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Determinants of Prenatal Care and Supplement Use: The Case of Honduras

Catherine E. Henze
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DETERMINANTS OF PRENATAL CARE AND SUPPLEMENT USE: THE CASE OF HONDURAS

Catherine E. Henze
PMCH 691 – MPH Research Project

Virginia Commonwealth University
Medical College of Virginia Campus
School of Medicine

Department of Preventive Medicine and Community Health

Master of Public Health Program

Ilene Speizer, PhD, MHS

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Submission Statement
for the MPH Research Project

This MPH Research Project report is submitted in partial fulfillment of the requirements for a Master of Public Health degree from Virginia Commonwealth University's School of Medicine. I agree that this research project report be made available for circulation in accordance with the program's policies and regulations pertaining to documents of this type. I also understand that I must receive approval from my Faculty Advisor in order to copy from or publish this document, or submit to a funding agency. I understand that any copying from or publication of this document for potential financial gain is not allowed unless permission is granted by my Faculty Advisor or (in the absence of my Faculty Advisor) the Director of the MPH Program.

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Project Agreement Form
for the MPH Research Project

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Number of semester hours (3-6): 3 Semester: Summer Year: 2004

Please complete the following outline. **Do not exceed 2 pages (A-H).**

A. PROJECT TITLE:
Determinants of Prenatal Care and Supplement Use: The Case of Honduras

B. PURPOSE (state hypothesis/research question):
What are the differences in characteristics of Honduran women who used prenatal care and supplements during their last pregnancy compared to those who did not?

C. SPECIFIC OBJECTIVES (list major aims of the study):
1) To review literature on the importance and effects of prenatal supplement use (prenatal, iron, and folic acid supplements) and prenatal care on maternal and birth outcomes.
2) To examine the differences in characteristics between Honduran women who used prenatal supplements and prenatal care during their last pregnancy and Honduran women who did not.
3) To explore the relationship between intentionality of the pregnancy and prenatal supplement and prenatal care use.
4) To identify the characteristics of women least likely to use prenatal supplements and prenatal care and recommend interventions to increase use of these services.

D. DESCRIPTION OF METHODS

D.1. Identify source(s) of data (eg, existing data set, data collection plans, etc):
This project will use existing data from the Honduran Association of Family Planning (ASHONLAFA) in conjunction with the CDC. The data were collected in 2001 through the Epidemiology and Family Health National Survey (ENESF-2001) of women.

D.2. State the type of study design (eg, cross-sectional, cohort, case-control, intervention, etc):
The cross-sectional study used a multi-stage sampling design.

D.3. Describe the study population and sample size:
N = 8362 Honduran women ages 15-49 were surveyed.

D.4. List variables to be included (If a qualitative study, describe types of information to be collected)
*Use of prenatal care during pregnancy
*Use of general prenatal supplements, iron supplements, and folic acid supplements
*Age, location, education, marital status, cigarette smoking, parity, history of stillbirths and miscarriages, contraceptive use, gestational period at prenatal care and supplement initiation, SES status, age at first sexual relation, age at first pregnancy, intentionality of pregnancy.

D.5. Describe methods to be used for data analysis (If a qualitative study, describe general approach to compiling the information collected)
Bivariate (cross-tabulations) and multivariate logistic regression will be used. All analyses will be weighted to make the data representative of the Honduras female population. While the data were collected using a clustered survey design, the analyses will not correct for the clustered nature of the data (to be discussed in the limitations).

E. ANTICIPATED RESULTS:

We anticipate differences in characteristics between Honduran women who use prenatal supplements and prenatal care and those who do not. We expect to see differences in use by age, urban and rural areas, education, SES, parity, contraceptive use, and intentionality of pregnancy.

F. SIGNIFICANCE OF PROJECT TO PUBLIC HEALTH:

While there is conflicting evidence on the benefits of prenatal care and prenatal supplement use, they are regarded as important preventive measures in maternal health and birth outcomes. Overall, it appears that prenatal care and supplement use can result in favorable maternal and child health outcomes: decreased incidence of maternal and infant mortality, neural tube birth defects, congenital heart defects, anemia, preterm birth, low birth weight, and SIDS and improved nutrition of the mother and infant. Increasing prenatal care and supplement use may also be cost-effective preventive measures. Identifying differences between Honduran women who use prenatal care and supplements and those women who do not will provide information on which women most need public health intervention to increase their access to, quality of, and use of prenatal care and supplements. Improving the maternal and child health of women in Honduras and other developing countries is of great significance to the public health field.

G. IRB Status:

1) Do you plan to collect data through direct intervention or interaction with human subjects? ___yes __X__no

2) Will you have access to any existing identifiable private information? ___yes _X_no

If you answered "no" to both of the questions above, IRB review is not required.
If you answered "yes" to either one of these questions, your proposed study must be reviewed by the VCU Institutional Review Board (IRB). Please contact Dr. Turf or Dr. Buzzard for assistance with this procedure.

Please indicate your IRB status:
___ to be submitted (targeted date_____)
___ submitted (date of submission _____; VCU IRB # _____)
___ IRB exempt review approved (date_____)
___ IRB expedited review approved (date_____)
_X_ IRB approval not required

H. PROPOSED SCHEDULE: Start Date: 05/24/04 End Date: 07/30/04

I. INDICATE WHICH OF THE FOLLOWING AREAS OF PUBLIC HEALTH KNOWLEDGE WILL BE DEMONSTRATED:

1. Biostatistics – collection, storage, retrieval, analysis and interpretation of health data; design and analysis of health-related surveys and experiments; and concepts and practice of statistical data analysis. __X_yes ___no (if yes, briefly describe): This study involves completing secondary statistical analyses on existing data from health-related surveys

2. Epidemiology – distributions and determinants of disease, disabilities and death in human populations; the characteristics and dynamics of human populations; and the natural history of disease and the biologic basis of health. __X_yes ___no (if yes, briefly describe): This study will examine the importance of using prenatal care and supplements, the characteristics of Honduran women who use them versus those who do not. The public health implications for these differences will be discussed.

3. Environmental Health Sciences – environmental factors including biological, physical and chemical factors which affect the health of a community. ___yes _X__no (if yes, briefly describe):

4. Health Services Administration – planning, organization, administration, management, evaluation and policy analysis of health programs. ___yes _X_no (if yes, briefly describe):

5. Social/Behavioral Sciences – concepts and methods of social and behavioral sciences relevant to the identification and the solution of public health problems. __X_yes ___no (if yes, briefly describe): Using prenatal care and supplements are protective maternal behaviors. This study will examine the characteristics of women who practice this health behavior versus those that don't and will identify the women who most need intervention to increase use of prenatal vitamins.

Preceptor: Name: Same as Faculty Advisor Title: _____

Address: _____

E-mail: _____ Phone: _____

Field of expertise: _____

Faculty Advisor: Name: Ilene Speizer, PhD

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SIGNATURES:

Student: _____ Date: _____

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Faculty Advisor: _____ Date: _____

MPH Program Director: _____ Date: _____

MPH Program Coordinator: _____ Date: _____

MPH Research Project Approval Form

Determinants of Prenatal Care and Supplement Use: The Case of Honduras

Submitted to the Graduate Faculty of the
Department of Preventive Medicine and Community Health
Virginia Commonwealth University

In partial fulfillment of the requirements for the degree of
Master of Public Health

Comments:

Approval signatures:

MPH Student	Date
MPH Research Project Faculty Advisor	Date
MPH Program Director	Date
MPH Program Coordinator	Date

DEDICATION

This paper is dedicated to my mom and stepfather, Martha and John, my dad and stepmother, David and Roxann, and my brothers and sisters, Zoey, Caroline, Davey, and Margaret, for your unconditional love, encouragement, and support.

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TABLES

ACKNOWLEDGMENTS

I would like to express my appreciation to my advisor, Dr. Ilene Speizer, for her constant guidance, support, and high expectations throughout this process. Additionally, I would like to thank her and the Centers for Disease Control and Prevention for allowing me to use data from the 2001 Epidemiology and Family Health National Survey conducted in Honduras.

I also would like to thank Department of Preventive Medicine and Community Health faculty, staff, and students, particularly Ms. Lisa Anderson, Ms. Karen Bryant, and Ms. Rhonda Stanfield, for your assistance and support throughout this process.

To my mom who has experienced a dissertation, thank you for all the little tips of advice.

Finally, I wish to acknowledge all of my family and friends for their support, encouragement, and understanding while I pursued my Master of Public Health degree.

Catherine E. Henze
Summer 2004

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ABSTRACT

Context: Literature suggests that prenatal care and prenatal supplement use improves pregnancy outcomes. However, we do not know the factors associated with prenatal care and supplement use in Honduras.

Objective: To identify characteristics of Honduran women who are the least and most likely to use prenatal care and supplements.

Methods: Data from a 2001 Honduras cross-sectional survey of women was used to assess their use of prenatal care and supplements. All data was weighted, resulting in a sample size of n = 5647 women who had a live birth since January 1996. Bivariate and multivariate analyses were used to examine factors associated with prenatal care and supplement use.

Results: Current education level was highly positively related to prenatal care and supplement use. Women who were 35 years or older at the time of their most recent birth, currently unmarried, of non-Catholic religious affiliation, and of low SES were significantly less likely to have used prenatal care and supplements. Women who reported the intentionality of their most recent birth as unwanted also were significantly less likely to have used prenatal care and supplements. Prenatal care was the most significant determinant of prenatal supplement use.

Conclusion: There are significant differences between Honduran women who use prenatal care and supplements and women who do not. Efforts to increase prenatal health services among underserved women, especially women who are older, unmarried, with no formal education, of low SES, of a non-Catholic religious affiliation, and at risk for an unwanted pregnancy, may significantly improve pregnancy outcomes in Honduras.

INTRODUCTION

In developing countries, child and mother health is far behind that of industrialized countries.[1,2,3,4] The significant disparities in child and maternal health indicators, in particular infant and maternal mortality, between developed and developing countries are greatly attributed to prenatal health service utilization and behaviors such as prenatal and obstetrical care and prenatal supplement use.[1,2,3,4,5,6,7,8,9,10,11,12]

Prenatal care has played an important role in the reduction of infant mortality and morbidity.[4,6,7] In countries with the lowest infant mortality rates, prenatal care is readily available.[6] Lack of prenatal care has been shown to be a major risk factor for poor pregnancy outcomes.[6] Studies have found increased utilization of prenatal care to be associated with a lower incidence of low birth weight, increased gestational age, lower infant mortality, and lower rates of preterm delivery.[7,8,13,14,15,16] In U.S. studies, prenatal care has also been found to be the most cost-effective means for preventing low birth weight.[17,18] A study in nearby Brazil found that each 10 percent increase in up-to-date prenatal care would result in 6.6 fewer infant deaths per 1,000 live births.[7] Infants from women who attended no prenatal care visits are at a two-fold higher risk (range: 2.04-2.29) of being low birth weight as compared to infants of women who had received at least some prenatal care.[7] A study in Chile discovered that women with good prenatal care had approximately one-third the rate of preterm deliveries and one-half the rate of perinatal mortality compared to that of women with poor or no prenatal care.[8] Low birth weight infants who were born to women with prenatal care appear to have fewer neonatal intensive care days, shorter hospitalizations, better survival rates and fewer morbidities such as respiratory illness.[15]

Literature does not suggest that prenatal care significantly reduces maternal mortality.[2] Women who receive early prenatal care may be more likely to receive quality perinatal care compared to those who start prenatal care later in their pregnancies or not at all.[17] Prenatal care may strive for early detection of obstetrical complications or high-risk pregnancies and, therefore, initiate prevention or intervention.[16] However, Maine argues that literature does not support the approach that maternal mortality can be prevented through prenatal care programs in which obstetrical complications can be detected, predicted, or treated early, claiming that most obstetrical complications cannot be prevented or predicted.[2] Maternal mortality appears to be mostly improved by essential obstetric care services, specifically for emergency obstetrical complications.[1,2]

Prenatal supplement use has also been associated with improved pregnancy outcomes. Folic-acid containing supplements have been shown to reduce the risk of occurrent and recurrent neural tube defects by respective 60 and 70 percents, as well as other major, non-genetic syndromatic congenital abnormalities, urinary tract anomalies, cardiovascular defects, and orofacial clefts.[19,20,21,22] Folate in combination with iron has shown positive effects on gestational weight gain and duration of pregnancy.[22] Low folate and zinc intakes and circulating concentrations have been related to increased risks of preterm delivery and infant low birth weight.[21,22]

Iron deficiency anemia, highly prevalent in developing countries, appears to increase the risk of preterm delivery and low calcium intake increases the risk of preeclampsia.[22] In a study of multivitamin and mineral prenatal supplement use, women who started supplement use in the first trimester were found to have had a two-fold reduction in risk of preterm delivery and four-fold reduction in risk of very preterm delivery.[22] Their risk of low birth weight and very low

birth weight decreased by two-fold and six-fold, respectively.[22] Even for women who did not begin multivitamin and mineral prenatal supplement use until the second trimester, their risk for preterm and very preterm delivery decreased by two-fold.[22] Their risk of low birth weight and very low birth weight decreased by approximately two-fold and seven-fold.[22] Other studies on the effects of multivitamin and mineral supplements have demonstrated similar reductions in preterm delivery and low birth weight.[23]

With approximately 58 percent of women in developing countries suffering from anemia, mothers may also benefit from prenatal iron supplementation through an alleviation of anemic symptoms.[3] They may experience improved physical well-being, less fatigue, improved appetite, and an appreciation for the benefits to the fetus.[3]

Studies on the effects of micronutrients are difficult in that pregnant women in developing countries may experience multiple micronutrient deficiencies, making it difficult to assess the true benefits of a single micronutrient when deficiencies are still present.[12] Even when supplementing with multiple micronutrients, a diet that remains inadequate in calories and protein would be limiting and it would be difficult to pinpoint the benefits that follow from each micronutrient.[12]

While studies have shown that prenatal care and supplement use can have significant positive pregnancy outcomes, especially on birth outcomes, many women in developing countries do not have access to or are not utilizing prenatal care and supplements.[3,9,10,11,12,16] Therefore, it is important to determine the characteristics that influence use versus non-use of prenatal care and supplement use. Research in developing countries has found many factors to be associated with prenatal care utilization. The woman's education level has a positive and significant association on the use of prenatal care.[8,10,11,24,25,26,27] A study by Faundes in Chilé

found that of the women studied, 40 percent with little or no education had good prenatal care compared to 48% of women with 3-8 years of education and 53% with higher education.[8] Health insurance coverage, income, household wealth, and housing characteristics such as presence of electricity in the house appear to be positively associated with prenatal care use.[10,25,26,28] Women whose husbands held blue-collar occupations were significantly less likely to use prenatal care while women with husbands in white-collar occupations were more likely to use prenatal care.[10,28] Potter claims that poverty and lack of familiarity with Western culture are important barriers to modern maternal health services.[26] Potter also found that persons speaking only an indigenous language were less likely to use prenatal care.[26]

Being married and duration of the marriage are positively associated with prenatal care use.[8,11] In his study, Faundes found that only 35% of single women had good prenatal care compared to 57% of married women.[8] Increasing maternal age has been associated with use of prenatal care, however, being 30 years or older has been negatively associated with prenatal care use.[11,29] Women living in rural areas appear to be less likely to use prenatal care than women residing in urban areas.[10,11,16,24] One study conducted in Brazil demonstrated that 80% of women in urban areas had at least some prenatal care while more than 40% of women residing in rural areas had no prenatal care at all.[24] Ethnicity and religious background are also associated with prenatal care use.[10,27]

Research shows parity to be associated with prenatal care utilization, but the direction of the association varies.[10,11,25] Celik et al. found that women pregnant with their first child were more likely to use prenatal care than women with two or more previous pregnancies.[10] However, Abbas et al. found that women of low parity (1-3) and high parity (7+) were significantly less likely to use prenatal care compared to women with parity of 4-6 children.[11] In the U.S., use of

family planning services and intentionality of the pregnancy also have been found to be factors associated with prenatal care utilization such that women having unintended pregnancies attend prenatal care later or not at all.[30,31,32]

There are some system factors that relate to prenatal care use as well. Presence of well-trained, well-equipped medical professionals is positively associated with prenatal care use.[10] Availability and accessibility of health services (i.e. existence of good roads, distance to services, and time and cost involved in traveling to services) are significantly associated with prenatal care use.[10,26]

Studies in the U.S. have found increased primiparity, early nausea during pregnancy, earlier entry into care, increasing education level, increasing maternal age, and ethnicity (white) to be positively associated with prenatal supplement use.[22,33] O'Scholl et al., found a high percentage of women using prenatal supplements, particularly women who began use in the first trimester, had had pregnancy complications such as early bleeding.[22] Specific to folate supplements, O'Scholl reported the following negative associations: ethnicity (African-American and Hispanic), being unmarried, under 20 years of age, having less than a high school level education, multiparity, late entry into prenatal care, maternal confidence that her diet is good, an unstable home life, and side effects attributed to the supplement.[21] She also reported that women with a history of adverse pregnancy outcomes were more likely to use supplements preconceptionally.[21] However, research conducted in the United Kingdom found that supplementation during pregnancy was not affected by age, social class or reproductive history, but that it was influenced by advice that was received and whether or not the woman took iron supplements.[34] The researchers found that prevalence of supplementation use among women who had received advice about vitamins during their pregnancy was almost three times as high

compared to women who had not received advice.[34] The prevalence of supplementation use was highest among women who had received a specific recommendation for use and lowest among women who had been advised against it.[34]

One study found that women with unwanted pregnancies were less likely to report preconceptional and prenatal daily vitamin use and less likely to increase daily vitamin use during pregnancy than women with intended pregnancies.[31] Wulff et al. found that Swedish women's use of iron-containing supplements during pregnancy was influenced by side effects of supplements, perceived need, and advice from midwives.[35]

Determinants of prenatal supplement use in the U.S., U.K. and other industrialized countries may differ from that of developing countries. Galloway et al. conducted a study on iron deficiency anemia and supplementation and women's perceptions in eight developing countries including Honduras.[3] The research shows that experiencing negative side effects is one reason for non-compliance with iron supplements during pregnancy but not the major reason as only one-tenth of the women in iron supplementation trials quit use due to side effects.[3] The results showed that other barriers to iron supplement use included difficult access to and poor utilization of prenatal care services, lack of knowledge and awareness of anemia and its consequences, beliefs against consuming medications during pregnancy, and fears that taking too much iron may cause too much blood and increase birth weight, thereby making the delivery more difficult.[3] Health system factors negatively associated with iron supplement use include poor access to supplies (i.e. poor utilization of prenatal care or inadequate supplies), poor quality of the tablets, inadequate counseling by and training of health providers, poor distribution systems, and ineffective communication materials.[3,12]

PURPOSE

To date, we do not know specific factors associated with prenatal care and prenatal supplement use in Honduras. It is important to examine both outcome variables because a woman may attend prenatal care, but not use prenatal supplements or vice versa. Knowing the determinants of prenatal care and prenatal supplement utilization are important in designing public health interventions to target the underserved populations. This study will examine the differences in characteristics between Honduran women who used prenatal care and prenatal supplements in their last pregnancy and Honduran women who did not. This research also aims to explore the relationship between intentionality of the pregnancy and prenatal care and supplement use. Through this analysis, we seek to identify the characteristics of women least likely to use prenatal care and prenatal supplements and recommend interventions to increase use of these services.

METHODS

Study Setting

Honduras, a country located in Central America, has a population of approximately 6.7 million.[5,36] In the United Nations Human Development Index, Honduras is ranked at the lower end of the medium human development category: 115th out of 175 countries.[37] The country's literacy rate is 75.7 with no disparities between males and females.[5] The total fertility rate is 4.3 among women ages 15-49.[36] According to Population Reference Bureau's 2003 country profile, Honduras has an infant mortality rate of 37.1 per 1000 live births and a maternal mortality rate of 220, although another source reports 108, per 100,000 live births.[5,36] In comparison, the United States, ranked 7th, has an MMR of 9.8 per 100,000 live births and an IMR of 6.9 per 1,000 live

births in 2000.[37,38] Honduras has a 9.1% prevalence of low birth weight and a high prevalence of neural tube defects (2.6 per 1,000 live births).[5,39]

Study Design and Data Collection

The target population was Honduran women of childbearing age who had ever been or were currently pregnant. This study uses existing data from the 2001 Epidemiology and Family Health National Survey (ENESF-2001) of women. The Honduran Association of Family Planning (ASHONLAFA), in conjunction with the CDC, conducted the cross-sectional survey using a multi-stage sampling design. 400 primary sampling units (PSU), each representing census segments, were selected for the survey. The PSU's probability of selection was proportional to the size of the population of the PSU. Within each PSU, each household had the same probability of selection and thirty households were selected. Female interviewers collected survey data in one-on-one interviews of Honduran women ages 15-49. In total, data were collected on n = 8362 Honduran women ages 15-49.

Data Measures

Among women who had their last child born alive since January 1996, the outcome variable, prenatal care, was measured by the following questions: "Did you receive any prenatal care while pregnant with [name of last child born alive]," "In total, how many prenatal care visits did you have," "During which month of your pregnancy did you have your first prenatal care visit?" We categorized the number of prenatal care visits into groups of 1-4, 5-8, and 9+ visits. We determined the trimester in which prenatal care was initiated by classifying women who reported their first visit in the first to third month into a first trimester group, women who reported their first visit in the fourth to sixth month into a second trimester group, and women who reported their first visit in the seventh to ninth month into a third trimester group.

Among women who had a baby born alive since 1999, prenatal supplement use was determined by the following questions asked about each supplement: "During the pregnancy of [name of last child born alive] did you take: a) prenatal vitamins, b) iron tablets, and/or c) folic acid tablets," "How many months pregnant were you when you started taking them [prenatal vitamins, iron, or folic acid]," and "For how many months did you take them [prenatal vitamins, iron, or folic acid] during the pregnancy?" The trimester in which use was initiated was classified the same way as prenatal care. The number of months of the respective supplement use was classified into 1-3, 4-6, and 7-9 months categories. For ease of statistical analysis, we created an "Any Supplement Use" variable to account for use of any of the prenatal supplements (prenatal vitamins, iron tablets, and/or folic acid tablets).

Independent variables that were examined include current age (15-19, 20-24, 25-29, 30-34, 35-39, 40+); age at the time of the last live birth (< 20, 20-24, 25-29, 30-34, 35+); current marital status (married, living with a partner, formerly married [divorced, separated, widowed], single); religious affiliation (Catholic, Evangelical/Protestant, none/other); area of residence (urban or rural); current education level (none, incompleted primary education, completed primary education, incompleted secondary education, completed secondary education or higher); current socioeconomic status (SES) (low, medium, high); total number of children born alive; and time, in years, since the last live birth (<1, 1-2, 3-5). Socioeconomic status was assessed through a goods and services index based on presence of nine household characteristics: piped water, toilet, electricity, radio, television, refrigerator, telephone, private vehicle, and electric or gas stove. Intentionality of the last birth (intended, mistimed, unwanted) was also included in analyses and measured by asking "When you got pregnant with [name of last child born alive] did you want to become pregnant then, wanted to wait, or not want to have anymore children."

Data Analysis

For the purposes of this study, we excluded women who had never been pregnant, decreasing unweighted sample size to n = 6807. Based on the nature of the prenatal care and supplement use measures, we only included women who had their last live birth since January 1996 (n = 4486). Due to oversampling of some areas of Honduras, it was necessary to weight the data to make the observations more representative of the Honduras female population. The weighted number of observations is n = 5647. All analyses were weighted. Although the data were collected using a clustered survey design, we did not correct for the clustered nature of the data. All data were analyzed using SPSS. We conducted univariate and bivariate analyses. In the bivariate analyses, we used Pearson chi-square analysis to determine any significant differences among the women's characteristics. We also conducted multivariate logistic regression analyses to examine factors associated with prenatal care use and supplement use. All adjusted results are reported as odds ratios. $P \leq 0.05$ was used to determine statistical significance.

RESULTS

Table 1 describes characteristics of the women aged 15-49 who had a live birth since January 1996 from the 2001 Honduras sample. The majority of the women in this sample were 29 or younger, married or in consensual union, and Catholic. More of these women lived in a rural area (56.9%) rather than an urban area (43.1%). Seventy-seven percent of the women did not have higher than a primary education level. Most of them were of a low or middle socioeconomic status. Approximately 25% of the women were reporting on a last birth that was their fifth or higher order live birth. Almost half of the last births were reported as intended, 23% as mistimed, and the remaining 29% were unwanted.

Table 2 shows the overall distribution of prenatal care use, prenatal vitamin use, and any supplement use among the women who had a birth since 1996 (1999 for supplement use). Eighty-five percent of the women reported prenatal care use during the pregnancy of their last child born alive. Of those who reported prenatal care use, 67.4% had their first prenatal care visit during the first trimester, 27.2% during the second trimester, and 4.9% during the third trimester. The majority of prenatal care users (58.4%) reported 5-8 visits, 27.4% reported 1-4 visits, and 13.2% reported 9+ visits.

Prenatal vitamin, iron tablet, and folic acid use was only assessed among women who had their last live birth since 1999. Of all ever pregnant women since 1996 (n = 5647) there were n = 1848 women who had their last live birth prior to 1999 and, therefore, were not asked the question on prenatal supplement use. In total, the number of women with births since 1999 was n = 3799. Of those, 66.6% used prenatal vitamins during the pregnancy of their last live birth. Among prenatal vitamin users, 58.8% initiated use in the first trimester, 25.1% in the second trimester, and 5.4% in the third trimester. Although use tended to be initiated early, only 29.3% used prenatal vitamins for 7-9 months, while 23.2% and 46.3% used for 1-3 and 4-6 months, respectively. Prevalence of any prenatal supplement use, defined as use of at least one prenatal supplement (prenatal vitamins, iron tablets, and/or folic acid tablets), was 74.9%. Because the prevalence rates of prenatal vitamin use and any prenatal supplement use were similar, any prenatal supplement use was used in the Pearson chi-square and multivariate logistic regression analyses.

Table 3 presents the distribution and significance of prenatal care utilization by the sampled women's characteristics. Significance tests found all the demographic characteristics to be associated with prenatal care in the expected directions. All significance tests were $p \leq 0.001$

except for years since last birth ($p \leq 0.01$). Use of prenatal care declined with increasing maternal age at birth. Women who were currently married or in consensual union were significantly more likely to use prenatal care during the pregnancy of their last live birth than women who were formerly married or single. Women with more education were more likely to have used prenatal care. Ninety-eight percent of those with a secondary or higher education level reported attending prenatal care while only 66.3% of those with no education reported attending prenatal care. Those with Catholic and Evangelical/Protestant religious affiliations reported less use of prenatal care than those with none/other religion. Women who lived in an urban area were more likely to use prenatal care (88.3%) than those who lived in a rural area (82.5%). As socioeconomic status increased so did the use of prenatal care: 80.8% for low SES, 84.9% for middle SES, and 94.3% for high SES.

Prenatal care appears to be associated with lower parity with 91.9% of women reporting about their first birth using prenatal care, 87.1% of women reporting about their second birth using prenatal care, 87.2% of women reporting about their third birth, 83.5% of women reporting about their fourth birth, and only 75.4% of women reporting about their fifth or higher live birth reporting use. Women whose last live birth was prior to 1999 were less likely to report prenatal care use (83.2%) than those whose last live birth was since 1999 (86.1%). Women who reported an intended or mistimed last birth reported similar rates of prenatal care use, 88.7% and 87.7% respectively, but among those who reported their last live birth as unwanted, only 77% used prenatal care.

Table 4 shows two multivariate logistic regression models used to generate the adjusted odds ratios for prenatal care use among the sampled women. Because of a high correlation (0.71) between age at last birth and total number of live births, Model 1 adjusts for all variables

except for total number of live births and Model 2 includes number of live births but not age at last birth. In Model 1, women who were 35 or older at the time of the last birth were significantly less likely to have used prenatal care (OR 0.67 [0.52, 0.86]) than women age 25-29. Having the last live birth 3-5 years prior to the survey decreased the use of prenatal care by 0.74 times (0.63, 0.87). Compared to married women, single women were the least likely to have used prenatal care (OR 0.26 [0.18, 0.38]) followed by formerly married women (OR 0.44 [0.34, 0.56]) and the women who were living in consensual union (OR 0.58 [0.47, 0.71]). None/other religious affiliation was associated with a significant decrease in prenatal care use (OR 0.73 [0.59, 0.91]).

After adjusting for other variables, living in a rural area became insignificant. However, we attribute this to the high correlations between area of residence, SES, and education level. In Model 1, those with a high socioeconomic status were 1.68 times [1.20, 2.36] more likely to have used prenatal care than those of low SES. We found middle SES to be insignificant. Current education level was one of the most significant determinants of prenatal care. The pattern suggests that with increasing level of education, the likelihood of using prenatal care increased. The biggest impact was for those with secondary education or higher (OR 12.37 [6.68, 22.9]) compared with those with no education. In a model that dropped education from the model, middle SES became significant in the expected direction, but area of residence remained insignificant (not shown). Finally, women who had not wanted their last live birth were significantly less likely to have used prenatal care (OR 0.59 [0.50, 0.71]) compared to those with an intended birth.

In Model 2, age at last birth was not included but total number of live births was. Compared to women whose last live birth was their first, increasing number of live births was

associated with decreased use of prenatal care: two (OR 0.53[0.41, 0.70]), three (OR 0.59 [0.44, 0.80]), four (OR 0.54 [0.39, 0.74]), and five or more (OR 0.38 [0.29, 0.51]). The direction, magnitude and significance of the other variables were similar to that of Model 1. When age at last birth and total number of live births were analyzed together (not shown), age at last birth became insignificant.

Table 5 shows the distribution of any prenatal supplement use by the sampled women's characteristics. Pearson chi-square analysis found all variables to be significant determinants of prenatal supplement use. All significance tests were $p \leq 0.001$ except for years since last birth ($p \leq 0.05$). Prenatal supplement use peaked among the 25-29 age group while the 19 or younger and the 35+ groups reported the lowest usage. Marital status also affected prenatal supplement use. Married women were the most likely to have used prenatal supplements (87.6%) followed by women in consensual union (80.2%), single women (75%), and formerly married women (73.7%). Catholics were more likely to have used prenatal supplements than women of Evangelical/Protestant and none/other religious affiliations.

Only 78.9% of women living in rural areas reported prenatal supplement use compared to 85.2% of those residing in urban areas. Education was directly correlated with prenatal supplement use with only 64.2% of those with no education reporting prenatal supplement use compared to 96.5% of those with a secondary or higher education level. SES status was positively correlated with prenatal supplement use: 76.6% of low SES, 82.9% of middle SES, and 91.5% of high SES women. Rates of prenatal supplement use were similar among women with one and two live births (86.8% and 85.9%) and with three and four live births (80.0% and 80.7%); however, only 72.3% of women with five or more live births used prenatal supplements. Women who had their last live birth more recently (less than one year) were more likely to have

used prenatal supplements than women whose last live birth was more than one year prior to the survey. There was little difference in prenatal supplement use between women who reported their last live birth as intended or as mistimed (84.6% and 84.3%), but women who reported an unwanted last live birth were less likely to have taken prenatal supplements (73.2%). Suggesting a strong relationship between attending prenatal care and prenatal supplement use, 92.3% of those who attended prenatal care reported prenatal supplement use compared to only 12.8% of those who did not attend prenatal care.

Table 6 shows the adjusted odds ratios for prenatal supplement use. As above, two models are used to reduce problems of multicollinearity due to a high correlation between age at last birth and number of live births. In Model 1, the women who were under 20 at last birth and the women who were 35 or older at last birth were significantly less likely to use prenatal supplements with ORs of 0.75 [0.56, 1.00] and 0.69 [0.50, 0.94] than women age 25-29 at last birth. After adjustment, one or more years since the last birth was no longer significant. Having Evangelical/Protestant and none/other religious affiliations were negatively associated with prenatal supplement use. Marital status appears to be a significant factor in prenatal supplement use. Women who were in consensual union were 0.69 [0.55, 0.88] times less likely to use prenatal supplements compared to women who were married in Model 1. Formerly married women were 0.43 [0.32, 0.59] times less likely to use prenatal supplements. Single women were the least likely to use prenatal supplements (OR 0.41 [0.27, 0.63]).

After adjustment for other factors, neither area nor SES was significant but current education level remained significant. Prenatal supplement use increased with each education level: OR 1.67 [1.32, 2.13] for incompleted primary education, OR 3.03 [2.26, 4.06] for completed primary education, OR 3.84 [2.54, 5.80] for incompleted secondary education, and

OR 9.18 [4.51, 18.65] for completed secondary or higher education. In a model that excluded education (not shown), both middle SES and high SES became significantly more likely to use prenatal supplements compared to those with low SES, but area of residence remained insignificant. Women with an unwanted last live birth were significantly less likely (OR 0.61 [0.49, 0.75]) to have used prenatal supplements than women with an intended or mistimed last live birth.

Except for age at last birth, which was not included in the model, we found that all of the variables that were significant in Model 1 were also significant in Model 2. Model 2 examined the significance of total number of live births. We found that women having three or five or more live births were significantly less likely to use prenatal supplements with ORs of 0.68 [0.50, 0.92] and 0.59 [0.43, 0.80] compared to women reporting about their first birth. The effect for women with four live births was not significant, possibly a consequence of a small sample size in this category.

Because of the significant role of attending prenatal care on determining prenatal supplement use (model not shown), the determinants of these two outcomes are highly correlated. Therefore to better understand determinants of prenatal supplement use, we ran logistic regression analyses for only women who attended prenatal care. This provides a perspective on who used prenatal supplements and who did not among women who attended prenatal care.

Table 7 presents the adjusted odds ratios for prenatal supplement use among prenatal care users. Again, we used two models to account for the correlation between age at last birth and total number of live births. We found some differences in the results of this analysis compared to Table 6. In Model 1, being in consensual union and single marital status,

Evangelical/Protestant religion, and number of live births became insignificant. Being younger than 20 at the last birth became even more negatively associated with prenatal supplement use (OR 0.50 [0.32, 0.78]). Notably, older age at the time of last birth no longer was associated with prenatal supplement use, among users of prenatal care. Of current marital status, only the formerly married category remained a significant determinant of prenatal supplement use (OR 0.52 [0.33, 0.81]). The none/other religious affiliation was still associated with being less likely to use prenatal supplements (OR 0.65 [0.45, 0.96]).

All education levels remained positively correlated with prenatal supplement use; however, the odds ratios became smaller: incompleted primary education (OR 1.49 [1.01, 2.19]), completed primary education (OR 2.44 [1.54, 3.86], incompleted secondary education (OR 3.06 [1.62, 5.81]), and completed secondary education or higher (OR 4.33 [1.82, 10.32]). In the sample of prenatal care users, women with one or more years since their last birth were less likely to have used prenatal supplements (OR 0.62 [0.43, 0.90]) than women who's last birth was in the last year. Unwanted intentionality of the last live birth remained significantly associated with lower use of prenatal supplements. Model 2 was similar to Model 1 with the exception of the Evangelical/Protestant group, which became significant (OR 0.73 [0.53, 0.99]).

Table 8 describes the distribution of the use of prenatal supplements (prenatal vitamins, iron tablets, and folic acid) by the number of prenatal visits, and the trimester in which prenatal care was initiated. Overall, among women who used prenatal care 82.5% used prenatal vitamins, 51.7% took iron tablets, and 42.6% took folic acid. The distribution shows that use of prenatal supplements increased with the number of prenatal care visits. It also shows that women who initiated prenatal care early were more likely to use prenatal supplements.

Pearson chi-square analysis and post-hoc tests found significant differences in prenatal supplement use by number of prenatal visits and the trimester of initiation. For prenatal vitamins, post-hoc tests showed significant differences between 1-4 visits and 5-8 or 9+ visits, but not between the 5-8 and 9+ visits' women. For iron tablets, the tests showed significant differences among all three groups. For folic acid use, the significance was found between 1-4 visits and 5-8 or 9+ visits. This suggests that women who only attended prenatal care for four or fewer visits were less likely to use prenatal supplements compared to women who attended 5-8 or 9+ visits. However, only for iron tablet use was there significant difference between 5-8 visits and 9+ visits, but after five visits, there were no significant differences in prenatal vitamin or folic acid tablet use for women with more visits. Although there were no significant differences in prenatal vitamin use between women who initiated care in the first or second trimesters, women who waited until the third trimester to initiate care were significantly less likely to have used them. Women who began prenatal care in the first trimester were more likely to have used iron tablets and folic acid than all others; however, there were no significant differences in iron or folic acid use between those who initiated care in the second and third trimesters. This suggests women who initiate prenatal care in the first trimester and attend for five or more visits have the most likelihood of using prenatal supplements compared to women who initiate later or have fewer visits.

DISCUSSION

This study found significant differences between the women in Honduras who utilized prenatal care and supplements and the women who did not. In the multivariate analyses, women who were 35 years or older at the time of their last birth were the least likely to use prenatal care and supplements of all the age groups. Women ages 35 years or older may have more children

for whom to care and less time to attend prenatal care or may feel more experienced with pregnancy and childbirth and therefore do not perceive a need for prenatal care or supplements. However, for women ages 35 or older who entered prenatal care, their age was no longer a significant determinant of prenatal supplement use. While women who were 20 years or younger at the time of their most recent birth were not less likely to use prenatal care, they were less likely to use prenatal supplements. This may be attributed to lack of knowledge or awareness of prenatal supplements and their importance or to having no history of any pregnancy complications or adverse outcomes.

Greater time, in years, since the most recent live births was negatively associated with prenatal care and with prenatal supplement use specific to prenatal care users. This may be due to recall bias in that women with more years since their last live birth may not recall their prenatal care and supplement use as well as women who have more recently given birth. This association may also be attributed to improvements in the access to, distribution, awareness, and utilization of prenatal care services and supplements in the more recent period.

Being in a consensual union, formerly married (widowed, separated, or divorced), or single, in order of significance, were negatively correlated with prenatal care and prenatal supplement use before excluding non-users of prenatal care, compared to married women. Women who are not married may have less family, social, and economic support than women who are married. After excluding non-users of prenatal care, only women who were formerly married were significantly less likely to have used prenatal supplements. This finding could be due to the decrease in sample size or the limitation that we could only account for current marital status which does not necessarily reflect the marital status at the time of the most recent birth. The fact that the woman is currently not married may reflect that at the time of the birth she had

less support from her partner. If the woman was formerly married at the time of the most recent birth, she could have had less support in her life than married women or women in consensual union and could have had more emotional issues, socioeconomic problems, and children impacting her life than women who were single.

Education appears to be one of the most significant determinants of prenatal care and supplement use. Educated women may have greater knowledge of reproductive health and the importance of prenatal care and supplement use during pregnancy. They may also have more family and social support and higher socioeconomic status. High SES was positively associated with prenatal care, but was only associated with prenatal supplement use in one model. Area was not significantly associated with prenatal care or prenatal supplement use. Area and SES were not as highly associated with prenatal care as we had anticipated because of the correlation with education. Education may account for the significant differences in use between rural and urban areas and between low, middle, and high SES. SES and education did become more significant when we placed them in separate models (not shown).

Religious affiliation also played a role in prenatal care and supplement use. Women with no religion or a religious affiliation other than Catholic and Evangelical/Protestant were significantly less likely to have used prenatal care and prenatal supplements. Evangelical/Protestant religious affiliations were significantly less likely to use prenatal supplements in all but one model.

Multiparous women were less likely to use prenatal care. Women with parity of three or of five or more were less likely to have used prenatal supplement use before excluding non-users of prenatal care. When we examined determinants of prenatal supplement use only among prenatal care users, parity became insignificant. As age at last birth and parity were so highly

correlated, so are their plausible reasons for association. Women with more children may have less time to attend prenatal care or adhere to prenatal supplement use. They may also feel more experienced with pregnancy and childbirth and do not perceive the need for prenatal care or supplements. That parity became insignificant when considering only prenatal care users suggests that multiparous women who did attend prenatal care were not any less likely to use prenatal supplements than other women whose last live birth was their first.

Women who reported the intention of their most recent birth as unwanted were significantly less likely to use prenatal care and supplements across all models. If a woman's pregnancy is unwanted, she may not recognize her pregnancy as early as woman who wanted or just mistimed her pregnancy. This may delay the initiation of prenatal care and supplement use. She may also be inexperienced or already have had all the children she wanted and therefore was unwilling to put the time and effort into proper prenatal care and supplement use.

Although we did not include it in any of the models, we explored the association between history of negative pregnancy outcomes (any live births who died, stillbirths, and/or spontaneous abortions) and prenatal care and supplement use. Having had at least one live birth who died was significantly associated with prenatal care and supplement use, but we were unable to determine the direction of the association due to the cross-sectional design of the survey and we could not determine which live birth had died.

This study was not without several limitations. The Honduras survey was conducted in 2001. For prenatal care use, women who had had a live birth since January 1996 were questioned and for prenatal supplement use, women who had had a live birth since 1999 were questioned. This could have introduced recall bias into the study, which may be seen in the

negative association between women who had had more years since their last live birth and prenatal care and supplement use.

Another limitation is that we were unable to assess the marital status, educational status, SES level, and area of residence during the most recent pregnancy of the most recent birth. We were only able to examine the current status of those variables. The women's marital status, educational level, SES, and area of residence may have been different at the time of the last birth than at the time of the survey. However, because the associations were similar to what we expected and to findings in other studies, this limitation may not have significantly impacted the results.

A third limitation was that the main factors associated with prenatal supplement use are the same as the factors associated with attendance at prenatal care. To better understand the specific associations with using prenatal supplements, we performed the analysis of prenatal supplement use only among prenatal care users. Prenatal supplement use analyses also had smaller sample sizes compared to that of prenatal care analyses because women who had their births prior to 1999 were not questioned.

A final limitation is that we did not account for the cluster design of the survey, which may bias the results by ignoring intra-cluster correlations between observations from the same sampling units. We decided that this was beyond the scope of the MPH research project, but we did account for the weighted nature of the data.

CONCLUSION

From this study, we can better understand which Honduran women are the least and most likely to use prenatal care and supplements. Women who are older, unmarried, of a non-Catholic religious affiliation, with no formal education, low SES, and multiparous and whose pregnancy

is unwanted are the least likely to use prenatal care and supplements and therefore, should be the most targeted with interventions. The most significant determinant of prenatal supplement use is prenatal care (model not shown). Of those who attend prenatal care, women who initiate care sooner and for five or more visits are the most likely to use prenatal supplements. Increasing the use of prenatal care among those least likely to use it should be the goal of an intervention. If prenatal care utilization increases, prenatal supplement use likely will as well. Indirect interventions may include increasing the education of women in Honduras, increasing the use of family planning to prevent unwanted and mistimed pregnancies, and improving health system factors such as the quality of and access to prenatal care and prenatal supplements. Literature supports that prenatal care and supplement use can improve pregnancy outcomes. Interventions to increase women's use of prenatal care and supplement use among women who are least likely to use them may result in improved pregnancy outcomes and overall child and maternal health in Honduras.

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Table 1. Characteristics of women ages 15 to 49 who had a live birth since Jan. 1996 in the Honduras 2001 sample

	Total	
Variable	**N**	**%**
Age		
15-19	653	11.6
20-24	1501	26.6
25-29	1418	25.1
30-34	961	17.0
35-39	651	11.5
40+	463	8.2
Age at last birth		
<20	1141	20.2
20-24	1630	28.9
25-29	1289	22.8
30-34	815	14.4
35+	771	13.7
Religion		
Catholic	2908	51.5
Evang./Protestant	1885	33.4
None/Other	854	15.1
Current marital status		
Married	1765	31.3
Living w/partner	2795	49.5
Formerly married	819	14.5
Single	268	4.7
Area		
Urban	2435	43.1
Rural	3212	56.9
Current education		
None	673	11.9
Prim. Incomplete	2123	37.6
Prim. Complete	1573	27.9
Sec. Incomplete	737	13.1
Sec. Complete+	541	9.6
SES status		
Low	2401	42.5
Middle	2112	37.4
High	1134	20.1
Total live births		
1	1437	25.4
2	1244	22.0
3	917	16.2
4	648	11.5
5+	1401	24.8
Years since last birth		
< 1	855	15.2
1-2	2863	50.7
3-5	1904	33.7
Unknown	25	0.4
Intentionality of last birth		
Intended	2676	47.4
Mistimed	1311	23.2
Unwanted	1660	29.4

Notes: All N's are adjusted by the weighted design of the survey. Unweighted N = 4486 for women ages 15-49 who had a live birth since January 1996. Some total N's are less than N = 5647 due to missing values.

Table 2. Use of prenatal care and prenatal supplements during the pregnancy of the last child born alive since January 1996 for prenatal care and since 1999 for prenatal supplements

Variable		
PRENATAL CARE		
Prenatal care	**N = 5647**	
Yes	4802	85.0
No	845	15.0
Initial prenatal care visit	**N = 4802**	
1st trimester	3237	67.4
2nd trimester	1308	27.2
3rd trimester	235	4.9
Unknown	22	0.5
Prenatal visits		
	N = 4802	
1-4	1316	27.4
5-8	2805	58.4
9+	634	13.2
Unknown	47	1.0
PRENATAL SUPPLEMENT USE		
Prenatal vitamin use		
	N = 3799	
Yes	2529	66.6
No	968	25.4
DN/DR	11	0.3
Unknown	291	7.7
Initial prenatal vitamin use		
	N = 2529	
1st trimester	1486	58.8
2nd trimester	888	25.1
3rd trimester	137	5.4
Unknown	18	0.7
Duration of prenatal vitamin use		
	N = 2529	
1-3 months	586	23.2
4-6	1171	46.3
7-9	742	29.3
Unknown	30	1.2
Any supplement use		
	N = 3799	
Yes	2846	74.9
No	653	17.2
Unknown	300	7.9

Note: Prenatal vitamin is defined as a prenatal multivitamin. Any supplement use is defined as the mother used any or all of the following during the pregnancy: prenatal vitamins, iron tablets, and/or folic acid. All N's are adjusted by the weighted design of the survey.

Table 3. Distribution of prenatal care by women's characteristics

	Received prenatal care (N = 4802)	
Variable	**%**	X^2
Age at last birth		***
<20	87.6	
20-24	86.5	
25-29	87.4	
30-34	82.8	
35+	76.5	
Years since last birth		**
0-2	86.1	
3-5	83.2	
Current marital status		***
Married	90.9	
Living w/partner	83.3	
Formerly married	81.0	
Single	77.2	
Religion		***
Catholic	85.6	
Evang./Protestant	86.2	
None/Other	97.6	
Area		***
Urban	88.3	
Rural	82.5	
Current education		***
None	66.3	
Prim. Incomplete	82.1	
Prim. Complete	89.5	
Sec. Incomplete	92.0	
Sec. Complete+	97.6	
SES status		***
Low	80.8	
Middle	84.9	
High	94.3	
Total live births		***
1	91.9	
2	87.1	
3	87.2	
4	83.5	
5+	75.4	
Intentionality of last birth		***
Intended	88.7	
Mistimed	87.7	

Unwanted	77.0

Note: Proportions based on the row percentages of prenatal care users. Significance tests are based on Pearson chi-square analysis. Significance: * p ≤ 0.05, ** p ≤ 0.01, *** p ≤ 0.001, NS = Not Significant.

Table 4. Adjusted odds ratios for prenatal care use

	Adjusted ORs (95% CI)	
Variable	**Model 1**	**Model 2**
Age at last birth		N/A
<20	1.20 (0.92, 1.56)	
20-24	0.96 (0.76, 1.21)	
25-29 (ref)	--	
30-34	0.82 (0.63, 1.06)	
35+	0.67 (0.52, 0.86)	
Years since last birth		
0-2 (ref)	--	--
3-5	0.74 (0.63, 0.87)	0.74 (0.63, 0.87)
Current marital status		
Married (ref)	--	--
Living w/partner	0.58 (0.47, 0.71)	0.57 (0.46, 0.70)
Formerly married	0.44 (0.34, 0.56)	0.40 (0.31, 0.51)
Single	0.26 (0.18, 0.38)	0.20 (0.13, 0.29)
Religion		
Catholic (ref)	--	--
Evang./Protestant	0.95 (0.79, 1.14)	0.96 (0.80, 1.15)
None/Other	0.73 (0.59, 0.91)	0.74 (0.60, 0.92)
Area		
Urban (ref)	--	--
Rural	1.01 (0.83, 1.24)	1.01 (0.83, 1.23)
Current education		
None (ref)	--	--
Prim. Incomplete	2.02 (1.65, 2.48)	1.97 (1.61, 2.42)
Prim. Complete	3.42 (2.66, 4.40)	3.19 (2.48, 4.11)
Sec. Incomplete	4.25 (2.99, 6.04)	3.86 (2.71, 5.50)
Sec. Complete+	12.37 (6.68, 22.9)	10.59 (5.70, 19.7)
SES status		
Low (ref)	--	--
Middle	0.99 (0.81, 1.20)	0.96 (0.78, 1.17)
High	1.68 (1.20, 2.36)	1.54 (1.09, 217)
Total live births	N/A	
1 (ref)		--
2		0.53 (0.41, 0.70)
3		0.59 (0.44, 0.80)
4		0.54 (0.39, 0.74)
5+		0.38 (0.29, 0.51)
Intentionality of last birth		
Intended (ref)	--	--
Mistimed	0.82 (0.66, 1.01)	0.85 (0.69, 1.06)

Unwanted	0.59 (0.50, 0.71)	0.69 (0.57, 0.83)

Table 5. Distribution of prenatal supplement use by women's characteristics

	Any Supplement Use (N = 2846)	
Variable	**%**	X^2
Age at last birth		***
<20	79.4	
20-24	83.1	
25-29	84.9	
30-34	80.3	
35+	79.6	
Years since last birth		*
< 1	83.7	
1-3	80.6	
4-5	N/A	
Current marital status		***
Married	87.6	
Living w/partner	80.2	
Formerly married	73.7	
Single	75.0	
Religion		***
Catholic	83.3	
Evang./Protestant	81.0	
None/Other	75.4	
Area		***
Urban	85.2	
Rural	78.9	
Current education		***
None	64.2	
Prim. Incomplete	77.1	
Prim. Complete	86.9	
Sec. Incomplete	89.9	
Sec. Complete+	96.5	
SES status		***
Low	76.6	
Middle	82.9	
High	91.5	
Total live births		***
1	86.8	
2	85.9	
3	80.0	
4	80.7	
5+	72.3	
Intentionality of last birth		***
Intended	84.6	
Mistimed	84.3	
Unwanted	73.2	
Prenatal care		***
Yes	92.3	
No	12.8	

Note: Proportions based on the row percentages of prenatal care users. Significance tests are based on Pearson chi-square analysis. Significance: * $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$, NS = Not Significant.

Table 6. Adjusted odds ratios for prenatal supplement use

	Adjusted ORs (95% CI)	
Variable	**Model 1**	**Model 2**
Age at last birth		N/A
<20	0.75 (0.56, 1.00)	
20-24	0.87 (0.67, 1,14)	
25-29 (ref)	--	
30-34	0.82 (0.60, 1.13)	
35+	0.69 (0.50, 0.94)	
Years since last birth		
<1 (ref)	--	--
1-3	0.82 (0.66, 1.02)	0.82 (0.66, 1.02)
Current marital status		
Married (ref)	--	--
Living w/partner	0.69 (0.55, 0.88)	0.65 (0.51, 0.82)
Formerly married	0.43 (0.32, 0.59)	0.39 (0.29, 0.53)
Single	0.41 (0.27, 0.63)	0.32 (0.21, 0.50)
Current education		
None (ref)	--	--
Prim. Incomplete	1.67 (1.32, 2.13)	1.59 (1.25, 2.03)
Prim. Complete	3.03 (2.26, 4.06)	2.81 (2.10, 3.78)
Sec. Incomplete	3.84 (2.54, 5.80)	3.47 (2.29, 5.27)
Sec. Complete+	9.18 (4.51, 18.65)	8.58 (4.21, 17.49)
Religion		
Catholic (ref)	--	--
Evang./Protestant	0.77 (0.63, 0.94)	0.76 (0.62, 0.94)
None/Other	0.69 (0.53, 0.88)	0.66 (0.51, 0.84)
Area		
Urban (ref)	--	--
Rural	1.03 (0.81, 1.29)	1.03 (0.82, 1.30)
SES status		
Low (ref)	--	--
Middle	1.12 (0.89, 1.41)	1.07 (0.85, 1.36)
High	1.53 (1.04, 2.25)	1.42 (0.97, 2.09)
Total live births	N/A	
1 (ref)		--
2		0.96 (0.71, 1.29)
3		0.68 (0.50, 0.92)
4		0.81 (0.57, 1.16)
5+		0.59 (0.43, 0.80)
Intentionality of last birth		
Intended (ref)	--	--
Mistimed	0.88 (0.70, 1.12)	0.88 (0.70, 1.12)
Unwanted	0.61 (0.49, 0.75)	0.72 (0.58, 0.90)

Table 7. Adjusted odds ratios for prenatal supplement use among prenatal care users

	Adjusted ORs (95% CI)	
Variable	**Model 1**	**Model 2**
Age at last birth		N/A
<20	0.50 (0.32, 0.78)	
20-24	0.82 (0.53, 1.26)	
25-29 (ref)	--	
30-34	0.76 (0.46, 1.25)	
35+	0.66 (0.40, 1.09)	
Years since last birth		
<1 (ref)	--	--
1-3	0.62 (0.43, 0.90)	0.63 (0.44, 0.90)
Current marital status		
Married (ref)	--	--
Living w/partner	0.82 (0.58, 1.17)	0.74 (0.52, 1.05)
Formerly married	0.52 (0.33, 0.81)	0.47 (0.30, 0.73)
Single	1.31 (0.57, 3.04)	1.09 (0.47, 2.56)
Current education		
None (ref)	--	--
Prim. Incomplete	1.49 (1.01, 2.19)	1.39 (0.95, 2.05)
Prim. Complete	2.44 (1.54, 3.86)	2.24 (1.41, 3.56)
Sec. Incomplete	3.06 (1.62, 5.81)	2.81 (1.47, 5.34)
Sec. Complete+	4.33 (1.82, 10.32)	4.31 (1.81, 10.30)
Religion		
Catholic (ref)	--	--
Evang./Protestant	0.74 (0.54, 1.01)	0.73 (0.53, 0.99)
None/Other	0.65 (0.45, 0.96)	0.60 (0.41, 0.87)
Area		
Urban (ref)	--	--
Rural	1.10 (0.77, 1.56)	1.14 (0.80, 1.62)
SES status		
Low (ref)	--	--
Middle	1.09 (0.76, 1.57)	1.08 (0.75, 1.56)
High	1.10 (0.64, 1.92)	1.10 (0.63, 1.91)
Total live births	N/A	
1 (ref)		--
2		1.55 (0.97, 2.47)
3		0.82 (0.53, 1.27)
4		1.14 (0.70, 1.95)
5+		0.89 (0.56, 1.40)
Intentionality of last birth		
Intended (ref)	--	--
Mistimed	0.92 (0.64, 1.33)	0.89 (0.61, 1.28)
Unwanted	0.56 (0.40, 0.77)	0.63 (0.45, 0.89)

Table 8. Distribution of prenatal supplement use among those who attended prenatal care

	Prenatal Care Visits				Trimester of Initiation				Total
Variable	**1-4 N = 943**	**5-8 N = 1738**	**9+ N = 315**	X^2	**1st N = 1897**	**2nd N = 931**	**3rd N = 180**	X^2	***N = 3020***
Prenatal vitamins				***				***	
Yes	71.9	87.5	86.6		85.5	80.6	61.7		82.5
No	27.7	12.5	13.7		14.3	19.4	38.3		17.3
DN/DR	0.4	0	0		0.2	0	0		0.2
Iron tablets				***				***	
Yes	36.1	56.4	71.1		58.1	42.7	30.0		51.7
No	62.8	42.3	27.9		40.5	56.2	70.0		47.2
DN/DR	1.2	1.3	1.0		1.4	1.1	0		1.2
Folic acid tablets				***				***	
Yes	27.7	46.4	63.8		49.0	34.7	15.6		42.6
No	70.3	51.8	33.7		48.9	63.6	83.3		55.4
DK/DR	2.0	1.8	2.5		2.2	1.7	1.1		2.0

Note: Proportions based on the column percentages among prenatal care users. The N's for prenatal care visits and trimester of initiation N's are fewer than the total due to missing values among prenatal care users.