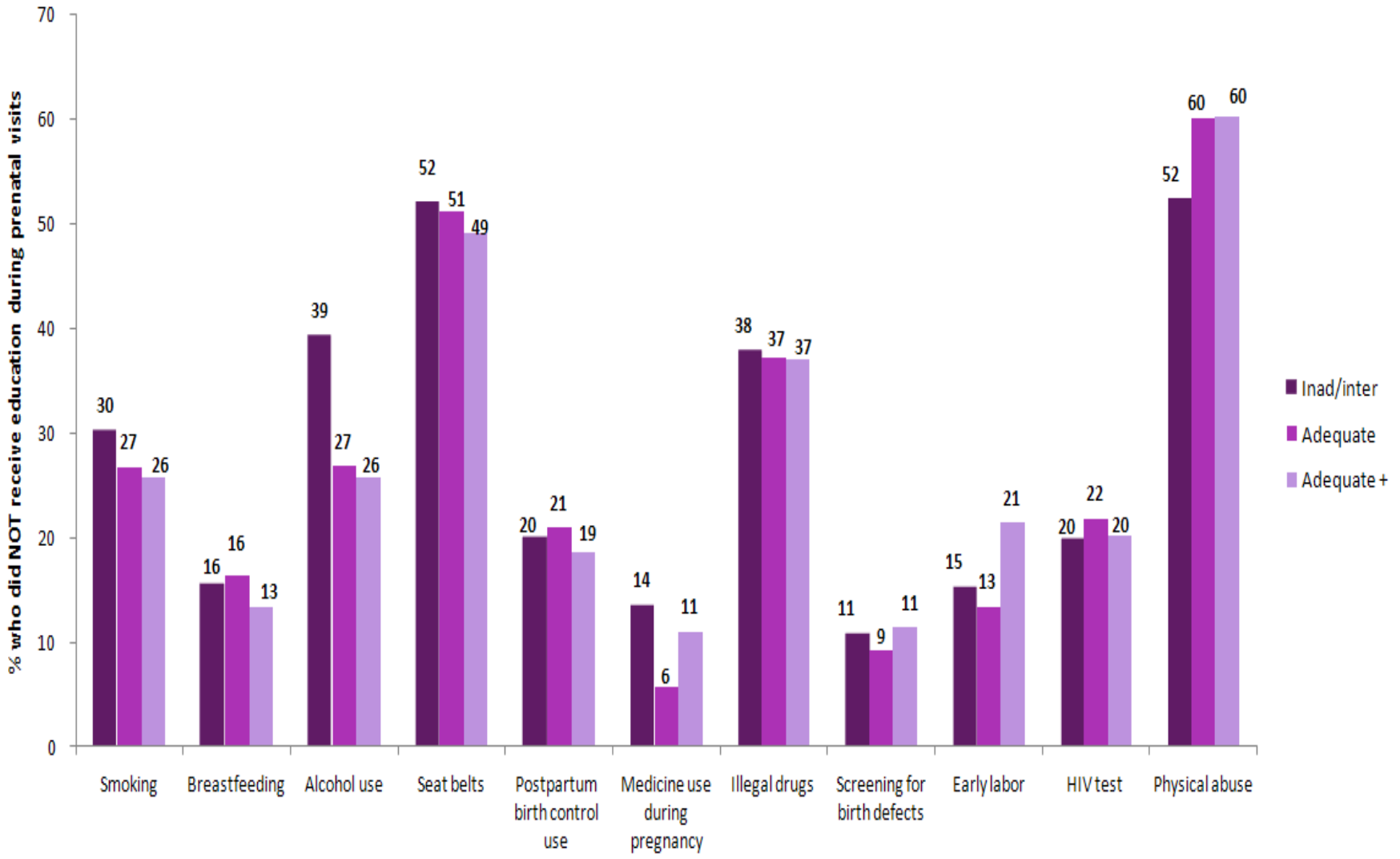
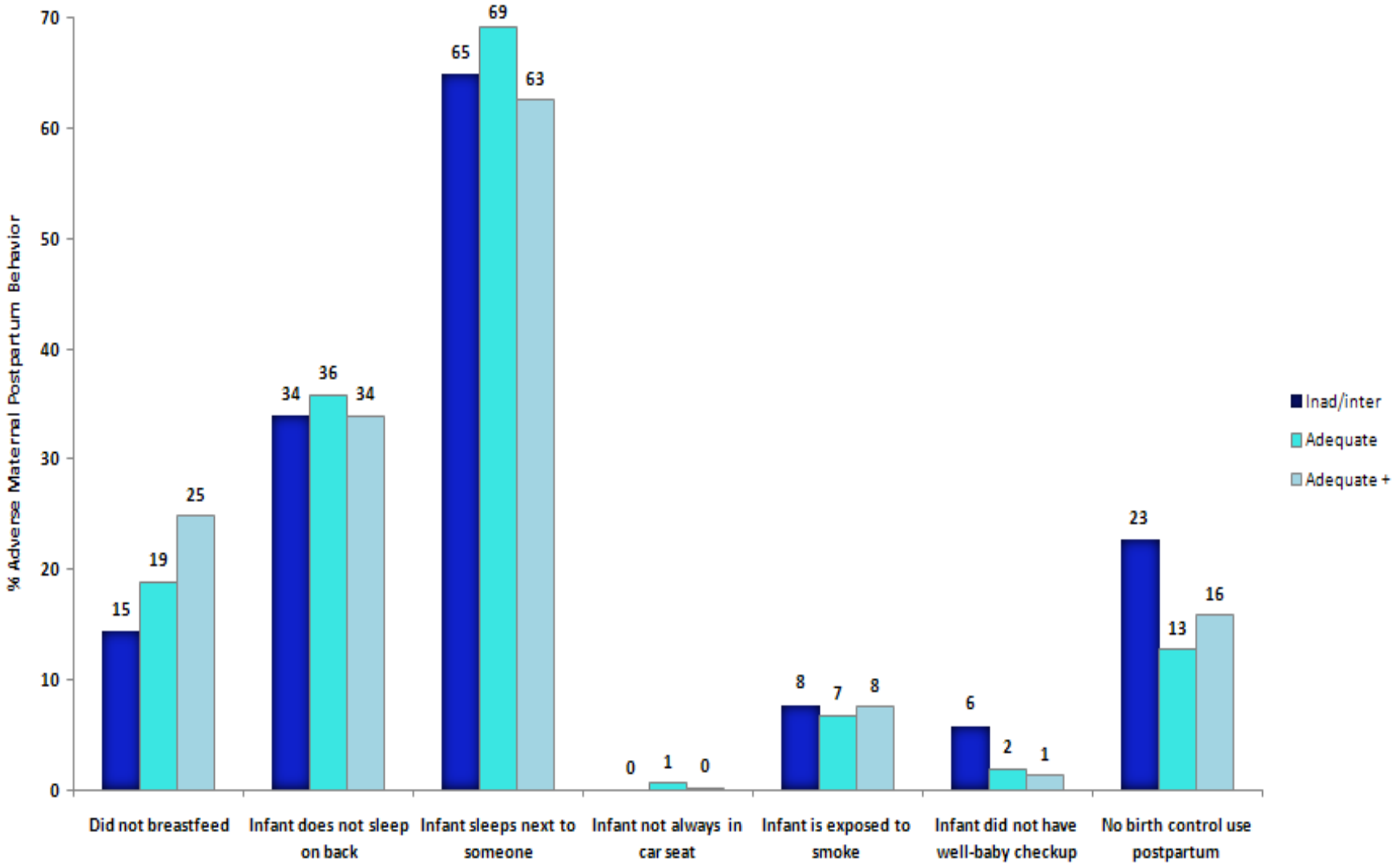


Figure 2: Adverse maternal postpartum behavior



Appendix

SAS Code

```
*Thesis: The association between prenatal care content and quality with
         preterm birth and maternal postpartum health behaviors;

*Before starting, run files "A_Create PRAMS formats" and "B_attach formats to
PRAMS variables".
Then create new program and make Kotelchuck APNCU index. Run once, applies
permanently.

THESIS ANALYSIS STEPS;
*1. Run files "A_Create PRAMS Formats";


*2. Set a library for dataset location and reference format file provided (in
same location as dataset);
libname prams 'C:\Documents and Settings\Susan\Desktop\Thesis\PRAMS';
options fmtsearch = (prams);
run;


*3. Create new formats for computed variables. Need to add formats for any
additional variables used.;
proc format;
value Indexsum    /*Kotelchuck's APNCU index*/
0 = '  0 - Missing information'
1 = ' 1 - INADEQUATE'
2 = ' 2 - INTERMEDIATE'
3 = '3 - ADEQUATE'
4 = ' 4 - ADEQUATE PLUS'
;
value IndexsumA /*adequate+adequateplus*/
0 = '0 - Missing information'
1 = '1 - INADEQUATE'
2 = '2 - INTERMEDIATE'
3 = '3 - ADEQUATE & ADEQUATE PLUS'
;
value indexsum_4gpx /*APNCU 4 groups exclude missing*/
1 = ' 1 - INADEQUATE'
2 = ' 2 - INTERMEDIATE'
3 = '3 - ADEQUATE'
4 = ' 4 - ADEQUATE PLUS'
;
value indexsum_3gpx /*APNCU 3 groups exclude missing*/
1 = ' 1 - Inadequate & Intermediate'
2 = '2 - Adequate'
3 = ' 3 - Adequate Plus'
;
value PRETERMx /*preterm birth*/
1 = ' 1-preterm (<37 weeks)'
0 = '0-term (37+ weeks)'
;
```

```
value LBWx /*low birth weight*/
1 = ' 1 - Low birthweight (<2500 grams)'
0 = '0 - Normal birthweight (2500+ grams)'
;
value RACEx /*mom race/ethnicity*/
1 = '1-White,NH'
2 = '    2-Black,NH'
3 = '   3-Hispanic'
4 = ' 4-Other, NH'
;
value EDUCATIONx /*mom education*/
1 = '  1 - <HS'
2 = ' 2 - HS'
3 = '3 - >HS'
;
value AGEx /*mom age*/
1 = ' 1 - <18'
2 = '2 - 18-34'
3 = '  3 - 35+'
;
value INSURANCEx /*How prenatal care was paid for*/
1 = '  1-Medicaid/FAMIS'
2 = '2-Private Insurance'
3 = ' 3-TRICARE'
4 = '     4-Self Pay'
5 = '    5-Other'
6 = '      6-None listed'
7 = '   7-Two or more sources'
;
value INCOMEx /*income*/
1 = '  1-low income (<$20,000)'
2 = ' 2-medium income ($20,000-$34,999)'
3 = '3-high income (>=$35,000)'
;
value DMAx /*Q26: DM before pregnant*/
1 = ' 1-yes'
0 = '0-no'
;
value DMx /*Q26: DM during pregnancy*/
1 = ' 1-yes'
0 = '0-no'
;
value VBLEEDx /*Q26: vaginal bleeding*/
1 = ' 1-yes'
0 = '0-no'
;
value UTIx /*Q26: bladder or kidney infection*/
1 = ' 1-yes'
0 = '0-no'
;
value NAUDEHYx /*Q26: severe nausea/dehydration*/
1 = ' 1-yes'
0 = '0-no'
;
value INCCERx /*Q26: incompetent cervix*/
```

```
1 = ' 1-yes'
0 = '0-no'
;
value HTNx /*Q26: hypertension*/
1 = ' 1-yes'
0 = '0-no'
;
value PLACENTAx /*Q26: placenta problems*/
1 = ' 1-yes'
0 = '0-no'
;
value LABORx /*Q26: early labor*/
1 = ' 1-yes'
0 = '0-no'
;
value PROMx /*Q26: PROM*/
1 = ' 1-yes'
0 = '0-no'
;
value TRANSFUSIONx /*Q26: blood transfusion*/
1 = ' 1-yes'
0 = '0-no'
;
value CARx /*Q26: car accident*/
1 = ' 1-yes'
0 = '0-no'
;
value PREGPROBx /*Problems experienced during pregnancy (Q26)*/
1 = '1-Diabetes-before pregnancy'
2 = '2-Diabetes-during pregnancy'
3 = '3-Vaginal bleeding'
4 = '4-Kidney or bladder infection'
5 = '5-Severe nausea/dehydration'
6 = '6-Incompetent cervix'
7 = '7-Hypertension'
8 = '8-Placenta problems'
9 = '9-Early labor'
10 = '10-PROM'
11 = '11-Blood transfusion'
12 = '12-Car accident'
;
value PREGPROB2x /*Problem experienced during pregnancy*/
1 = ' 1-yes'
0 = '0-no'
;
value SMOKEx /*mom smoke at all in the last 3 months of pregnancy*/
1 = ' 1-yes'
0 = '0-no'
;
value DRINKx /*mom drink at all in the last 3 months of pregnancy*/
1 = ' 1-yes'
0 = '0-no'
;
value SMOKDRINKx /*mom smoke or drink at all in the last 3 months of
pregnancy*/
```

```
1 = ' 1-yes'
0 = '0-no'
;
value ABUSEx /*Physical abuse during pregnancy*/
1 = ' 1-yes'
0 = '0-no'
;
value INTENTx /*mom pregnancy intent prior to pregnancy*/
1 = '1-pregnancy intended'
0 = ' 0-pregnancy mistimed or unwanted'
;
value SMK_TLKx /*Q:21 smoking*/
1 = ' 1-yes'
0 = '0-no'
;
value BF_TLKx /*Q21: Breastfeeding*/
1 = ' 1-yes'
0 = '0-no'
;
value DRK_TLKx /*Q21: Alcohol use*/
1 = '1-yes'
0 = ' 0-no'
;
value BELT_TLKx /*Q21: Seat belts*/
1 = '1-yes'
0 = ' 0-no'
;
value BC_TLKx /*Q21: Birth control after pregnancy*/
1 = ' 1-yes'
0 = '0-no'
;
value MEDS_TLKx /*Q21: Medicine use during pregnancy*/
1 = '1-yes'
0 = ' 0-no'
;
value DRUG_TLKx /*Q21: Illegal drugs*/
1 = '1-yes'
0 = ' 0-no'
;
value BDEF_TLKx /*Q21: Screening for birth defects*/
1 = '1-yes'
0 = ' 0-no'
;
value LABR_TLKx /*Q21: Early labor*/
1 = '1-yes'
0 = ' 0-no'
;
value HIVT_TLKx /*Q21: HIV test*/
1 = '1-yes'
0 = ' 0-no'
;
value ABUS_TLKx /*Q21: Physical abuse*/
1 = '1-yes'
0 = ' 0-no'
;
```

```
value TALKx /*Topics discussed by doctor/nurse/health care worker during
prenatal care visits (Q21)*/
1 = '1-Smoking'
2 = '2-Breastfeeding'
3 = '3-Alcohol use'
4 = '4-Seat belts'
5 = '5-Birth control after pregnancy'
6 = '6-Medicine use during pregnancy'
7 = '7-Illegal drugs'
8 = '8-Screening for birth defects'
9 = '9-Early labor'
10 ='10-HIV test'
11 ='11-Physical abuse'
;
value BF_POSTx /*Ever breastfed or pump breast milk to feed infant post
delivery*/
1 = ' 1-yes'
0 = '0-no'
;
value POSITION_POSTx /*Infant sleep position on back*/
1 = '1-yes'
0 = ' 0-no'
;
value BED_POSTx /*Infant sleeps on bed with someone else*/
1 = ' 1-yes'
0 = '0-no'
;
value CARSEAT_POSTx /*Infant is always/almost always in a car seat*/
1 = '1-yes'
0 = ' 0-no'
;
value SMKEXP_POSTx /*Infant exposed to cigarette smoke*/
1 = '1-yes'
0 = ' 0-no'
;
value WELLCHK_POSTx /*Infant had well-baby checkup*/
1 = '1-yes'
0 = ' 0-no'
;
value BC_POSTx /*Current birth control use (post delivery)*/
1 = ' 1-yes'
0 = '0-no'
;
value BADBEHAVIORx /*Maternal postpartum bad behaviors*/
1 = 'No breastfeeding'
2 = 'Infant does not sleep on back position'
3 = 'Infant sleeps on bed with someone'
4 = 'Infant does not always/almost always sit in car seat'
5 = 'Infant exposed to cigarette smoke'
6 = 'Infant did not have well-baby checkup'
7 = 'Does not use birth control currently'
;
run;
```

```
*4. Create new dataset, compute new variables and apply formats created
above;
Data Prams.newprams;                                /*new dataset*/
Set Prams.Vaprams07Kotelchuck;                      /*old dataset*/

/*APNCU 4 groups*/
if indexsum= 1 then indexsum_4gp= 1;                *inadequate;
else if indexsum= 2 then indexsum_4gp= 2;           *intermediate;
else if indexsum= 3 then indexsum_4gp= 3;           *adequate;
else if indexsum= 4 then indexsum_4gp= 4;           *adequate+;
else indexsum_4gp= .;

/*APNCU 3 groups*/
if indexsum in (1,2) then indexsum_3gp= 1;          *inadequate + intermediate;
else if indexsum= 3 then indexsum_3gp= 2;           *adequate;
else if indexsum= 4 then indexsum_3gp= 3;           *adequate+;
else indexsum_3gp= .;

/*Preterm Gestation*/
if 1 le GEST_WK lt 37 then PRETERM= 1;              *preterm, <37 weeks;
else if GEST_WK ge 37 then PRETERM= 0;              *term, >=37 weeks;
else PRETERM= .;

/*Low birth weight*/
if 1 le GRAM lt 2500 then LBW = 1;          *low birth weight, <2500 grams;
else if GRAM ge 2500 then LBW = 0;          *normal birthweight, 2500+ grams;
else LBW = .;

/*Race & ethnicity*/
if hispanic= 2 then RACE= 3;                        *Hispanic*;
else if mat_race= 2 and hispanic = 1 then race= 1;    *white,NH*;
else if mat_race= 3 and hispanic = 1 then race= 2;    *black,NH*;
else if mat_race in (1,4,5,6,7,8,9,10) and hispanic = 1 then race= 4;
*other,NH*;
else race=.;

/*Maternal Education in 3 groups*/
if mat_ed in (1,2) then EDUCATION= 1;               *less than high school;
else if mat_ed= 3 then EDUCATION= 2;                *high school;
else if mat_ed in (4,5) then EDUCATION= 3;          *greater than high school;
else EDUCATION= .;

/*Maternal Age in 3 groups*/
if 1 le mat_age lt 18 then AGE= 1;                  *<18 years old;
else if 18 le mat_age le 34 then AGE= 2;            *18-34 years old;
else if mat_age ge 35 then AGE= 3;                  *35+ years old;
else AGE= .;

/*Prenatal Insurance*/
if pp_medic = 2 and pp_ihmo= 1 and pp_milit= 1 and pp_incm= 1 and pp_oth= 1
then INSURANCE= 1;              /*MEDICAID/FAMIS*/
else if pp_medic = 1 and pp_ihmo= 2 and pp_milit= 1 and pp_incm= 1 and
pp_oth= 1 then INSURANCE= 2;  /*Private insurance*/
else if pp_medic = 1 and pp_ihmo= 1 and pp_milit= 2 and pp_incm= 1 and
pp_oth= 1 then INSURANCE= 3;  /*TRICARE*/
```

```
else if pp_medic = 1 and pp_ihmo= 1 and pp_milit= 1 and pp_incm= 2 and
pp_oth= 1 then INSURANCE= 4;  /*Self pay*/
else if pp_medic = 1 and pp_ihmo= 1 and pp_milit= 1 and pp_incm= 1 and
pp_oth= 2 then INSURANCE= 5;  /*Other*/
else if pp_medic + pp_ihmo + pp_milit + pp_incm + pp_oth = 10 then INSURANCE=
6;                            /*none listed*/
else if pp_medic + pp_ihmo + pp_milit + pp_incm + pp_oth GE 7 then INSURANCE=
7;                            /*2 or more sources*/
else INSURANCE= .;

/*Income Categories in 3 groups*/
if income5 in (1,2,3) then INCOME= 1;          *low (<$20,000);
else if income5 in (4,5) then INCOME= 2;       *medium ($20k-34,999);
else if income5 in (6,7) then INCOME= 3;       *high ($35,000+);
else INCOME= .;

/*Medical problem during pregnancy*/
if MORB_DIB= 2 then DMA= 1;                *Diabetes-before pregnancy;
else if MORB_DIB= 1 then DMA= 0;           *no diabetes before pregnancy;

if MORB_DID=  2 then DM= 1;                *Diabetes-during pregnancy;
else if MORB_DID= 1 then DM= 0;            *no diabetes-during pregnancy;

if MORB_BLD= 2 then VBLEED= 1;             *Vaginal bleeding;
else if MORB_BLD= 1 then VBLEED= 0;        *no Vaginal bleeding;

if MORB_KID= 2 then UTI= 1;                *Kidney or bladder infection;
else if MORB_KID= 1 then UTI= 0;           *no Kidney or bladder infection;

if MORB_NAU= 2 then NAUDEHY= 1;            *Severe nausea/dehydration;
else if MORB_NAU= 1 then NAUDEHY= 0;       *no Severe nausea/dehydration;

if MORB_CRV= 2 then INCCER= 1;             *incompetent cervix;
else if MORB_CRV= 1 then INCCER= 0;        *no incompetent cervix;

if MORB5BP= 2 then HTN= 1;                 *Hypertension;
else if MORB5BP= 1 then HTN= 0;            *no Hypertension;

if MORB_PLA= 2 then PLACENTA= 1;           *Placenta problems;
else if MORB_PLA= 1 then PLACENTA= 0;      *no Placenta problems;

if MORB_LAB= 2 then LABOR= 1;              *Early labor;
else if MORB_LAB= 1 then LABOR= 0;         *no Early labor;

if MORB_PRM= 2 then PROM= 1;               *PROM;
else if MORB_PRM= 1 then PROM= 0;          *no PROM;

if MORB_TRN= 2 then TRANSFUSION= 1;                  *Blood transfusion;
else if MORB_TRN= 1 then TRANSFUSION= 0;             *no Blood transfusion;

if MORB_CAR= 2 then CAR= 1;                          *car accident;
else if MORB_CAR= 1 then CAR= 0;                     *no car accident;

/*Reported problems during pregnancy (did not code for those without the
following conditions)*/
```

```
if MORB_DIB= 2 then PREGPROB= 1;                    *Diabetes-before
pregnancy;
else if MORB_DID= 2 then PREGPROB= 2;               *Diabetes-during
pregnancy;
else if MORB_BLD= 2 then PREGPROB= 3;               *Vaginal bleeding;
else if MORB_KID= 2 then PREGPROB= 4;               *Kidney or bladder
infection;
else if MORB_NAU= 2 then PREGPROB= 5;               *Severe
nausea/dehydration;
else if MORB_CRV= 2 then PREGPROB= 6;               *Incompetent cervix;
else if MORB5BP= 2 then PREGPROB= 7;                *Hypertension;
else if MORB_PLA= 2 then PREGPROB= 8;               *Placenta problems;
else if MORB_LAB= 2 then PREGPROB= 9;               *Early labor;
else if MORB_PRM= 2 then PREGPROB= 10;              *PROM;
else if MORB_TRN= 2 then PREGPROB= 11;              *Blood transfusion;
else if MORB_CAR= 2 then PREGPROB= 12;              *Car accident;
else PREGPROB= .;

/*Problems experienced during pregnancy (yes or no)*/
if MORB_DIB=2 or MORB_DID= 2 or MORB_BLD= 2 or MORB_KID= 2 or MORB_NAU= 2 or
MORB_CRV= 2 or MORB5BP= 2 or
MORB_PLA= 2 or MORB_LAB= 2 or MORB_PRM= 2 or MORB_TRN= 2 or MORB_CAR= 2 then
PREGPROB2= 1;           *yes, >=1 pregnancy problem;
else if MORB_DIB=1 and MORB_DID= 1 and MORB_BLD= 1 and MORB_KID= 1 and
MORB_NAU= 1 and MORB_CRV= 1 and MORB5BP= 1 and
MORB_PLA= 1 and MORB_LAB= 1 and MORB_PRM= 1 and MORB_TRN= 1 and MORB_CAR= 1
then PREGPROB2= 0;      *no;
else PREGPROB2= .;

/*In the last 3 months of pregnancy, smoked any cigarettes at all*/
if SMK5_3L in (1,2,3,4,5,6) then SMOKE= 1;          *yes;
else if SMK5_3L= 7 then SMOKE= 0;                   *no;
else SMOKE= .;

/*In the last 3 months of pregnancy, drank any alcohol at all*/
if DRK5_3L in (1,2,3,4,5) then DRINK= 1;            *yes;
else if DRK5_3L= 6 then DRINK= 0;                   *no;
else DRINK= .;

/*in the last 3 months of pregnancy, smoke or drink at all*/
if SMOKE= 1 or DRINK= 1 then SMOKDRINK= 1;          *yes;
else if SMOKE= 0 and DRINK= 0 then SMOKDRINK= 0;    *no;
else SMOKDRINK= .;

/*Physical abuse during pregnancy by ex, current husband/partner, or others*/
if PAD_XHUS= 2 or PAD_HUS= 2 or PAD_OTH= 2 then ABUSE= 1;    *yes;
else if PAD_XHUS= 1 and PAD_HUS= 1 and PAD_OTH= 1 then ABUSE= 0; *no;
else ABUSE= .;

/*Pregnancy intent just before getting pregnant*/
if FEEL_PG in (1,3) then INTENT= 1;             *pregnancy intended;
else if FEEL_PG in (2,4) then INTENT= 0;        *pregnancy mistimed or
unwanted;
else INTENT= .;
```

```
/*Counseling on smoking during pregnancy (Q21a)*/
if TLK_SMK= 2 then SMK_TLK= 1;                          *yes;
else if TLK_SMK= 1 then SMK_TLK= 0;                     *no;
else SMK_TLK= .;

/*Counseling on breastfeeding (Q21b)*/
if TLK_BF= 2 then BF_TLK= 1;                            *yes;
else if TLK_BF= 1 then BF_TLK= 0;                       *no;
else BF_TLK= .;

/*Counseling on alcohol during pregnancy (Q21c)*/
if TLK_DRK= 2 then DRK_TLK= 1;                          *yes;
else if TLK_DRK= 1 then DRK_TLK= 0;                     *no;
else DRK_TLK= .;

/*Counseling on seat belt use during pregnancy (Q21d)*/
if TLK_BELT= 2 then BELT_TLK= 1;                        *yes;
else if TLK_BELT= 1 then BELT_TLK= 0;                   *no;
else BELT_TLK= .;

/*Counseling on birth control use after pregnancy (Q21e)*/
if TLK_BC= 2 then BC_TLK= 1;                            *yes;
else if TLK_BC= 1 then BC_TLK= 0;                       *no;
else BC_TLK= .;

/*Counseling on safe medicines to take during pregnancy (Q21f)*/
if TLK_MEDS= 2 then MEDS_TLK= 1;                        *yes;
else if TLK_MEDS= 1 then MEDS_TLK= 0;                   *no;
else MEDS_TLK= .;

/*Counseling on illegal drugs (Q21g)*/
if TLK_DRUG= 2 then DRUG_TLK= 1;                        *yes;
else if TLK_DRUG= 1 then DRUG_TLK= 0;                   *no;
else DRUG_TLK= .;

/*Counseling on screening for birth defects (Q21h)*/
if TLK_BDEF= 2 then BDEF_TLK= 1;                        *yes;
else if TLK_BDEF= 1 then BDEF_TLK= 0;                   *no;
else BDEF_TLK= .;

/*Counseling on early labor (Q21i)*/
if TLK_LABR= 2 then LABR_TLK= 1;                        *yes;
else if TLK_LABR= 1 then LABR_TLK= 0;                   *0-no;
else LABR_TLK= .;

/*Counseling on getting tested for HIV (Q21j)*/
if TLK_HIVT= 2 then HIVT_TLK= 1;                        *yes;
else if TLK_HIVT= 1 then HIVT_TLK= 0;                   *no;
else HIVT_TLK= .;

/*Counseling on physical abuse (Q21k)*/
if TLK_ABUS= 2 then ABUS_TLK= 1;                        *yes;
else if TLK_ABUS= 1 then ABUS_TLK= 0;                   *no;
else ABUS_TLK= .;
```

```
/*Received counseling by doctor, nurse, or health care worker during prenatal
care visits (Q21)*/
if SMK_TLK= 1 then TALK= 1;                *Smoking during pregnancy;
else if BF_TLK= 1 then TALK= 2;            *Breastfeeding after pregnancy;
else if DRK_TLK= 1 then TALK= 3;           *Alcohol use during pregnancy;
else if BELT_TLK= 1 then TALK= 4;          *Seat belts during pregnancy;
else if BC_TLK= 1 then TALK= 5;            *Birth control after pregnancy;
else if MEDS_TLK= 1 then TALK= 6;          *Medicine use during pregnancy;
else if DRUG_TLK= 1 then TALK= 7;          *Illegal drugs during pregnancy;
else if BDEF_TLK= 1 then TALK= 8;          *Screening for birth defects;
else if LABR_TLK= 1 then TALK= 9;          *Early labor;
else if HIVT_TLK= 1 then TALK= 10;         *HIV test;
else if ABUS_TLK= 1 then TALK= 11;         *Physical abuse;
else TALK= .;

/*Ever breastfeed after delivery*/
if BF5EVER= 2 then BF_POST= 1;                          *yes;
else if BF5EVER= 1 then BF_POST= 0;                     *no;
else BF_POST= .;

/*Infant is placed only on back to sleep*/
if SLEEPPOS= 2 then POSITION_POST= 1;                          *yes;
else if SLEEPPOS in (1,3,4,5,6,7) then POSITION_POST= 0;       *no;
else POSITION_POST= .;

/*Infant sleeps on bed with someone else*/
if SLEEPBED in (1,2,3,4) then BED_POST= 1;              *yes;
else if SLEEPBED= 5 then BED_POST= 0;                   *no;
else BED_POST= .;

/*Infant always or almost always rides in a car seat*/
if SAF_CAR4= 2 then CARSEAT_POST= 1;                    *yes;
else if SAF_CAR4= 1 then CARSEAT_POST= 0;               *no;
else CARSEAT_POST= .;

/*Infant is in the same room as someone who smokes*/
if SMK_EXP GE 1 then SMKEXP_POST= 1;                    *yes;
else if SMK_EXP= 0 then SMKEXP_POST= 0;                 *no;
else SMKEXP_POST= .;

/*Infant had a well-baby checkup*/
if WBC_ANY= 2 then WELLCHK_POST= 1;                     *yes;
else if WBC_ANY= 1 then WELLCHK_POST= 0;                *no;
else WELLCHK_POST= .;

/*Current use of birth control after delivery*/
if BC_NOW4= 2 then BC_POST= 1;                          *yes;
else if BC_NOW4= 1 then BC_POST= 0;                     *no;
else BC_POST= .;

/*Maternal postpartum bad behavior*/
if BF_POST= 0 then BADBEHAVIOR= 1;              *no breastfeeding;
else if POSITION_POST= 0 then BADBEHAVIOR= 2;   *infant is not placed on back
position to sleep;
```

```
else if BED_POST= 1 then BADBEHAVIOR= 3;        *infant sleeps on bed with
someone;
else if CARSEAT_POST= 0 then BADBEHAVIOR= 4;    *infant does not
always/almost always sit in carseat;
else if SMKEXP_POST= 1 then BADBEHAVIOR= 5;     *infant exposed to cigarette
smoke;
else if WELLCHK_POST= 0 then BADBEHAVIOR= 6;    *infant didn't have well-baby
checkup;
else if BC_POST= 0 then BADBEHAVIOR= 7;         *does not use birth control
currently;
else BADBEHAVIOR= .;


*5. Apply formats to new variables;
Format
indexsum_4gp indexsum_4gpx.
indexsum_3gp indexsum_3gpx.
PRETERM PRETERMx.
LBW LBWx.
RACE RACEx.
EDUCATION EDUCATIONx.
AGE AGEx.
INSURANCE INSURANCEx.
INCOME INCOMEx.
DMA DMAx.
DM DMx.
VBLEED VBLEEDx.
UTI UTIx.
NAUDEHY NAUDEHYx.
INCCER INCCERx.
HTN HTNx.
PLACENTA PLACENTAx.
LABOR LABORx.
PROM PROMx.
TRANSFUSION TRANSFUSIONx.
CAR CARx.
PREGPROB PREGPROBx.
PREGPROB2 PREGPROB2x.
SMOKE SMOKEx.
DRINK DRINKx.
SMOKDRINK SMOKDRINKx.
ABUSE ABUSEx.
INTENT INTENTx.
SMK_TLK SMK_TLKx.
BF_TLK BF_TLKx.
DRK_TLK DRK_TLKx.
BELT_TLK BELT_TLKx.
BC_TLK BC_TLKx.
MEDS_TLK MEDS_TLKx.
DRUG_TLK DRUG_TLKx.
BDEF_TLK BDEF_TLKx.
LABR_TLK LABR_TLKx.
HIVT_TLK HIVT_TLKx.
ABUS_TLK ABUS_TLKx.
TALK TALKx.
```

```
BF_POST BF_POSTx.
POSITION_POST POSITION_POSTx.
BED_POST BED_POSTx.
CARSEAT_POST CARSEAT_POSTx.
SMKEXP_POST SMKEXP_POSTx.
WELLCHK_POST WELLCHK_POSTx.
BC_POST BC_POSTx.
BADBEHAVIOR BADBEHAVIORx.
;


*6. Keep your newly computed variables and the ones from which they were
derived;
Keep
/*old*/
indexsum
indexsum1
GEST_WK
GRAM
hispanic mat_race
mat_ed
mat_age
pp_medic pp_ihmo pp_milit pp_incm pp_oth
income5
MORB_DIB MORB_DID MORB_BLD MORB_KID MORB_NAU MORB_CRV MORB5BP MORB_PLA
MORB_LAB MORB_PRM MORB_TRN MORB_CAR
SMK5_3L
DRK5_3L
PAD_XHUS PAD_HUS PAD_OTH
FEEL_PG
TLK_SMK TLK_BF TLK_DRK TLK_BELT TLK_BC TLK_MEDS TLK_DRUG TLK_BDEF TLK_LABR
TLK_HIVT TLK_ABUS
BF5EVER SLEEPPOS SLEEPBED SAF_CAR4 SMK_EXP WBC_ANY BC_NOW4
tod_yr4
/*new*/
indexsum_4gp
indexsum_3gp
PRETERM
LBW
RACE
EDUCATION
AGE
INSURANCE
INCOME
DMA DM VBLEED UTI NAUDEHY INCCER HTN PLACENTA LABOR PROM TRANSFUSION CAR
PREGPROB PREGPROB2
SMOKE DRINK SMOKDRINK
ABUSE
INTENT
SMK_TLK BF_TLK DRK_TLK BELT_TLK BC_TLK MEDS_TLK DRUG_TLK BDEF_TLK LABR_TLK
HIVT_TLK ABUS_TLK TALK
BF_POST POSITION_POST BED_POST CARSEAT_POST SMKEXP_POST WELLCHK_POST BC_POST
BADBEHAVIOR
stratumc wtanal
;
```

```
run;


*7. Check recodes against original variables;
Proc freq data = Prams.newprams;
tables
indexsum*(indexsum_3gp indexsum_4gp)
GEST_WK*PRETERM
GRAM*LBW
(hispanic mat_race)*race
mat_ed*EDUCATION
mat_age*AGE
(pp_medic pp_ihmo pp_milit pp_incm pp_oth)*INSURANCE
income5*INCOME
MORB_DIB*DMA MORB_DID*DM MORB_BLD*VBLEED MORB_KID*UTI MORB_NAU*NAUDEHY
MORB_CRV*INCCER MORB5BP*HTN MORB_PLA*PLACENTA
MORB_LAB*LABOR MORB_PRM*PROM MORB_TRN*TRANSFUSION MORB_CAR*CAR
(MORB_DIB MORB_DID MORB_BLD MORB_KID MORB_NAU MORB_CRV MORB5BP MORB_PLA
MORB_LAB MORB_PRM MORB_TRN MORB_CAR)*PREGPROB
(MORB_DIB MORB_DID MORB_BLD MORB_KID MORB_NAU MORB_CRV MORB5BP MORB_PLA
MORB_LAB MORB_PRM MORB_TRN MORB_CAR)*PREGPROB2
SMK5_3L*SMOKE
DRK5_3L*DRINK
(SMOKE DRINK)*SMOKDRINK
(PAD_XHUS PAD_HUS PAD_OTH)*ABUSE
FEEL_PG*INTENT
TLK_SMK*SMK_TLK TLK_BF*BF_TLK TLK_DRK*DRK_TLK TLK_BELT*BELT_TLK TLK_BC*BC_TLK
TLK_MEDS*MEDS_TLK
TLK_DRUG*DRUG_TLK TLK_BDEF*BDEF_TLK TLK_LABR*LABR_TLK TLK_HIVT*HIVT_TLK
TLK_ABUS*ABUS_TLK
(SMK_TLK BF_TLK DRK_TLK BELT_TLK BC_TLK MEDS_TLK DRUG_TLK BDEF_TLK LABR_TLK
HIVT_TLK ABUS_TLK)*TALK
BF5EVER*BF_POST
SLEEPPOS*POSITION_POST
SLEEPBED*BED_POST
SAF_CAR4*CARSEAT_POST
SMK_EXP*SMKEXP_POST
WBC_ANY*WELLCHK_POST
BC_NOW4*BC_POST
(BF_POST POSITION_POST BED_POST CARSEAT_POST SMKEXP_POST WELLCHK_POST
BC_POST)*BADBEHAVIOR
;
run;


*8. Proc freq of all variables. Check where missing values go by ading
'/missprint' to the end of the code;
Proc freq data = Prams.Newprams;
tables
indexsum indexsum1 indexsum_4gp indexsum_3gp
GEST_WK PRETERM
GRAM LBW
hispanic mat_race race
mat_ed EDUCATION
mat_age AGE
```

```
pp_medic pp_ihmo pp_milit pp_incm pp_oth INSURANCE
income5 INCOME
MORB_DIB MORB_DID MORB_BLD MORB_KID MORB_NAU MORB_CRV MORB5BP MORB_PLA
MORB_LAB MORB_PRM MORB_TRN MORB_CAR
DMA DM VBLEED UTI NAUDEHY INCCER HTN PLACENTA LABOR PROM TRANSFUSION CAR
PREGPROB PREGPROB2
SMK5_3L SMOKE
DRK5_3L DRINK
SMOKE DRINK SMOKDRINK
PAD_XHUS PAD_HUS PAD_OTH ABUSE
FEEL_PG INTENT
TLK_SMK SMK_TLK TLK_BF BF_TLK TLK_DRK DRK_TLK TLK_BELT BELT_TLK TLK_BC BC_TLK
TLK_MEDS MEDS_TLK
TLK_DRUG DRUG_TLK TLK_BDEF BDEF_TLK TLK_LABR LABR_TLK TLK_HIVT HIVT_TLK
TLK_ABUS ABUS_TLK
SMK_TLK BF_TLK DRK_TLK BELT_TLK BC_TLK MEDS_TLK DRUG_TLK BDEF_TLK LABR_TLK
HIVT_TLK ABUS_TLK TALK
BF5EVER BF_POST
SLEEPPOS POSITION_POST
SLEEPBED BED_POST
SAF_CAR4 CARSEAT_POST
SMK_EXP SMKEXP_POST
WBC_ANY WELLCHK_POST
BC_NOW4 BC_POST
BF_POST POSITION_POST BED_POST CARSEAT_POST SMKEXP_POST WELLCHK_POST BC_POST
BADBEHAVIOR
;
run;

Proc surveyfreq data = Prams.Newprams;
strata stratumc;
*/cluster clustervariable;
weight wtanal;
tables race education age insurance/ chisq row;
run;

************************************

*TABLE 1: Does APNCU predict PT? (Kotelchuck APNCU -> PT & LBW);

*unweighted N - Preterm/Term births;
Proc freq data = Prams.Newprams;
tables indexsum_4gp*PRETERM/ nopercent nocol norow;
run;

*weighted % - Preterm births;
Proc surveyfreq data = Prams.Newprams;
strata stratumc;
*/cluster clustervariable;
weight wtanal;
tables indexsum*PRETERM/ chisq row;
run;

*Crude OR - Preterm births;
Proc surveylogistic data = Prams.Newprams;
```

```
strata stratumc;
*/cluster clustervariable;
weight wtanal;
class indexsum_4gp/param = ref;
model PRETERM = indexsum_4gp;
run;

*unweighted N - LBW/NBW;
Proc freq data = Prams.Newprams;
tables indexsum_4gp*LBW/ nopercent nocol norow;
run;

*weighted % - LBW;
Proc surveyfreq data = Prams.Newprams order = formatted;
strata stratumc;
*/cluster clustervariable;
weight wtanal;
tables indexsum_4gp*LBW/ chisq row;
run;

*Crude OR - LBW;
Proc surveylogistic data = Prams.Newprams;
strata stratumc;
*/cluster clustervariable;
weight wtanal;
class indexsum_4gp/param = ref;
model LBW = indexsum_4gp;
run;


************************************

*TABLE 2: What are risk factors for inadequate PNC? (unwt n and wt %);

*unweighted n;
Proc freq data = Prams.Newprams;
tables (RACE EDUCATION AGE INSURANCE INCOME PREGPROB SMOKDRINK ABUSE
INTENT)*indexsum_3gp/nocol norow nopercent;
run;

*weighted %: Proc freq crosstab;
Proc freq data= Prams.Newprams;
weight wtanal;
tables (RACE EDUCATION AGE INSURANCE INCOME PREGPROB SMOKDRINK ABUSE
INTENT)*indexsum_3gp/ nofreq nopercent;
run;

*weighted %: Proc surveyfreq crosstab;
Proc surveyfreq data= Prams.Newprams;
strata stratumc;
*/cluster clustervariable;
weight wtanal;
tables (race EDUCATION AGE INSURANCE INCOME PREGPROB SMOKDRINK ABUSE
INTENT)*indexsum_3gp/nostd nofreq nowtfreq row col chisq;
run;
```

```
*add "/OR CL chisq" to the end of indexsum_3gp to get chi^2, OR, and
confidence limits in SAS 9.2.
"row" (after nostd) includes the row% in the output - otherwise, you only get
the total%;

************************************

*TABLE 3: What are risk factors for inadequate and adequate plus PNC (COR/AOR
and 95% CI);

*Crude OR - comparing "inadequate/intermediate" to "adequate";
Proc surveylogistic data= prams.newPRAMS order = formatted;
strata stratumc;
*/cluster clustervariable;
weight wtanal;
class RACE/param = ref;
model indexsum_3gp = RACE;
where indexsum_3gp ne 3;
run;
Proc surveylogistic data= prams.newPRAMS;
strata stratumc;
*/cluster clustervariable;
weight wtanal;
class EDUCATION/param = ref;
model indexsum_3gp = EDUCATION;
where indexsum_3gp ne 3;
run;
Proc surveylogistic data= prams.newPRAMS;
strata stratumc;
*/cluster clustervariable;
weight wtanal;
class AGE/param = ref;
model indexsum_3gp = AGE;
where indexsum_3gp ne 3;
run;
Proc surveylogistic data= prams.newPRAMS;
strata stratumc;
*/cluster clustervariable;
weight wtanal;
class INSURANCE/param = ref;
model indexsum_3gp = INSURANCE;
where indexsum_3gp ne 3;
run;
Proc surveylogistic data= prams.newPRAMS;
strata stratumc;
*/cluster clustervariable;
weight wtanal;
class INCOME/param = ref;
model indexsum_3gp = INCOME;
where indexsum_3gp ne 3;
run;
/***Proc surveylogistic data= prams.newPRAMS;
strata stratumc;
*cluster clustervariable;
weight wtanal;
```

```
class DMA/param = ref;
model indexsum_3gp = DMA;
where indexsum_3gp ne 3;
run;
Proc surveylogistic data= prams.newPRAMS;
strata stratumc;
*cluster clustervariable;
weight wtanal;
class DM/param = ref;
model indexsum_3gp = DM;
where indexsum_3gp ne 3;
run;
Proc surveylogistic data= prams.newPRAMS;
strata stratumc;
*cluster clustervariable;
weight wtanal;
class VBLEED/param = ref;
model indexsum_3gp = VBLEED;
where indexsum_3gp ne 3;
run;
Proc surveylogistic data= prams.newPRAMS;
strata stratumc;
*cluster clustervariable;
weight wtanal;
class UTI/param = ref;
model indexsum_3gp = UTI;
where indexsum_3gp ne 3;
run;
Proc surveylogistic data= prams.newPRAMS;
strata stratumc;
*cluster clustervariable;
weight wtanal;
class NAUDEHY/param = ref;
model indexsum_3gp = NAUDEHY;
where indexsum_3gp ne 3;
run;
Proc surveylogistic data= prams.newPRAMS;
strata stratumc;
*cluster clustervariable;
weight wtanal;
class INCCER/param = ref;
model indexsum_3gp = INCCER;
where indexsum_3gp ne 3;
run;
Proc surveylogistic data= prams.newPRAMS;
strata stratumc;
*cluster clustervariable;
weight wtanal;
class HTN/param = ref;
model indexsum_3gp = HTN;
where indexsum_3gp ne 3;
run;
Proc surveylogistic data= prams.newPRAMS;
strata stratumc;
*cluster clustervariable;
```

```
weight wtanal;
class PLACENTA/param = ref;
model indexsum_3gp = PLACENTA;
where indexsum_3gp ne 3;
run;
Proc surveylogistic data= prams.newPRAMS;
strata stratumc;
*cluster clustervariable;
weight wtanal;
class LABOR/param = ref;
model indexsum_3gp = LABOR;
where indexsum_3gp ne 3;
run;
Proc surveylogistic data= prams.newPRAMS;
strata stratumc;
*cluster clustervariable;
weight wtanal;
class PROM/param = ref;
model indexsum_3gp = PROM;
where indexsum_3gp ne 3;
run;
Proc surveylogistic data= prams.newPRAMS;
strata stratumc;
*cluster clustervariable;
weight wtanal;
class TRANSFUSION/param = ref;
model indexsum_3gp = TRANSFUSION;
where indexsum_3gp ne 3;
run;
Proc surveylogistic data= prams.newPRAMS;
strata stratumc;
*cluster clustervariable;
weight wtanal;
class CAR/param = ref;
model indexsum_3gp = CAR;
where indexsum_3gp ne 3;
run; ****/
Proc surveylogistic data= prams.newPRAMS;
strata stratumc;
*cluster clustervariable;
weight wtanal;
class PREGPROB2/param = ref;
model indexsum_3gp = PREGPROB2;
where indexsum_3gp ne 3;
run;
Proc surveylogistic data= prams.newPRAMS;
strata stratumc;
*/cluster clustervariable;
weight wtanal;
class SMOKDRINK/param = ref;
model indexsum_3gp = SMOKDRINK;
where indexsum_3gp ne 3;
run;
Proc surveylogistic data= prams.newPRAMS;
strata stratumc;
```

```
*/cluster clustervariable;
weight wtanal;
class ABUSE/param = ref;
model indexsum_3gp = ABUSE;
where indexsum_3gp ne 3;
run;
Proc surveylogistic data= prams.newPRAMS;
strata stratumc;
*/cluster clustervariable;
weight wtanal;
class INTENT/param = ref;
model indexsum_3gp = INTENT;
where indexsum_3gp ne 3;
run;

*Adjusted OR - comparing "inadequate/intermediate" to "adequate";
Proc surveylogistic data= prams.newPRAMS;
strata stratumc;
*/cluster clustervariable;
weight wtanal;
class INSURANCE INCOME PREGPROB2/param = ref;
model indexsum_3gp = INSURANCE INCOME PREGPROB2;
where indexsum_3gp ne 3;
run;

*Crude OR - comparing "adequate plus" to "adequate";
Proc surveylogistic data= prams.newPRAMS;
strata stratumc;
*/cluster clustervariable;
weight wtanal;
class RACE/param = ref;
model indexsum_3gp = RACE;
where indexsum_3gp ne 1;
run;
Proc surveylogistic data= prams.newPRAMS;
strata stratumc;
*/cluster clustervariable;
weight wtanal;
class EDUCATION/param = ref;
model indexsum_3gp = EDUCATION;
where indexsum_3gp ne 1;
run;
Proc surveylogistic data= prams.newPRAMS;
strata stratumc;
*/cluster clustervariable;
weight wtanal;
class AGE/param = ref;
model indexsum_3gp = AGE;
where indexsum_3gp ne 1;
run;
Proc surveylogistic data= prams.newPRAMS;
strata stratumc;
*/cluster clustervariable;
weight wtanal;
class INSURANCE/param = ref;
```

```
model indexsum_3gp = INSURANCE;
where indexsum_3gp ne 1;
run;
Proc surveylogistic data= prams.newPRAMS;
strata stratumc;
*/cluster clustervariable;
weight wtanal;
class INCOME/param = ref;
model indexsum_3gp = INCOME;
where indexsum_3gp ne 1;
run;
/***Proc surveylogistic data= prams.newPRAMS;
strata stratumc;
*cluster clustervariable;
weight wtanal;
class DMA/param = ref;
model indexsum_3gp = DMA;
where indexsum_3gp ne 1;
run;
Proc surveylogistic data= prams.newPRAMS;
strata stratumc;
*cluster clustervariable;
weight wtanal;
class DM/param = ref;
model indexsum_3gp = DM;
where indexsum_3gp ne 1;
run;
Proc surveylogistic data= prams.newPRAMS;
strata stratumc;
*cluster clustervariable;
weight wtanal;
class VBLEED/param = ref;
model indexsum_3gp = VBLEED;
where indexsum_3gp ne 1;
run;
Proc surveylogistic data= prams.newPRAMS;
strata stratumc;
*cluster clustervariable;
weight wtanal;
class UTI/param = ref;
model indexsum_3gp = UTI;
where indexsum_3gp ne 1;
run;
Proc surveylogistic data= prams.newPRAMS;
strata stratumc;
*cluster clustervariable;
weight wtanal;
class NAUDEHY/param = ref;
model indexsum_3gp = NAUDEHY;
where indexsum_3gp ne 1;
run;
Proc surveylogistic data= prams.newPRAMS;
strata stratumc;
*cluster clustervariable;
weight wtanal;
```

```
class INCCER/param = ref;
model indexsum_3gp = INCCER;
where indexsum_3gp ne 1;
run;
Proc surveylogistic data= prams.newPRAMS;
strata stratumc;
*cluster clustervariable;
weight wtanal;
class HTN/param = ref;
model indexsum_3gp = HTN;
where indexsum_3gp ne 1;
run;
Proc surveylogistic data= prams.newPRAMS;
strata stratumc;
*cluster clustervariable;
weight wtanal;
class PLACENTA/param = ref;
model indexsum_3gp = PLACENTA;
where indexsum_3gp ne 1;
run;
Proc surveylogistic data= prams.newPRAMS;
strata stratumc;
*cluster clustervariable;
weight wtanal;
class LABOR/param = ref;
model indexsum_3gp = LABOR;
where indexsum_3gp ne 1;
run;
Proc surveylogistic data= prams.newPRAMS;
strata stratumc;
*cluster clustervariable;
weight wtanal;
class PROM/param = ref;
model indexsum_3gp = PROM;
where indexsum_3gp ne 1;
run;
Proc surveylogistic data= prams.newPRAMS;
strata stratumc;
*cluster clustervariable;
weight wtanal;
class TRANSFUSION/param = ref;
model indexsum_3gp = TRANSFUSION;
where indexsum_3gp ne 1;
run;
Proc surveylogistic data= prams.newPRAMS;
strata stratumc;
*cluster clustervariable;
weight wtanal;
class CAR/param = ref;
model indexsum_3gp = CAR;
where indexsum_3gp ne 1;
run;***/
Proc surveylogistic data= prams.newPRAMS;
strata stratumc;
*cluster clustervariable;
```

```
weight wtanal;
class PREGPROB2/param = ref;
model indexsum_3gp = PREGPROB;
where indexsum_3gp ne 1;
run;
Proc surveylogistic data= prams.newPRAMS;
strata stratumc;
*/cluster clustervariable;
weight wtanal;
class SMOKDRINK/param = ref;
model indexsum_3gp = SMOKDRINK;
where indexsum_3gp ne 1;
run;
Proc surveylogistic data= prams.newPRAMS;
strata stratumc;
*/cluster clustervariable;
weight wtanal;
class ABUSE/param = ref;
model indexsum_3gp = ABUSE;
where indexsum_3gp ne 1;
run;
Proc surveylogistic data= prams.newPRAMS;
strata stratumc;
*/cluster clustervariable;
weight wtanal;
class INTENT/param = ref;
model indexsum_3gp = INTENT;
where indexsum_3gp ne 1;
run;

*Adjusted OR - comparing "adequate plus" to "adequate";
Proc surveylogistic data= prams.newPRAMS;
strata stratumc;
*/cluster clustervariable;
weight wtanal;
class INCOME/param = ref;
model indexsum_3gp = INCOME;
where indexsum_3gp ne 1;
run;


************************************

*TABLE 4: Distribution of PRAMS content questions by APNCU group;

*unweighted n;
Proc freq data = Prams.Newprams;
tables (SMK_TLK BF_TLK DRK_TLK BELT_TLK BC_TLK MEDS_TLK DRUG_TLK BDEF_TLK
LABR_TLK HIVT_TLK ABUS_TLK)*indexsum_3gp/nocol norow nopercent;
run;

*weighted %: Proc freq crosstab;
Proc freq data= Prams.Newprams;
weight wtanal;
```

```
tables (SMK_TLK BF_TLK DRK_TLK BELT_TLK BC_TLK MEDS_TLK DRUG_TLK BDEF_TLK
LABR_TLK HIVT_TLK ABUS_TLK)*indexsum_3gp/nofreq nopercent chisq;
run;

*weighted %: Proc surveyfreq crosstab;
Proc surveyfreq data= Prams.Newprams;
strata stratumc;
*/cluster clustervariable;
weight wtanal;
tables (SMK_TLK BF_TLK DRK_TLK BELT_TLK BC_TLK MEDS_TLK DRUG_TLK BDEF_TLK
LABR_TLK HIVT_TLK ABUS_TLK)*indexsum_3gp/nostd nofreq nowtfreq row col chisq;
run;
*add "/OR CL chisq" to the end of indexsum_3gp to get chi^2, OR, and
confidence limits in SAS 9.2.
"row" (after nostd) includes the row% in the output - otherwise, you only get
the total%;


************************************

*Table 5: What are education/content risk factors for inadequate and adequate
plus PNC (COR/AOR and 95% CI);

*Crude OR - comparing "inadequate/intermediate" to "adequate";
Proc surveylogistic data= prams.newPRAMS order = formatted;
strata stratumc;
*/cluster clustervariable;
weight wtanal;
class SMK_TLK/param = ref;
model indexsum_3gp = SMK_TLK;
where indexsum_3gp ne 3;
run;
Proc surveylogistic data= prams.newPRAMS;
strata stratumc;
*/cluster clustervariable;
weight wtanal;
class BF_TLK/param = ref;
model indexsum_3gp = BF_TLK;
where indexsum_3gp ne 3;
run;
Proc surveylogistic data= prams.newPRAMS;
strata stratumc;
*/cluster clustervariable;
weight wtanal;
class DRK_TLK/param = ref;
model indexsum_3gp = DRK_TLK;
where indexsum_3gp ne 3;
run;
Proc surveylogistic data= prams.newPRAMS;
strata stratumc;
*/cluster clustervariable;
weight wtanal;
class BELT_TLK/param = ref;
model indexsum_3gp = BELT_TLK;
where indexsum_3gp ne 3;
```

```
run;
Proc surveylogistic data= prams.newPRAMS;
strata stratumc;
*/cluster clustervariable;
weight wtanal;
class BC_TLK/param = ref;
model indexsum_3gp = BC_TLK;
where indexsum_3gp ne 3;
run;
Proc surveylogistic data= prams.newPRAMS;
strata stratumc;
*/cluster clustervariable;
weight wtanal;
class MEDS_TLK /param = ref;
model indexsum_3gp = MEDS_TLK ;
where indexsum_3gp ne 3;
run;
Proc surveylogistic data= prams.newPRAMS;
strata stratumc;
*/cluster clustervariable;
weight wtanal;
class DRUG_TLK/param = ref;
model indexsum_3gp = DRUG_TLK;
where indexsum_3gp ne 3;
run;
Proc surveylogistic data= prams.newPRAMS;
strata stratumc;
*/cluster clustervariable;
weight wtanal;
class BDEF_TLK/param = ref;
model indexsum_3gp = BDEF_TLK;
where indexsum_3gp ne 3;
run;
Proc surveylogistic data= prams.newPRAMS;
strata stratumc;
*/cluster clustervariable;
weight wtanal;
class LABR_TLK/param = ref;
model indexsum_3gp = LABR_TLK;
where indexsum_3gp ne 3;
run;
Proc surveylogistic data= prams.newPRAMS;
strata stratumc;
*/cluster clustervariable;
weight wtanal;
class  HIVT_TLK/param = ref;
model indexsum_3gp =  HIVT_TLK;
where indexsum_3gp ne 3;
run;
Proc surveylogistic data= prams.newPRAMS;
strata stratumc;
*/cluster clustervariable;
weight wtanal;
class ABUS_TLK/param = ref;
model indexsum_3gp = ABUS_TLK;
```

```
where indexsum_3gp ne 3;
run;

*Adjusted OR - comparing "inadequate/intermediate" to "adequate";
Proc surveylogistic data= prams.newPRAMS;
strata stratumc;
*/cluster clustervariable;
weight wtanal;
class /param = ref;
model indexsum_3gp = ;
where indexsum_3gp ne 3;
run;

*Crude OR - comparing "adequate plus" to "adequate";
Proc surveylogistic data= prams.newPRAMS order = formatted;
strata stratumc;
*/cluster clustervariable;
weight wtanal;
class SMK_TLK/param = ref;
model indexsum_3gp = SMK_TLK;
where indexsum_3gp ne 1;
run;
Proc surveylogistic data= prams.newPRAMS;
strata stratumc;
*/cluster clustervariable;
weight wtanal;
class BF_TLK/param = ref;
model indexsum_3gp = BF_TLK;
where indexsum_3gp ne 1;
run;
Proc surveylogistic data= prams.newPRAMS;
strata stratumc;
*/cluster clustervariable;
weight wtanal;
class DRK_TLK/param = ref;
model indexsum_3gp = DRK_TLK;
where indexsum_3gp ne 1;
run;
Proc surveylogistic data= prams.newPRAMS;
strata stratumc;
*/cluster clustervariable;
weight wtanal;
class BELT_TLK/param = ref;
model indexsum_3gp = BELT_TLK;
where indexsum_3gp ne 1;
run;
Proc surveylogistic data= prams.newPRAMS;
strata stratumc;
*/cluster clustervariable;
weight wtanal;
class BC_TLK/param = ref;
model indexsum_3gp = BC_TLK;
where indexsum_3gp ne 3;
run;
Proc surveylogistic data= prams.newPRAMS;
```

```
strata stratumc;
*/cluster clustervariable;
weight wtanal;
class MEDS_TLK /param = ref;
model indexsum_3gp = MEDS_TLK ;
where indexsum_3gp ne 1;
run;
Proc surveylogistic data= prams.newPRAMS;
strata stratumc;
*/cluster clustervariable;
weight wtanal;
class DRUG_TLK/param = ref;
model indexsum_3gp = DRUG_TLK;
where indexsum_3gp ne 1;
run;
Proc surveylogistic data= prams.newPRAMS;
strata stratumc;
*/cluster clustervariable;
weight wtanal;
class BDEF_TLK/param = ref;
model indexsum_3gp = BDEF_TLK;
where indexsum_3gp ne 1;
run;
Proc surveylogistic data= prams.newPRAMS;
strata stratumc;
*/cluster clustervariable;
weight wtanal;
class LABR_TLK/param = ref;
model indexsum_3gp = LABR_TLK;
where indexsum_3gp ne 1;
run;
Proc surveylogistic data= prams.newPRAMS;
strata stratumc;
*/cluster clustervariable;
weight wtanal;
class  HIVT_TLK/param = ref;
model indexsum_3gp =  HIVT_TLK;
where indexsum_3gp ne 1;
run;
Proc surveylogistic data= prams.newPRAMS;
strata stratumc;
*/cluster clustervariable;
weight wtanal;
class ABUS_TLK/param = ref;
model indexsum_3gp = ABUS_TLK;
where indexsum_3gp ne 1;
run;

*Adjusted OR - comparing "adequate plus" to "adequate";
Proc surveylogistic data= prams.newPRAMS;
strata stratumc;
*/cluster clustervariable;
weight wtanal;
class /param = ref;
model indexsum_3gp = ;
```

```
where indexsum_3gp ne 1;
run;


************************************

*TABLE 6: Maternal Post-partum Behaviors by Adequacy of PNC;

*unweighted n;
Proc freq data = Prams.Newprams;
tables (BF_POST POSITION_POST BED_POST CARSEAT_POST SMKEXP_POST WELLCHK_POST
BC_POST BADBEHAVIOR)*indexsum_3gp/nocol norow nopercent;
run;

*weighted %: Proc freq crosstab;
Proc freq data= Prams.Newprams;
weight wtanal;
tables (BF_POST POSITION_POST BED_POST CARSEAT_POST SMKEXP_POST WELLCHK_POST
BC_POST BADBEHAVIOR)*indexsum_3gp/nofreq nopercent chisq;
run;

*weighted %: Proc surveyfreq crosstab;
Proc surveyfreq data= Prams.Newprams;
strata stratumc;
*/cluster clustervariable;
weight wtanal;
tables (BF_POST POSITION_POST BED_POST CARSEAT_POST SMKEXP_POST WELLCHK_POST
BC_POST BADBEHAVIOR)*indexsum_3gp/nostd nofreq nowtfreq row col chisq;
run;


************************************

*TABLE 7: What are postpartum behavior risk factors for inadequate and
adequate plus PNC (COR/AOR and 95% CI);

*Crude OR - comparing "inadequate/intermediate" to "adequate";
Proc surveylogistic data= prams.newPRAMS order = formatted;
strata stratumc;
*/cluster clustervariable;
weight wtanal;
class BF_POST/param = ref;
model indexsum_3gp = BF_POST;
where indexsum_3gp ne 3;
run;
Proc surveylogistic data= prams.newPRAMS;
strata stratumc;
*/cluster clustervariable;
weight wtanal;
class POSITION_POST/param = ref;
model indexsum_3gp = POSITION_POST;
where indexsum_3gp ne 3;
run;
Proc surveylogistic data= prams.newPRAMS;
strata stratumc;
```

```
*/cluster clustervariable;
weight wtanal;
class BED_POST/param = ref;
model indexsum_3gp = BED_POST;
where indexsum_3gp ne 3;
run;
Proc surveylogistic data= prams.newPRAMS;
strata stratumc;
*/cluster clustervariable;
weight wtanal;
class CARSEAT_POST/param = ref;
model indexsum_3gp = CARSEAT_POST;
where indexsum_3gp ne 3;
run;
Proc surveylogistic data= prams.newPRAMS;
strata stratumc;
*/cluster clustervariable;
weight wtanal;
class SMKEXP_POST/param = ref;
model indexsum_3gp = SMKEXP_POST;
where indexsum_3gp ne 3;
run;
Proc surveylogistic data= prams.newPRAMS;
strata stratumc;
*/cluster clustervariable;
weight wtanal;
class WELLCHK_POST/param = ref;
model indexsum_3gp = WELLCHK_POST;
where indexsum_3gp ne 3;
run;
Proc surveylogistic data= prams.newPRAMS;
strata stratumc;
*/cluster clustervariable;
weight wtanal;
class BC_POST/param = ref;
model indexsum_3gp = BC_POST;
where indexsum_3gp ne 3;
run;

*Adjusted OR - comparing "inadequate/intermediate" to "adequate";
Proc surveylogistic data= prams.newPRAMS;
strata stratumc;
*/cluster clustervariable;
weight wtanal;
class /param = ref;
model indexsum_3gp = ;
where indexsum_3gp ne 3;
run;

*Crude OR - comparing "adequate plus" to "adequate";
Proc surveylogistic data= prams.newPRAMS order = formatted;
strata stratumc;
*/cluster clustervariable;
weight wtanal;
class BF_POST/param = ref;
```

```
model indexsum_3gp = BF_POST;
where indexsum_3gp ne 1;
run;
Proc surveylogistic data= prams.newPRAMS;
strata stratumc;
*/cluster clustervariable;
weight wtanal;
class POSITION_POST/param = ref;
model indexsum_3gp = POSITION_POST;
where indexsum_3gp ne 1;
run;
Proc surveylogistic data= prams.newPRAMS;
strata stratumc;
*/cluster clustervariable;
weight wtanal;
class BED_POST/param = ref;
model indexsum_3gp = BED_POST;
where indexsum_3gp ne 1;
run;
Proc surveylogistic data= prams.newPRAMS;
strata stratumc;
*/cluster clustervariable;
weight wtanal;
class CARSEAT_POST/param = ref;
model indexsum_3gp = CARSEAT_POST;
where indexsum_3gp ne 1;
run;
Proc surveylogistic data= prams.newPRAMS;
strata stratumc;
*/cluster clustervariable;
weight wtanal;
class SMKEXP_POST/param = ref;
model indexsum_3gp = SMKEXP_POST;
where indexsum_3gp ne 1;
run;
Proc surveylogistic data= prams.newPRAMS;
strata stratumc;
*/cluster clustervariable;
weight wtanal;
class WELLCHK_POST/param = ref;
model indexsum_3gp = WELLCHK_POST;
where indexsum_3gp ne 1;
run;
Proc surveylogistic data= prams.newPRAMS;
strata stratumc;
*/cluster clustervariable;
weight wtanal;
class BC_POST/param = ref;
model indexsum_3gp = BC_POST;
where indexsum_3gp ne 1;
run;

*Adjusted OR - comparing "adequate plus" to "adequate";
Proc surveylogistic data= prams.newPRAMS;
strata stratumc;
```

```
*/cluster clustervariable;
weight wtanal;
class /param = ref;
model indexsum_3gp = ;
where indexsum_3gp ne 1;
run;


************************************

*TABLE 8: PNC education on Maternal Postpartum Behavior by Adequacy groups;

*unweighted n - among inadequate/intermediate;
Proc freq data = Prams.Newprams;
tables (BF_TLK SMK_TLK BC_TLK)*(BF_POST SMKEXP_POST BC_POST)/nocol norow
nopercent;
where indexsum_3gp = 1;
Title 'unweighted n - inadequate/intermediate';
run;

*weighted % - among inadequate/intermediate;
Proc surveyfreq data= Prams.Newprams;
strata stratumc;
*/cluster clustervariable;
weight wtanal;
tables (BF_TLK SMK_TLK BC_TLK)*(BF_POST SMKEXP_POST BC_POST)/nostd nofreq
nowtfreq row col chisq;
where indexsum_3gp = 1;
Title 'weighted % - inadequate/intermediate';
run;

*COR - among inadequate/intermediate;
Proc surveylogistic data= prams.newPRAMS;
strata stratumc;
*/cluster clustervariable;
weight wtanal;
class BF_TLK/param = ref;
model BF_POST = BF_TLK;
where indexsum_3gp = 1;
run;
Proc surveylogistic data= prams.newPRAMS;
strata stratumc;
*/cluster clustervariable;
weight wtanal;
class SMK_TLK/param = ref;
model SMKEXP_POST = SMK_TLK;
where indexsum_3gp = 1;
run;
Proc surveylogistic data= prams.newPRAMS;
strata stratumc;
*/cluster clustervariable;
weight wtanal;
class BC_TLK/param = ref;
model BC_POST = BC_TLK;
where indexsum_3gp = 1;
```

```
run;


*unweighted n - among adequate;
Proc freq data = Prams.Newprams;
tables (BF_TLK SMK_TLK BC_TLK)*(BF_POST SMKEXP_POST BC_POST)/nocol norow
nopercent;
where indexsum_3gp = 2;
Title 'unweighted n - adequate';
run;

*weighted % - among adequate;
Proc surveyfreq data= Prams.Newprams;
strata stratumc;
*/cluster clustervariable;
weight wtanal;
tables (BF_TLK SMK_TLK BC_TLK)*(BF_POST SMKEXP_POST BC_POST)/nostd nofreq
nowtfreq row col chisq;
where indexsum_3gp = 2;
Title 'weighted % - adequate';
run;

*COR - among adequate;
Proc surveylogistic data= prams.newPRAMS;
strata stratumc;
*/cluster clustervariable;
weight wtanal;
class BF_TLK/param = ref;
model BF_POST = BF_TLK;
where indexsum_3gp = 2;
run;
Proc surveylogistic data= prams.newPRAMS;
strata stratumc;
*/cluster clustervariable;
weight wtanal;
class SMK_TLK/param = ref;
model SMKEXP_POST = SMK_TLK;
where indexsum_3gp = 2;
run;
Proc surveylogistic data= prams.newPRAMS;
strata stratumc;
*/cluster clustervariable;
weight wtanal;
class BC_TLK/param = ref;
model BC_POST = BC_TLK;
where indexsum_3gp = 2;
run;

*unweighted n - among adequate plus;
Proc freq data = Prams.Newprams;
tables (BF_TLK SMK_TLK BC_TLK)*(BF_POST SMKEXP_POST BC_POST)/nocol norow
nopercent;
where indexsum_3gp = 3;
Title 'unweighted n - adequate plus';
run;
```

```
*weighted % - among adequate plus;
Proc surveyfreq data= Prams.Newprams;
strata stratumc;
*/cluster clustervariable;
weight wtanal;
tables (BF_TLK SMK_TLK BC_TLK)*(BF_POST SMKEXP_POST BC_POST)/nostd nofreq
nowtfreq row col chisq;
where indexsum_3gp = 3;
Title 'weighted % - adequate plus';
run;

*COR - among adequate plus;
Proc surveylogistic data= prams.newPRAMS;
strata stratumc;
*/cluster clustervariable;
weight wtanal;
class BF_TLK/param = ref;
model BF_POST = BF_TLK;
where indexsum_3gp = 3;
run;
Proc surveylogistic data= prams.newPRAMS;
strata stratumc;
*/cluster clustervariable;
weight wtanal;
class SMK_TLK/param = ref;
model SMKEXP_POST = SMK_TLK;
where indexsum_3gp = 3;
run;
Proc surveylogistic data= prams.newPRAMS;
strata stratumc;
*/cluster clustervariable;
weight wtanal;
class BC_TLK/param = ref;
model BC_POST = BC_TLK;
where indexsum_3gp = 3;
run;
```