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Does Preconception Health Differ by Nativity?: Findings from the Los Angeles Mommy and Baby (LAMB) Study

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Abstract

Objectives—To compare certain preconception health (PCH) behaviors and conditions among US-born (USB) and foreign-born (FB) mothers in Los Angeles County (LAC), regardless of race/ethnicity, and to determine if any identified differences vary among Asian/Pacific Islanders (API's) and Hispanics.

Methods—Data are from the 2012 Los Angeles Mommy and Baby (LAMB) study (n=6,252). PCH behaviors included tobacco use, multivitamin use, unintended pregnancy, and contraception use. PCH conditions comprised being overweight/obese, diabetes, asthma, hypertension, gum disease, and anemia. The relationship between nativity and each PCH behavior/condition was assessed using multivariable logistic regression models.

Results—USB women were more likely than FB women to smoke (AOR=2.12, 95% CI=1.49–3.00), be overweight/obese (AOR=1.57, 95% CI=1.30–1.90), and have asthma (AOR=2.04, 95% CI=1.35–3.09) prior to pregnancy. They were less likely than FB women to use contraception before pregnancy (AOR=0.59, 95% CI=0.49–0.72). USB Hispanics and API's were more likely than their FB counterparts to be overweight/obese (AOR=1.57, 95% CI=1.23–2.01 and AOR=2.37, 95% CI=1.58–3.56, respectively) and less likely to use contraception (AOR=0.58, 95% CI=0.45–0.74 and AOR=0.46, 95% CI=0.30–0.71, respectively). USB Hispanic mothers were more likely than their FB counterparts to smoke (AOR=2.47, 95% CI=1.46–4.17), not take multivitamins (AOR=1.30, 95% CI=1.02–1.66), and have asthma (AOR=2.35, 95% CI=1.32–4.21) before pregnancy.

Conclusions—US nativity is linked to negative PCH among LAC women, with many of these associations persisting among Hispanics and API's. As PCH profoundly impacts maternal and

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child health across the lifecourse, culturally-appropriate interventions that maintain positive behaviors among FB reproductive-aged women and encourage positive behaviors among USB women should be pursued.

Keywords

Preconception health; nativity; maternal; child health

INTRODUCTION

Improving preconception health, generally defined as women's health before pregnancy, has reemerged as an important way for women to optimize their pregnancy and obstetric outcomes [1,2,3,4,5,6,7]. Good preconception health includes having a reproductive health plan, healthy body weight and nutrition, folic acid intake, adequate exercise, and abstaining from smoking and alcohol use before pregnancy. Benefits of positive preconception health include reduced risks of birth defects through folic acid supplementation and decreased maternal morbidity through ongoing disease management [8]. However, though maternal and child health research and interventions have increasingly highlighted the importance of preconception health, little is known about the state of preconception health among minority populations and the relationship between preconception health, specifically preconception behaviors and conditions, and nativity in these populations.

The US has become increasingly diverse since the passage of the Immigration Act of 1965, with immigrants currently accounting for 13% of the total US population and 27% of California's population in 2010 [9]. Specifically, there has been a substantial influx of Latin American and Asian immigrants to the US during the last forty years; in 2010, more than 65% of new immigrants were of Hispanic ethnicity or Asian/Pacific Islander (API) race [10]. Further, with over 70% of births in Los Angeles County (LAC) occurring to Hispanic and API mothers in 2010 [11], it has become imperative to assess how health behaviors and conditions during the preconception period differ by nativity among these immigrant populations. Additionally, it is important to examine if and how the relationship between preconception health and nativity status differs among API and Hispanic mothers in order to guide the development of programmatic interventions that are specific to each of these immigrant groups.

There are documented, yet inconsistent, differences in several health indicators by US nativity status. Foreign-born (FB) mothers, on average, have better overall health outcomes than US-born (USB) mothers despite facing adverse social and economic conditions in a new country; this phenomenon is referred to as the immigrant paradox or the Healthy Migrant Effect [12,13,14]. A hallmark study on preconception health by Xaverius and Tenkku (2012), which compared health behaviors among USB and FB non-pregnant women of reproductive age, showed that USB women were more likely than FB women to smoke, use illicit drugs, binge drink, be overweight/obese, engage in moderate physical activity and use contraception [15]. Further, examining birth outcomes by US nativity status adds further complexity to this picture. Although FB women have been shown to have higher birthweight infants and lower risk of preterm deliveries, they also have an increased risk of gestational

diabetes and certain obstetric complications (e.g. perineal laceration and postpartum hemorrhage), compared to their USB counterparts [16,17].

To address the inconsistent findings and gaps in the literature regarding the associations between US nativity and preconception health, our study uses population-based data from the 2012 Los Angeles Mommy and Baby (LAMB) study. Specifically, we aim to determine: (1) If USB and FB mothers in LAC, regardless of their race/ethnicity, differ in their likelihood of engaging in certain preconception health behaviors (i.e., tobacco use, multivitamin use, unintended pregnancy, contraception use) and conditions (i.e., being overweight or obese, diabetes, asthma, hypertension, gum disease, anemia); and (2) If any identified differences in preconception behaviors and conditions vary among API and Hispanic subgroups.

METHODS

Sample

We used data from the 2012 LAMB study, a population-based study that examined preconception, prenatal, and postpartum correlates of adverse maternal and infant health outcomes. Eligible mothers were LAC residents who had given birth to a live-born infant in LAC in 2012. LAC is divided into eight geographic Service Planning Areas (SPAs) for public health planning purposes. By sampling each SPA and then sampling births within the SPA by race/ethnicity, a stratified random sample of 13,105 eligible LAC mothers was produced for recruitment.

The stages of recruitment employed by the LAMB study, which followed the CDC Pregnancy Risk Assessment Monitoring System (PRAMS) protocol [18], are further described elsewhere [19,20]. Overall, respondents completed the mailed questionnaire within seven months after delivery. About 5% of mothers completed the survey by phone, including mothers who spoke non-survey languages through a special translation services line. The response rate, after adjusting for faulty addresses, language issues, maternal deaths, and loss to follow-up due to inability to locate the respondent, was 62%, resulting in 6,843 women. For this study, we only included API, Black, Hispanic, and White mothers, and women with known nativity, resulting in a final sample of 6,252 women for our current analyses.

Measures

Independent variables—Nativity was dichotomized as US-born (USB) or foreign-born (FB). We further categorized it into four groups: Hispanic USB, Hispanic FB, API USB, and API FB.

Dependent Variables—The LAMB survey contained data on ten indicators of preconception health, measured as health behaviors or conditions occurring six months before pregnancy. These indicators were selected on the basis of their potential impact on maternal and infant health [21]. Preconception behaviors comprised tobacco use (smoking any cigarettes versus smoking no cigarettes at all), lack of multivitamin use (i.e., not using a daily multivitamin at all versus using a multivitamin once in a while or more), unintended

pregnancy (i.e., didn't want to be pregnant then or any time in the future versus wanted to be pregnant sooner, then or later), and contraception use (i.e., using any form of birth control all the time or sometimes versus not using any contraception at all). Preconception health conditions included overweight/obesity (i.e., a pre-pregnancy body mass index (BMI) ≥ 25 [22]), diabetes, asthma, hypertension, gum disease and anemia. All of the preconception health indicators were dichotomized as yes or no.

Covariates—The covariates used in this study were maternal age (<20, 20–24, 25–34, and 35), education (<high school, high school diploma or GED), race/ethnicity (White, Black, Hispanic, or API), medical insurance before pregnancy (yes, no), marital status (married, unmarried) and complicated obstetric history (experiencing either previous miscarriage, elective abortion or stillbirth, experiencing none of these conditions). Age, education and race/ethnicity were obtained from the birth records, whereas insurance, complicated obstetric history and marital status were ascertained from survey responses.

Statistical Analysis

Analyses were performed using SAS 9.3 software [23] and were weighted to account for complex sampling design and survey non-response. First, Chi-square tests were used to detect differences between groups on demographic characteristics. Second, bivariate logistic regression models were conducted to examine the associations between US nativity and each preconception behavior and condition. Though no variable used in the analysis had more than 3% of missing records, we imputed missing predictors based on Rubin's (1987) multiple imputation procedure [24] prior to conducting multivariable analysis as most of multivariate models would not utilize about 5% of the selected samples. Therefore, multiple imputation allowed us to fully utilize collected information. Multivariable logistic regression models were then performed to examine the association between US nativity and each preconception behavior and condition, adjusting for potential confounders. Covariates were considered confounders and were retained in the final model if they were associated with both the exposure and the outcome at a $p < 0.20$ level. The multivariate models ultimately adjusted for the following potential confounders: maternal age, education, pre-pregnancy medical insurance, marital status, and complicated obstetric history

RESULTS

Sample Description

Our analyses were based on 6,252 mothers. Among them, 58.6% were Hispanic, 18.3% were Whites, 15.4% were API, and 7.8% were Black. Almost 45% of mothers were FB. FB and USB women differed on the distribution of all demographic characteristics (Table 1). Among FB mothers, 63.9% were Hispanic, and 26.8% were API. Among USB mothers, 54.3% of mothers were Hispanic, and 26.5% were White. On average, compared to FB women, USB women were more likely to be younger (28.0 vs. 30.8 years) and have medical insurance before pregnancy (75.5% vs. 49.3%). Furthermore, significantly higher percentages of USB women received more than a high-school education (85.5% vs. 66.4%) and were unmarried (49.6% vs. 38.3%), compared to FB women.

Bivariate and Multivariate Analyses

Table 2 contains the bivariate and multivariate associations between US nativity status and each preconception behavior and condition. In the multivariable logistic regression models, USB women were over two times more likely to smoke (AOR=2.12, 95% CI=1.49–3.00), 1.6 times more likely to be overweight or obese (AOR=1.57, 95% CI=1.30–1.90) and two times more likely to have asthma (AOR=2.04, 95% CI=1.35–3.09) than FB women. However, USB women were less likely to use contraception before their pregnancy (AOR=0.59, 95% CI=0.49–0.72), compared to FB women.

In our race-specific subpopulation analysis (Table 3), both USB Hispanic and API's were less likely than their FB counterparts to use contraception prior to pregnancy (AOR=0.58, 95% CI=0.45–0.74 for Hispanics; AOR=0.46, 95% CI=0.30–0.71 for API's). In contrast, USB Hispanic and API women had a significantly higher risk of overweight/obesity than their FB counterparts (AOR=1.57, 95% CI=1.23–2.01 for Hispanics; AOR= 2.37, 95% CI=1.58–3.56 for API's).

There were several significant findings that were specific to Hispanic mothers (Table 3). USB Hispanic mothers were more than twice as likely to smoke before pregnancy (AOR=2.47, 95% CI=1.46–4.17) than FB Hispanic women. USB Hispanic mothers were also 1.3 times more likely to not take multivitamins before pregnancy (AOR=1.30, 95% CI=1.02–1.66) and 2.3 times more likely to have asthma (AOR=2.35, 95% CI=1.32–4.21), compared to FB Hispanics.

DISCUSSION

To our knowledge, this is the first study to examine how preconception health status differs by nativity among mothers who recently gave birth. Importantly, this paper provided a nuanced understanding of the Healthy Migrant Effect on preconception health among immigrant women in LAC, specifically the link between nativity and preconception health among Hispanic and API women. Our findings indicate that US nativity was associated with an increased likelihood of being overweight or obese before pregnancy, and this finding was consistent for both Hispanic and API's. Further, we found that US nativity was associated with increased risks of tobacco use and asthma before pregnancy as well as the decreased likelihood of using contraception before pregnancy; the findings regarding tobacco use and asthma persisted for only Hispanic mothers, whereas the finding regarding contraception use occurred with both Hispanic and API mothers.

The most consistent relationship between nativity and preconception health in our sample, including the sub-analyses of Hispanic and API mothers, entailed the significant association between US nativity and overweight/obesity. This finding is not surprising as US food habits typically include foods that are higher in saturated fat, refined sugar and processed meats [25]. Studies have also found that as immigrants reside longer in the US, they tend to adopt unhealthy US nutritional habits, along with related negative behaviors such as reduced physical activity, all of which have contributed to an elevated risk for chronic diseases, including heart disease, hypertension and diabetes [26,27,28,29,30,31,32,33,34]. Further, we found that the association between US nativity status and overweight/obesity was stronger

for USB API women than for USB Hispanic women. We posit that the stronger link between nativity and overweight/obesity among Asian women, when compared to Hispanic women, may be attributable to the vast nutritional differences between traditional diets in Asian countries (e.g. higher consumption of fresh seafood, vegetables, and soy products) and the typical US diet, which comprise foods with substantially higher fat, sugar, and processed content.

Our study also enriches findings from Xaverius and Tenkku's study, which showed that USB mothers who were not currently pregnant were more likely to smoke compared to their FB counterparts. In our study, differences in tobacco use by US nativity persisted for Hispanic women in our subgroup analysis. We posit that this may stem from more permissible attitudes towards tobacco use in the United States, compared to Latin and Central Americas. Bethel and Schenker (2005) noted consistent positive associations between increased smoking prevalence and acculturation for women only [35]. Potential reasons to explain this gender-specific trend include increased economic opportunities and independence for immigrant women in US society compared to traditional Hispanic cultures, reduced Hispanic social pressures that would otherwise discourage women from smoking, and greater exposure to acculturative stress [36,37].

Further, our study found that USB women and specifically, Hispanic USB women were significantly more likely suffer from asthma, when compared to their FB counterparts. This finding is not surprising, as the prevalence of asthma in the US has dramatically risen 74% between 1980 and 1996 [38,39]. This finding has also been widely corroborated in previous studies, and much of this research has been geared toward Mexican Americans [40,41], which comprise the majority of the Hispanics in our sample. One potential explanation behind the higher prevalence of asthma among USB Hispanics in our study may be that USB residents are exposed to more environmental risk factors (e.g. outdoor pollution, motor traffic emissions) that are associated with asthma, particularly in urban areas like LAC, than FB Hispanics from their native countries [42]. Along these lines, it has been posited that rural environments may be protective against asthma due to reduced microbial exposure, and 45% of Mexican-Americans in the US originate from rural parts of Mexico [43].

Interestingly, we also found that USB mothers were significantly less likely to use contraception in the preconception period compared to their FB counterparts, and this finding was consistent for both Hispanic and API mothers. This finding was surprising, as we had hypothesized that immigrant women hold more traditional views regarding birth control and also encounter more challenges accessing prescription contraception from their healthcare providers due to insurance and language barriers. Some previous findings [15,44], including Xaverius and Tenkku's study, have supported the expected link between nativity and increased contraception use. However, their study was conducted in 1996–2006, when it may not have been as normative for FB women to use contraception. Also, their study sampled the general population of US women and then sorted their analyses by pregnant and non-pregnant women, whereas our study sampled Los Angeles women who recently gave birth, which may not be representative of all non-pregnant women in the US. Furthermore, other research has linked US nativity [45] as well as other indicators of acculturation [46,47], such as primarily speaking English, to decreased use of contraception,

specifically among Hispanic women. Researchers have surmised that USB residents and more acculturated immigrants, especially the youth, may be more likely to engage in risky health behaviors, such as intercourse with multiple partners and lack of contraceptive use [48,49, 50,51,52]. As this literature has predominantly focused on contraceptive use among Hispanics, our study further contributes to the literature by providing evidence for decreased contraceptive use among USB APIs as well.

Further, while this study offers important insights into the relationship between US nativity and preconception health among women, some potential limitations should be considered. First, the LAMB study was cross-sectional, and therefore, we cannot make assumptions of causality [53,54,55,56]. Second, preconception health conditions and behaviors were self-reported by women and were not verified by providers or medical charts. However, as it is unlikely that immigrant women over-reported certain health conditions and behaviors compared to USB women, we do not think there is a systematic bias. Third, the aggregation of Asian and Pacific Islander mothers into a single category may not reflect the heterogeneity in health behaviors and outcomes across the sub-groups. For instance, Qin and Gould (2010) found that USB Filipino mothers had higher risks for adverse pregnancy outcomes, whereas USB Chinese and Japanese mothers had lower risks for these outcomes compared to their FB counterparts [57]. Unfortunately, the small sample sizes of individual API ethnicities in the study prohibited us from stratifying the analyses by ethnicity. Fourth, we did encounter some missing data for some of the variables in the analyses, resulting in the use of imputation; however, this did not likely affect our findings significantly as no variable used in the analysis had more than 3% of missing records. Finally, we acknowledge that nativity cannot adequately serve as a proxy to the multidimensional, complex and dynamic process of acculturation; therefore, future work on this topic should employ multidimensional scales to measure this construct.

Despite these limitations, our study's findings have important implications for maternal and infant health outcomes as well as policy, clinical and programmatic interventions. Higher rates of smoking and overweight/obesity among USB women are critical public health concerns as they have negative effects on the fetus. Additionally, decreased contraceptive use is likely to result in higher rates of unintended pregnancies, which, in turn, have profound and long-lasting implications for maternal and child health by influencing maternal behavior during pregnancy [58]. Similarly, maternal asthma has been shown to have deleterious effects on pregnancy, delivery and subsequent child health, including increased risk of pregnancy complications, emergency caesarean section delivery, and having a low birthweight or small for gestational age infant [59]. Therefore, it is imperative that clinical, programmatic, and policy efforts address these health behaviors and conditions among immigrants, especially second and third generation Hispanic women, during the preconception period and earlier in the life course by reducing smoking initiation, promoting smoking cessation, improving access to and intake of nutritious food, increasing health education regarding and access to contraception, reducing outdoor air pollutants, and emphasizing management of asthma symptoms. Additionally, regardless of nativity status, culturally competent strategies to reach diverse populations should include delivery of services and education materials in preferred languages, working with ethnic or community-based organizations to craft and propagate messages, and providing health education in non-

healthcare settings (e.g., English classes) [60]. Overall, when designing interventions to improve women's preconception health, culturally and linguistically appropriate efforts that maintain positive behaviors among FB women and encourage positive behaviors among USB women should be pursued.

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Table 1

Weighted prevalence of selected maternal sociodemographic characteristics by US nativity status¹, 2012 LAMB study (N=6,252)

Sociodemographic Characteristics (% of total sample)	US Nativity Status				Foreign-Born	
	US-Born					
	N	Weighted %	95% Confidence Interval	N	Weighted %	95% Confidence Interval
Total (100%)	4,099	55.3%	52.9–57.7	2,153	44.7%	42.3–47.1
Race/ethnicity						
White (18.3%)	1,371	26.5% *	24.9–28.2	211	8.0% *	6.7–9.4
Black (7.8%)	1,048	13.0% *	12.1–14.0	87	1.3% *	0.9–1.6
Hispanic (58.6%)	1,335	54.3% *	52.3–56.4	1,009	63.9% *	58.9–68.9
Asian/Pacific Islander (15.4%)	345	6.1% *	5.3–6.9	846	26.8% *	21.4–32.2
Age (mean)	28.0			30.8		
<20 (7.0%)	910	10.3% *	9.5–11.1	179	3.0% *	2.5–3.5
20–24 (18.8%)	689	23.7% *	21.7–25.7	209	12.7% *	10.6–14.8
25–34 (50.9%)	1,752	47.5% *	45.3–49.6	1,184	55.1% *	50.7–59.6
35 years (23.3%)	748	18.5% *	16.9–20.2	581	29.2% *	24.4–33.9
Pre-pregnancy medical insurance						
Yes (63.7%)	3,269	75.5% *	73.4–77.5	1,269	49.3% *	44.9–53.6
No (35.8%)	822	24.3% *	22.3–26.4	872	49.9% *	45.5–54.3
Unknown (0.5%)	8	0.2%	0.0–0.4	12	0.8%	0.3–1.3
Education						
HS (21.4%)	614	13.0% *	11.5–14.4	525	31.7% *	28.2–35.2
>HS (76.9%)	3,419	85.5% *	84.0–87.0	1,576	66.4% *	62.8–69.9
Unknown (1.7%)	66	1.5%	1.0–2.0	52	1.9%	1.2–2.6

Sociodemographic Characteristics (% of total sample)	US Nativity Status					
	US-Born			Foreign-Born		
	N	Weighted %	95% Confidence Interval	N	Weighted %	95% Confidence Interval
<u>Marital status</u>						
Married (54.3%)	1,870	49.3% *	47.2–51.5	1,391	60.4% *	56.5–64.2
Unmarried (44.5%)	2,170	49.6% *	47.4–51.7	738	38.3% *	34.5–42.1
Unknown (1.2%)	59	1.1%	07–1.5	24	1.4%	0.6–2.1
<u>Complicated obstetric history</u>						
Yes (30.5%)	1,515 *	35.8% *	33.7–37.8	573	24.1% *	21.3–26.8
No (69.5%)	1,515 *	64.2% *	62.2–66.3	1,580	75.9% *	73.2–78.7

* p<0.05

[†] Chi-square tests were used to assess differences between groups.

Table 2

Bivariate and multivariate¹ associations of each preconception health behavior and condition by US nativity status²; 2012 LAMB study (n=6,252)³

Preconception Health		Frequency (%) (95% Confidence Interval)	Crude Odds Ratio (95% Confidence Interval)	Adjusted Odds Ratio (95% Confidence Interval)
Tobacco use	US-born	11.7 (10.3–13.1)	2.59*** (1.95–3.43)	2.12*** (1.49–3.00)
	Foreign-born	4.9 (3.7–6.0)	reference	reference
	Total sample	8.6 (7.7–9.6)		
No multivitamin use	US-born	48.8 (46.7–51.0)	1.14 (0.95–1.38)	1.04 (0.86–1.25)
	Foreign-born	45.5 (41.3–49.7)	reference	reference
	Total sample	47.4 (45.1–49.6)		
Unintended pregnancy	US-born	47.2 (45.0–49.4)	1.07 (0.88–1.30)	0.94 (0.78–1.14)
	Foreign-born	45.6 (41.2–50.0)	reference	reference
	Total sample	46.5 (44.2–48.8)		
Contraception use	US-born	24.4 (22.5–26.3)	0.60*** (0.49–0.75)	0.59*** (0.49–0.72)
	Foreign-born	34.8 (30.6–39.0)	reference	reference
	Total sample	29.0 (26.9–31.2)		
<i>Preconception health condition</i>				
Overweight/Obesity	US-born	48.9 (46.7–51.0)	1.34*** (1.11–1.61)	1.57*** (1.30–1.90)
	Foreign-born	41.7 (37.7–45.7)	reference	reference
	Total sample	45.7 (43.5–47.9)		
Diabetes	US-born	2.1 (1.4–2.7)	0.52** (0.33–0.80)	0.70 (0.40–1.22)
	Foreign-born	4.0 (2.8–5.1)	reference	reference
	Total sample	2.9 (2.3–3.5)		
Asthma	US	6.9 (5.9–8.0)	2.78*** (1.92–4.01)	2.04*** (1.35–3.09)
	Foreign	2.6 (1.8–3.5)	reference	reference
	Total sample	5.0 (4.3–5.7)		
Hypertension	US-born	3.9 (3.1–4.7)	1.16 (0.79–1.70)	1.10 (0.66–1.82)
	Foreign-born	3.4 (2.4–4.4)	reference	reference
	Total sample	3.6 (3.0–4.3)		
Gum/dental disease	US-born	8.0 (6.8–9.2)	0.68*** (0.53–0.87)	0.77 (0.55–1.08)
	Foreign-born	11.4 (9.5–13.3)	reference	reference
	Total sample	9.5 (8.4–10.6)		
Anemia	US-born	12.8 (11.3–14.2)	1.21 (0.96–1.52)	0.85 (0.64–1.12)
	Foreign-born	10.8 (9.0–12.6)	reference	reference

Preconception Health	Frequency (%) (95% Confidence Interval)	Crude Odds Ratio (95% Confidence Interval)	Adjusted Odds Ratio (95% Confidence Interval)
Total sample	11.8 (10.7–13.0)		

*
P<0.05

**
P<0.01

P<0.001

¹ Multivariable logistic regression model controlled for maternal age, education, pre-pregnancy medical insurance, marital status, and complicated obstetric history.

² US-born versus foreign-born (reference)

³ The presented analysis was weighted to take into account for complex sample design and non-response.

Table 3

Multivariable logistic model regression¹ of each preconception health behaviors/condition by US nativity status² among Hispanic and Asian/Pacific Islander women; 2012 LAMB study³ (n=3,535)

	Hispanic (n=2,344)				Asian/Pacific Islander (n=1,191)			
Preconception Health	Crude Odds Ratio	95% Confidence Interval	Adj. Odds Ratio	95% Confidence Interval	Crude Odds Ratio	95% Confidence Interval	Adj. Odds Ratio	95% Confidence Interval
<i>Preconception health behavior</i>								
Smoked	2.42***	1.56 3.76	2.47***	1.46 4.17	1.76	0.92 3.39	0.99	0.49 1.99
Did not smoke	reference	reference	reference	reference	reference	reference	reference	reference
Did not use multivitamins	1.34**	1.08 1.65	1.30*	1.02 1.66	1.06	0.64 1.76	0.73	0.50 1.07
Used multivitamins	reference	reference	reference	reference	reference	reference	reference	reference
<i>Unintended pregnancy</i>								
Unintended pregnancy	1.08	0.88 1.32	0.98	0.77 1.26	1.05	0.54 2.02	0.93	0.63 1.38
Planned pregnancy	reference	reference	reference	reference	reference	reference	reference	reference
<i>Used contraception</i>								
Used contraception	0.61***	0.49 0.76	0.58***	0.45 0.74	0.44**	0.22 0.89	0.46***	0.30 0.71
Did not use contraception	reference	reference	reference	reference	reference	reference	reference	reference
<i>Preconception health condition</i>								
Overweight/obesity	1.11	0.90 1.36	1.57***	1.23 2.01	3.02***	2.00 4.87	2.37***	1.58 3.56
Normal weight	reference	reference	reference	reference	reference	reference	reference	reference
Had diabetes	0.47*	0.26 0.84	0.67	0.34 1.32	1.38	0.49 3.88	1.08	0.37 3.20
Did not have diabetes	reference	reference	reference	reference	reference	reference	reference	reference
Had asthma	2.74***	1.62 4.64	2.35***	1.32 4.21	0.90	0.40 2.06	0.51	0.21 1.23
Did not have asthma	reference	reference	reference	reference	reference	reference	reference	reference
Had hypertension	0.91	0.55 1.51	1.14	0.60 2.14	0.90	0.33 2.49	0.55	0.19 1.54
Did not have hypertension	reference	reference	reference	reference	reference	reference	reference	reference
<i>Had gum/dental disease</i>								
Had gum/dental disease	0.57***	0.41 0.78	0.72	0.48 1.08	0.82	0.41 1.65	0.71	0.32 1.56
Did not have gum/dental disease	reference	reference	reference	reference	reference	reference	reference	reference

	Hispanic (n=2,344)				Asian/Pacific Islander (n=1,191)			
	Crude Odds Ratio	95% Confidence Interval	Adj. Odds Ratio	95% Confidence Interval	Crude Odds Ratio	95% Confidence Interval	Adj. Odds Ratio	95% Confidence Interval
Preconception Health								
Had anemia	1.09	0.82 1.46	0.87	0.62 1.24	0.77	0.34 1.76	0.52	0.23 1.19
Did not have anemia		reference		reference		reference		reference

¹ The multivariable logistic regression model controlled for maternal age, education, pre-pregnancy medical insurance, marital status, and complicated obstetric history.

² US-born versus foreign-born (reference)

³ The presented analysis was weighted to take into account for complex sample design and non-response.

* P<0.05

** P<0.01

*** P<0.001