Race/Ethnicity and Nativity Differences in Alcohol and Tobacco Use During Pregnancy

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Use of alcohol, tobacco, and other drugs among pregnant women is among the leading preventable causes of birth defects, mental retardation, and neurodevelopmental disorders in the United States.[1,2] Yet we understand little about the risk and protective factors that affect the use of these substances in non-White populations.[3,4] Because of differences in gender-related social norms, social support structures, access to community resources, and experience with discrimination, the influence of risk and protective factors may vary across racial/ethnic groups.[5–7] With a better understanding of these variations, public health practitioners can improve the design and effectiveness of prevention and treatment programs for pregnant women from racial/ethnic subpopulations.

The size of racial/ethnic minority and immigrant populations in the United States has increased dramatically during the last decade.[8,9] Black, Hispanic, and Asian women now account for 42% of all US live births.[10] This demographic change makes it imperative that we evaluate the etiology and epidemiology of prenatal substance use within these populations. Because of the youth and high fertility of immigrant and minority women in the United States relative to US-born Whites, an increasing proportion of substance-exposed infants are likely to be born to them.[11,12] Moreover, as immigrant women acculturate to the United States, their risk of substance use during pregnancy increases.[13,14]

Most national data sets (e.g., the Natality Detail Files, the Pregnancy Risk Assessment Monitoring System) provide information on maternal substance use. Few (e.g., the National Maternal and Infant Health Survey, the National Pregnancy and Health Survey) provide information on both maternal substance use and the socioeconomic and psychosocial risk factors for substance use during pregnancy.[15,16] However, studies based on the latter 2 surveys, with their small samples of

Objectives. We examined race/ethnicity and nativity correlates of prenatal substance use.

Methods. Using data on a nationally representative cohort of pregnant women in US cities (N = 4185), we evaluated the relative importance of socioeconomic status, paternal health behaviors, social support, and maternal stress and health history in explaining variations in prenatal substance use by race/ethnicity and nativity.

Results. Maternal stress and health history appeared to fully explain differences in alcohol use by nativity, but these and other factors could not explain differences in prenatal smoking. For all races/ethnicities, paternal health behaviors were most strongly associated with maternal substance use. Except among Black women, socioeconomic background bore little relation to prenatal substance use after adjustment for more proximal risk factors (e.g., paternal and maternal health behaviors). Social support was most protective among Hispanic women.

Conclusions. Foreign-born immigrant women are at equal risk of prenatal alcohol use compared with similarly situated US-born women and should not be overlooked in the design of interventions for at-risk women. Furthermore, the inclusion of fathers and the development of social support structures for at-risk women can strengthen interventions. (*Am J Public Health.* 2006;96:1629–1636. doi:10.2105/AJPH.2004.056598)

Hispanics, have not had sufficient data to comprehensively model individual risk and protective factors within racial/ethnic groups and to compare the relative importance of these factors across groups. These limitations can lead to biased estimations and erroneous conclusions about risk and protective factors within minority populations.

Previous state and clinic-based studies have identified 5 sets of factors that influence substance use during pregnancy: (1) demographic factors (e.g., immigrant status,[12–14] race/ethnicity,[5,11,17,18] age[19,20]), (2) socioeconomic background (i.e., income, education),[14,21] (3) psychosocial resources (especially family and nonfamily social support),[17,22–29] (4) paternal behaviors (e.g., domestic violence, substance use history)[5,30,31] and (5) maternal stress (especially related to pregnancy wantedness)[20,22,25] and health history (e.g., parity, previous drug use, use of prenatal care).[6,14,32,33]

Using newly available data from the Fragile Families and Child Wellbeing Study,[34] we now offer the fullest accounting to date of

differences in alcohol and tobacco use during pregnancy by race/ethnicity (non-Hispanic White, non-Hispanic Black, or Hispanic) and nativity (US-born or foreign-born). We identified the prevalence of maternal alcohol, tobacco, and illicit drug use during pregnancy. We then evaluated the relative importance of socioeconomic status, paternal health behaviors, social support, and maternal stress and health history in explaining differences in substance use by race/ethnicity and nativity. Finally, we identified the effects of these risk and protective factors on alcohol and tobacco use within each racial/ethnic group.

METHODS

Sample

The Fragile Families and Child Wellbeing Study is a stratified random sampling of hospital births in 20 large US cities.[34] To allow for a greater focus on births to vulnerable populations, unwed mothers were oversampled. The weighted data are representative of births in US cities with populations over

200000 in 1999. For the majority of births, both new mothers and fathers were interviewed within 3 days of delivery. Response rates were 87% for unmarried mothers, 82% for married mothers, 76% for unmarried fathers, and 89% for married fathers. The baseline data set used in this analysis includes 4898 completed mother interviews and 3830 completed father interviews.

Because of their small sample size (n=154) and ethnic heterogeneity, we excluded "other" races from our analyses. Thus, the analysis focuses on maternal substance use among non-Hispanic Whites, non-Hispanic Blacks, and Hispanics. The deletion of observations with missing values for other covariates reduced our analytic sample to 4185 women. Because of missing weights, the analytic sample was reduced to 3311 women when the data were weighted. To ensure generalizability, prevalence estimates are reported using the weighted sample. To improve the power of our analysis within racial/ethnic groups, the unweighted sample was used in logit analyses. To account for sample design effects, we calculated robust standard errors and adjusted estimates for clustering.

Measures

Outcomes. Mothers were asked (1) "During your pregnancy, how often did you drink alcoholic beverages (nearly every day, several times a week, several times a month, less than once a month, or never)?" (2) "During your pregnancy, how many cigarettes did you smoke (≥ 2 packs a day, ≥ 1 but <2, <1, or 0)?" and (3) "During your pregnancy, how often did you use drugs such as marijuana, crack cocaine, or heroine (nearly every day, several times a week, several times a month, once a month, or never)?" Because of recall bias, women are generally more accurate in their report of whether they used substances during pregnancy than in reporting how frequently they used substances during pregnancy.[17] Therefore, for our bivariate analyses, we categorized use of each substance as frequent, infrequent, or never. For our multivariate analyses, we dichotomized the responses into 4 variables indicating any alcohol use, any tobacco use, any illicit drug use, and any substance use.

Demographic variables. Self-reported race and ethnicity data were combined to create 3 groups (non-Hispanic White, non-Hispanic Black, Hispanic). Respondents born in the United States or to US citizens in a foreign country were classified as US-born. Respondents born in a US territory (e.g., Puerto Rico) or to non–US citizens in a foreign country were classified as foreign-born. Because of the high correlation between maternal and paternal nativity (r=0.69) and ethnicity (r=0.74), only maternal values were used in the analysis. To account for nonlinear age trends, we categorized mother's age at delivery into 3 groups (<21 y, $21-30$ y, >30 y). The age 21 cutpoint accounted for differences in legal drinking and smoking ages. The age 30 cutpoint allowed for increasing risk of substance use among older women and ensured an adequate cell size for estimations within each racial/ethnic group.

Socioeconomic variables. Maternal education (<12 y, 12 y, some college, college graduate), welfare status (yes, no), and homeownership (yes, no) were reported by the mother in her interview. Although mothers also reported income, concern about biased self-reports and missing values led us to focus on maternal education, welfare status, and homeownership as measures of socioeconomic status. In additional analyses (not shown), income never contributed to our estimations after controlling for these 3 socioeconomic status measures. Analyses of correlations among covariates indicated that being a high-school dropout (<12 y of education) was correlated with welfare receipt (r=0.21), and college graduation was correlated with homeownership (r=0.23).

Social support variables. We considered both family and nonfamily social support. Family support was determined by a mother's marital relationship to the father of her newborn (married, cohabiting, single/uninvolved); whether her newborn's father often expressed love and affection for her (i.e., father support); and whether she could count on someone in her family for financial or in-kind assistance (i.e., kin support). Nonfamily support was determined by whether the mother worked while she was pregnant; whether she had lived in her current community for more than 1 year; and whether she attended

church at least several times each month (i.e., religious support). Among social support variables, only the correlation between single/uninvolved marital status and father support was significant (r=−0.26).

Paternal health behaviors. With reference to the past 3 months, fathers were asked the same questions as mothers regarding their use of alcohol, tobacco, and illicit drugs. Following our coding of maternal substance use, we dichotomized these into 3 variables indicating any alcohol use, any tobacco use, or any illicit drug use. Domestic violence was indicated if a mother reported that her newborn's father had previously hit or slapped her when angry. Domestic violence was not highly correlated with other paternal health behaviors. But paternal drinking, smoking, and drug use were correlated with one another (r=0.26 to r=0.31).

Maternal stress and health history. Using maternal self-reports, we created 2 indicators of stress associated with the mother's pregnancy. First, a pregnancy was categorized as unwanted if the mother reported having considered an abortion, having been asked by the father to consider an abortion, or having developed a worsening relationship with the father because of the pregnancy. Second, a mother was identified as experiencing additional stress if she lived in a neighborhood where she felt unsafe. These 2 variables were not highly correlated (r=0.09).

Measures of maternal health history included whether this was the mother's first birth (yes, no), whether the mother received prenatal care within the first trimester (yes, no), and whether the mother had previously received treatment for drug or alcohol abuse (yes, no). In previous research, large age differences between mothers and their babies' fathers have been associated with intimate partner violence and unwanted pregnancies.[35,36] Therefore, we also controlled for whether a mother was 10 or more years older or younger than her partner as part of this set of variables. Correlations on maternal health variables ranged from −0.06 to 0.11.

Analysis

We began by using the weighted data to estimate the prevalence of substance use by race/ethnicity and nativity. Calculations of

standard errors took the sampling design into effect and adjusted for clustering within cities. Differences in prevalence rates were tested with Student–Newman–Keuls adjustments (a 2-tailed test) for multiple comparisons. Because of the relatively low prevalence of maternal illicit drug use and small expected frequencies, we did not evaluate risk factors for maternal illicit drug use in the multivariate analyses; we focused only on maternal alcohol and tobacco use during pregnancy.

We used logits to estimate the independent associations of race/ethnicity and nativity with alcohol and tobacco use. To maximize the power of our analysis, we used the unweighted data but calculated robust standard errors and adjusted for clustering. We report adjusted odds ratios and 95% confidence intervals after (1) adjusting only for the age of the mother (baseline model); (2) adding only socioeconomic factors to the baseline model; (3) adding only social support factors to the baseline model; (4) adding only paternal health behaviors to the baseline model; and (5) adding only maternal stress and health history to the baseline model. We report the adjusted odds of alcohol and tobacco use by race/ethnicity and nativity after adjusting for all 5 sets of covariates and dichotomous indicators for each city. The inclusion of city indicators allowed us to control for unobserved variations by city of residence (e.g., alcohol or cigarette taxes[37–42]) that are associated with a mother's substance use. In sum, this analysis provided us with information on how well each set of variables may explain differences in patterns of alcohol and tobacco use by race/ethnicity and nativity. Finally, we present logit models for alcohol and tobacco use by race/ethnicity.

We used Stata 8.0 (Stata Corp, College Station, Tex) for all analyses. All logit analyses using the unweighted data were recalculated using the weighted data. There were no substantial differences in adjusted odds ratios when the weighted data were used, but the results were less precise. In addition, we also estimated multinomial logits on the level (frequent, infrequent, never) of alcohol and tobacco use during pregnancy. Results (available upon request) showed

that the primary risk and protective factors for frequent use were the same as for infrequent use. However, because of small numbers of frequent users, confidence intervals were much wider.

RESULTS

Prevalence of Substance Use

Twenty-three percent of women consumed alcohol, tobacco, or illicit drugs during the 9 months before delivery. However, prevalence and frequency of use varied considerably by race/ethnicity and nativity (Table 1). Among

foreign-born women, alcohol use was 4 times as prevalent as tobacco use during pregnancy (8% vs 2%). Among US-born women, this pattern was reversed. Newborns with White mothers were most at risk of alcohol and tobacco exposure; newborns with Black mothers were most at risk of exposure to illicit drugs; and newborns with Hispanic mothers were the least likely to be exposed to any drugs in utero.

Four percent of women reported frequent use of at least 1 substance during pregnancy; 2% reported frequent alcohol use (>1 drink/ mo), 2% reported frequent cigarette use

TABLE 1—Level of Substance Use During Pregnancy, by Race/Ethnicity and Nativity (Weighted)

	n	Any	Frequent[a]	Infrequent	Never
Alcohol use					
Total	3311	11.1%	2.1%	9.1%	88.9%
US-born	2803	11.8%	2.3%	9.5%	88.2%
Foreign-born	508	8.2%[b]	1.0%[b]	7.2%[b]	91.8%[b]
White, non-Hispanic	839	17.0%	1.8%	15.2%	83.0%
Black, non-Hispanic	1449	9.7%[c,d]	2.9%	6.8%[c,d]	90.3%[c,d]
Hispanic	1023	6.4%[c]	1.6%	4.8%[c]	93.6%[c]
Tobacco use					
Total	3311	15.1%	1.8%	13.3%	84.9%
US-born	2803	17.9%	2.1%	15.8%	82.1%
Foreign-born	508	2.3%[b]	0.3%[b]	2.1%[b]	97.7%[b]
White, non-Hispanic	839	20.1%	2.1%	18.0%	79.9%
Black, non-Hispanic	1449	18.6%[d]	2.6%[d]	16.1%[c,d]	81.4%[d]
Hispanic	1023	7.3%[c]	0.8%[c]	6.4%[c]	92.7%[c]
Illicit drug use					
Total	3311	3.4%	1.2%	2.3%	96.6%
US-born	2803	4.0%	1.4%	2.6%	96.0%
Foreign-born	508	1.0%[b]	0.0%[b]	1.0%[b]	99.0%[b]
White, non-Hispanic	839	1.8%	0.4%	1.4%	98.2%
Black, non-Hispanic	1449	7.2%[c,d]	3.1%[c,d]	4.0%[c,d]	92.8%[c,d]
Hispanic	1023	2.1%	0.3%	1.7%	97.9%
Any substance use					
Total	3311	23.0%	4.2%	18.8%	77.0%
US-born	2803	25.6%	4.9%	20.8%	74.4%
Foreign-born	508	11.0%[b]	1.3%[b]	9.7%[b]	89.0%[b]
White, non-Hispanic	839	31.1%	4.0%	27.0%	68.9%
Black, non-Hispanic	1449	24.9%[c,d]	6.5%[c,d]	18.4%[c,d]	75.1%[c,d]
Hispanic	1023	13.4%[c]	2.6%[c]	10.8%[c]	86.6%[c]

[a]Frequent alcohol or illicit drug use is use that occurs more than once per month. Frequent smoking is defined as at least 1 pack of cigarettes per day.
[b]Difference from US-born is significant (P<.05).
[c]Difference from White is significant (P<.05).
[d]Difference from Hispanic is significant (P<.05).

TABLE 2—Factors and Odds Ratios (With Confidence Intervals) for Prenatal Alcohol and Tobacco Use, by Nativity and Race/Ethnicity

	Model 1: Baseline	Model 2: Socioeconomic Factors	Model 3: Social Support	Model 4: Paternal Health Behaviors	Model 5: Maternal Stress and Health History	Model 6: All Factors and City Indicators
			Alcohol use			
US-born vs foreign-born (n = 727)	0.62 (0.45, 0.87)**	0.64 (0.46, 0.89)**	0.65 (0.45, 0.95)*	0.68 (0.49, 0.95)*	0.76 (0.54, 1.07)	0.81 (0.59, 1.13)
White vs non-Hispanic Black (n = 2062)	0.79 (0.62, 0.99)*	0.69 (0.54, 0.88)**	0.65 (0.51, 0.83)**	0.74 (0.59, 0.91)**	0.56 (0.42, 0.75)**	0.59 (0.44, 0.80)
White vs Hispanic (n = 1195)	0.49 (0.32, 0.75)**	0.40 (0.27, 0.62)**	0.42 (0.28, 0.64)**	0.45 (0.30, 0.69)**	0.41 (0.26, 0.64)**	0.42 (0.24, 0.74)
Model statistics						
Pseudo R^2	4.1%	5.9%	6.5%	7.1%	8.5%	13.0%
Pseudo log-likelihood	-1379	-1353	-1344	-1335	-1315	-1250
			Tobacco use			
US-born vs foreign-born (n = 727)	0.13 (0.07, 0.23)**	0.11 (0.06, 0.20)**	0.13 (0.07, 0.25)**	0.14 (0.08, 0.26)**	0.16 (0.09, 0.27)**	0.14 (0.07, 0.27)
White vs non-Hispanic Black (n = 2062)	0.66 (0.46, 0.94)**	0.34 (0.24, 0.47)**	0.38 (0.26, 0.56)**	0.58 (0.41, 0.82)**	0.45 (0.32, 0.62)**	0.29 (0.22, 0.39)
White vs Hispanic (n = 1195)	0.43 (0.27, 0.67)**	0.20 (0.13, 0.32)**	0.26 (0.18, 0.37)**	0.38 (0.24, 0.59)**	0.32 (0.21, 0.49)**	0.25 (0.15, 0.40)
Model statistics						
Pseudo R^2	6.0%	17.0%	14.0%	13.5%	15.1%	27.6%
Pseudo log-likelihood	-1917	-1699	-1759	-1770	-1737	-1480

Note. Data are unweighted. Models are estimated using robust standard errors and are adjusted for clustering (n = 4185). All models include the baseline adjustments for nativity, race/ethnicity, and mother's age at delivery. Each block of variables (i.e., socioeconomic, social support, paternal health, and maternal stress and health history) were added to the baseline separately. Model 6 (both alcohol and tobacco) adjusts for all the variables together.
**$P<0.01$; *$P<0.05$

(≥1 pack/day), and 1% reported frequent illicit drug use (>1 use/mo). US-born women and Black women were most likely to be frequent users of any substance.

Determinants of Differences in Alcohol and Tobacco Use by Nativity

After adjusting for mother's age at birth, foreign-born women were 38% less likely to drink (Table 2, Alcohol use). Adjustments for maternal stress and health history explained 24% of the initial differences in alcohol use by nativity. Adjustments for socioeconomic factors, social support, and paternal health behaviors each accounted for substantially less of the variation in alcohol use by nativity, but when combined with maternal stress and health history (column 6) we identified no remaining significant differences in alcohol use by nativity.

In contrast, immigrant women were 86% less likely to smoke during pregnancy than US-born women, and this difference could not be explained by observable risk and protective factors (Table 2, Tobacco use). Adjusting for socioeconomic background and other factors slightly accentuated the differences in prenatal smoking behaviors between foreign-born and US-born mothers.

Determinants of Differences in Alcohol and Tobacco Use by Race/Ethnicity

Adjustments for our covariates (i.e., socioeconomic background, social supports, paternal health behaviors, maternal stress and health history) magnified differences in substance use between Whites and non-Whites (Table 2). All else being equal, Black mothers were 71% less likely than Whites to smoke during pregnancy and 41% less likely to drink. Likewise, Hispanic mothers were 76% less likely to smoke during pregnancy and 58% less likely to drink alcohol than their White counterparts. By contrast, once we adjusted for differences between Blacks and Hispanics regarding maternal stress and health history, no significant differences in alcohol use ($\chi^2_{B-H}=3.74$; $P<.06$) or tobacco use ($\chi^2_{B-H}=3.39$; $P<.07$) remained between these 2 populations.

Correlates of Alcohol and Tobacco Use by Race/Ethnicity

The persistence of differences in alcohol and tobacco use between Whites and non-Whites suggested that our models could be improved by including interactions between race/ethnicity and each of our covariates. A test of the equality of coefficients across logit estimates for our different racial/ethnic subsamples confirmed that alcohol use (Table 3) and tobacco use (Table 4) for each racial/ethnic group were differentially influenced by covariates in our model.[43]

Demographic factors. Regardless of race/ethnicity, foreign-born women were less likely to smoke during pregnancy than their US-born counterparts. This was not true for drinking behavior during pregnancy. Hispanic and White foreign-born women were as likely to drink during pregnancy as their US-born counterparts. For all women, the

TABLE 3—Logit Models of Alcohol Use During the 9 Months Before Delivery, by Race: Fragile Families and Child Wellbeing Study

Correlate (% of Black, % of Hispanic, % of White)	Black (n = 2062), OR (95% CI)	Hispanic (n = 1195), OR (95% CI)	White (n = 928), OR (95% CI)	Significant Racial/Ethnic Difference[a]
Maternal demographic variables				
Foreign-born (5%, 47%, 5%)	0.6 (0.4, 1.0)	0.9 (0.5, 1.7)	1.4 (0.7, 2.6)	No
Age at delivery				
<21 y (28%, 27%, 18%)	Reference	Reference	Reference	
21-30 y (54%, 56%, 50%)	2.0 (1.2, 3.3)	1.6 (0.6, 4.6)	1.6 (1.1, 2.3)	No
>30 y (17%, 18%, 31%)	4.3 (2.2, 8.5)	3.1 (1.4, 6.9)	3.3 (2.1, 5.2)	No
Socioeconomic variables				
Maternal education				
<12 y (38%, 57%, 24%)	2.1 (1.4, 3.2)	1.0 (0.5, 2.1)	0.8 (0.5, 1.4)	Yes
12 y (30%, 20%, 20%)	Reference	Reference	Reference	
Some college (26%, 19%, 26%)	1.2 (0.9, 1.7)	0.8 (0.4, 1.9)	1.3 (0.9, 1.9)	No
College (6%, 4%, 29%)	2.3 (1.3, 4.2)	0.9 (0.2, 3.2)	1.2 (0.7, 2.0)	No
Welfare recipient (44%, 31%, 24%)	1.0 (0.7, 1.5)	1.5 (0.9, 2.4)	1.5 (0.9, 2.5)	No
Homeowner (27%, 26%, 54%)	0.8 (0.5, 1.2)	1.6 (0.9, 2.5)	1.8 (1.2, 2.7)	Yes
Family social support variables				
Marital status				
Married (13%, 23%, 50%)	Reference	Reference	Reference	
Cohabitating (35%, 47%, 31%)	1.5 (0.7, 3.6)	0.4 (0.2, 0.8)	0.7 (0.3, 1.6)	Yes
Single/uninvolved (52%, 30%, 19%)	1.8 (0.8, 3.7)	0.4 (0.2, 0.7)	1.0 (0.5, 1.9)	Yes
Father support (71%, 79%, 82%)	0.8 (0.7, 1.1)	0.5 (0.3, 0.8)	1.1 (0.6, 1.8)	Yes
Kin support (96%, 95%, 98%)	0.8 (0.5, 1.5)	1.2 (0.6, 2.6)	0.7 (0.2, 2.3)	Yes
Nonfamily social support variables				
Worked while pregnant (74%, 95%, 98%)	0.7 (0.5, 1.0)	1.0 (0.8, 1.3)	1.0 (0.5, 2.0)	No
Attends church often (40%, 41%, 32%)	0.9 (0.7, 1.2)	0.7 (0.4, 1.1)	0.7 (0.5, 1.1)	No
<1 y at current residence (32%, 33%, 31%)	1.5 (1.1, 2.1)	1.3 (0.9, 1.7)	1.3 (1.0, 1.6)	No
Paternal health behavior variables				
Drinks ≥1 time/wk (49%, 58%, 63%)	1.7 (1.2, 2.4)	1.2 (0.7, 2.0)	3.3 (1.4, 7.8)	Yes
Smokes ≥1 pack/day (30%, 26%, 34%)	1.3 (0.9, 1.9)	2.9 (1.6, 5.5)	1.6 (1.1, 2.5)	Yes
Used drugs last month (13%, 8%, 8%)	1.4 (1.0, 2.1)	1.6 (1.0, 2.5)	1.5 (0.8, 2.9)	No
History of domestic violence (4%, 5%, 2%)	1.9 (1.1, 3.3)	1.4 (0.6, 3.5)	2.2 (0.6, 8.2)	No
Maternal stress and health history variables				
Unwanted pregnancy (49%, 27%, 23%)	1.9 (1.5, 2.6)	2.3 (1.0, 5.1)	1.4 (0.8, 2.4)	No
Father ≥10 y older or younger (11%, 9%, 9%)	1.7 (1.2, 2.4)	2.5 (1.5, 4.1)	1.6 (0.8, 3.1)	No
Feels unsafe in neighborhood (20%, 20%, 9%)	1.1 (0.8, 1.5)	1.3 (0.7, 2.4)	1.3 (0.7, 2.3)	No
First child (33%, 39%, 45%)	0.8 (0.5, 1.2)	1.0 (0.6, 1.7)	1.3 (1.0, 1.7)	Yes
Prenatal care in first trimester (78%, 78%, 86%)	0.7 (0.4, 1.0)	1.2 (0.8, 1.8)	0.5 (0.3, 0.9)	Yes
Previous alcohol or drug treatment (5%, 2%, 6%)	2.7 (1.5, 4.7)	1.3 (0.5, 3.2)	1.6 (0.7, 3.5)	No
Model statistics and predicted prevalence rates				
Pseudo R^2	16%	12%	9%	
Pseudo log-likelihood	-613	-242	-366	
Unadjusted prevalence	11%	6%	16%	
Predicted prevalence for low-risk population[b]	1%	3%	2%	
Predicted prevalence for high-risk population[c]	53%	40%	26%	

Note. OR = odds ratio; CI = confidence interval. Data are unweighted, with robust standard errors adjusted for clustering (n = 4185). Using a Chow test, we rejected the hypothesis that models of alcohol were equivalent across race/ethnicity ($\chi^2_{alcohol}$ [df = 19] = 31; $P < .04$).
[a]"Yes" indicates that a Wald test of the equivalence of parameters across races was significant at $P \leq .05$.
[b]Calculated as the average predicted probability where all indicator variables are set to zero and prenatal care in the first trimester is set to 1.
[c]Calculated as the average predicted probability when the mother has an unwanted pregnancy, receives no prenatal care, and has previously had alcohol or drug treatment; and when the father is 10 or more years older or younger, has a history of domestic violence, and either smokes (smoking equations) or drinks (alcohol use equations).

risk of smoking or drinking during pregnancy increased with age. Black women over the age of 30 were at highest risk of tobacco use.

Socioeconomic factors. For Blacks, our results showed that both the least and most educated women were at risk for prenatal alcohol use. Among Whites, only wealthier and more educated persons were at risk for prenatal alcohol use. On the other hand, tobacco use during pregnancy was concentrated among less educated and poorer women (especially those receiving welfare) in both populations. Socioeconomic factors did not help to explain prenatal substance use among Hispanic women.

Social support. The importance of social support differed significantly between Hispanic and non-Hispanic women. Among non-Hispanic White and Black women, marriage to a partner and having family to count on for financial support were associated with less prenatal substance use. In contrast, what mattered most for Hispanic women was not their marital status but the supportiveness of their newborn's father. Hispanic women with partners who consistently expressed love and affection for them were less likely to engage in alcohol or smoking behaviors that might harm their fetuses.

Our results indicated that, outside of the family, social support from coworkers, religious peers, and neighbors reduced the likelihood of any prenatal substance use. Religious support was the most instrumental form of social support for Hispanics. Time in residence was relatively more important for Black and White women, especially with respect to alcohol use.

Paternal health behaviors. All women were more likely to report prenatal substance use if their newborn's father also reported substance use. Paternal alcohol and drug use were associated most strongly with maternal alcohol use, and paternal smoking was associated most strongly with maternal smoking. Women, especially Black and White women, who had experienced domestic violence were also more likely to report prenatal alcohol or tobacco use than those who reported no domestic violence history.

Maternal stress and health history. For all women, previous alcohol or drug treatment was associated with smoking, and to a lesser

TABLE 4—Logit Models of Smoking During the 9 Months Before Delivery, by Race: Fragile Families and Child Wellbeing Study

Correlate (% of Black, % of Hispanic, % of White)	Black (n = 2062) OR (95% CI)	Hispanic (n = 1195) OR (95% CI)	White (n = 928) OR (95% CI)	Significant Racial/Ethnic Difference[a]
Maternal demographic variables				
Foreign-born (5%, 47%, 5%)	0.1 (0.02, 0.5)	0.1 (0.04, 0.3)	0.9 (0.4, 2.3)	Yes
Age at delivery				
< 21 y (28%, 27%, 18%)	Reference	Reference	Reference	
21–30 y (54%, 56%, 50%)	1.6 (1.17, 2.3)	1.6 (1.07, 2.4)	1.8 (1.4, 2.4)	No
> 30 y (17%, 18%, 31%)	4.1 (3.14, 5.4)	1.9 (0.85, 4.2)	1.5 (0.8, 2.7)	Yes
Socioeconomic variables				
Maternal education				
< 12 y (38%, 57%, 24%)	2.6 (2.01, 3.3)	1.8 (0.80, 4.2)	1.9 (0.9, 3.7)	No
12 y (30%, 20%, 20%)	Reference	Reference	Reference	
Some college (26%, 19%, 26%)	1.0 (0.67, 1.5)	0.7 (0.21, 2.6)	0.8 (0.5, 1.2)	No
College (6%, 4%, 29%)	0.7 (0.34, 1.5)	2.0 (0.29, 14.0)	0.1 (0.0, 0.4)	Yes
Welfare recipient (44%, 31%, 24%)	1.4 (1.06, 1.8)	1.2 (0.74, 1.9)	1.5 (1.1, 2.1)	No
Homeowner (27%, 26%, 54%)	0.6 (0.42, 0.7)	0.9 (0.52, 1.7)	1.3 (0.8, 2.1)	Yes
Family social support variables				
Marital status				
Married (13%, 23%, 50%)	Reference	Reference	Reference	
Cohabitating (35%, 47%, 31%)	1.4 (0.84, 2.3)	2.2 (0.77, 6.5)	2.5 (1.5, 4.1)	No
Single/uninvolved (52%, 30%, 19%)	1.9 (1.20, 3.1)	1.0 (0.30, 3.2)	2.1 (0.9, 5.2)	No
Father support (71%, 79%, 82%)	1.2 (0.97, 1.4)	0.6 (0.34, 0.9)	1.0 (0.7, 1.6)	Yes
Kin support (96%, 95%, 98%)	0.4 (0.27, 0.7)	5.1 (0.57, 44.8)	0.6 (0.2, 2.4)	Yes
Nonfamily social support variables				
Worked while pregnant (74%, 95%, 98%)	0.9 (0.64, 1.3)	1.0 (0.76, 1.4)	1.3 (0.8, 2.1)	No
Attends church often (40%, 41%, 32%)	0.8 (0.53, 1.1)	0.5 (0.21, 1.1)	0.6 (0.4, 0.9)	No
< 1 y at current residence (32%, 33%, 31%)	1.0 (0.87, 1.2)	0.9 (0.55, 1.5)	1.3 (0.9, 1.9)	No
Paternal health behavior variables				
Drinks ≥ 1 time/wk (49%, 58%, 63%)	1.1 (0.78, 1.4)	1.5 (0.78, 2.7)	1.4 (0.9, 2.1)	No
Smokes ≥ 1 pack/day (30%, 26%, 34%)	3.1 (2.39, 4.1)	3.3 (2.15, 5.1)	2.7 (1.7, 4.3)	No
Used drugs last month (13%, 8%, 8%)	1.3 (0.98, 1.8)	0.9 (0.24, 3.1)	1.3 (0.8, 2.4)	No
History of domestic violence (4%, 5%, 2%)	2.0 (1.01, 4.0)	1.7 (0.75, 4.0)	3.6 (1.0, 12.6)	No
Maternal stress and health history variables				
Unwanted pregnancy (49%, 27%, 23%)	1.2 (0.88, 1.6)	1.9 (1.31, 2.7)	1.2 (0.8, 1.8)	No
Father ≥ 10 y older or younger (11%, 9%, 9%)	1.6 (1.20, 2.2)	2.1 (1.32, 3.3)	1.2 (0.7, 2.1)	No
Feels unsafe in neighborhood (20%, 20%, 9%)	1.3 (0.98, 1.8)	1.3 (0.67, 2.3)	1.3 (0.7, 2.2)	No
First child (33%, 39%, 45%)	0.8 (0.53, 1.1)	1.2 (0.80, 1.8)	0.9 (0.6, 1.4)	No
Prenatal care in first trimester (78%, 78%, 86%)	0.6 (0.45, 0.8)	0.8 (0.54, 1.2)	0.7 (0.5, 0.9)	No
Previous alcohol or drug treatment (5%, 2%, 6%)	6.5 (4.09, 10.3)	7.6 (1.76, 32.6)	4.7 (3.0, 7.6)	No
Model statistics and predicted prevalence rates				
Pseudo R[2]	24%	27%	31%	
Pseudo log-likelihood	-804	-265	-384	
Unadjusted prevalence	21%	9%	29%	
Predicted prevalence for low-risk population[b]	5%	1%	6%	
Predicted prevalence for high-risk population[c]	93%	94%	68%	

Note. OR = odds ratio; CI = confidence interval. Data are unweighted, with robust standard errors adjusted for clustering (N = 4185). Using a Chow test, we rejected the hypothesis that models of smoking were equivalent across race/ethnicity (χ^2_{smoke} [df = 19] = 349; P < .001).
[a]"Yes" indicates that a Wald test of the equivalence of parameters across races was significant at P ≤ .05.
[b]Calculated as the average predicted probability where all indicator variables are set to zero and prenatal care in the first trimester is set to 1.
[c]Calculated as the average predicted probability when the mother has an unwanted pregnancy, receives no prenatal care, and has previously had alcohol or drug treatment; and when the father is 10 or more years older or younger, has a history of domestic violence, and either smokes (smoking equations) or drinks (alcohol use equations).

extent, with alcohol use during pregnancy. Black and Hispanic women with significantly older or younger husbands and an unwanted pregnancy were also more likely to have smoked or drunk during their pregnancy. Early prenatal care was associated with a lower likelihood of prenatal substance use among all but Hispanic women.

Combined risks. Many of these risk factors clustered together. Focusing on modifiable risk factors (i.e., paternal and maternal health variables) that significantly influenced substance use, we calculated actual and predicted prevalence rates by race/ethnicity. These risk factors included (1) a partner who either smoked, drank, or used illicit drugs; (2) a partner with a history of domestic violence; (3) an unwanted pregnancy; (4) mother's previous alcohol or drug treatment; (5) no prenatal care in the first trimester, (6) a partner 10 or more years older or younger; and (7) low educational status (< 12 y). Eleven percent of the sample had none of these risk factors; 34% had 1; 32% had 2; and 23% had 3 or more. Women with 0, 2, and 3 or more of these risk factors drank at rates of 4%, 10%, and 18%, respectively (r_{trend} < 0.0001). They smoked at rates of 5%, 20%, and 37%, respectively (r_{trend} < 0.0001). For all ethnic groups, the predicted prevalence rates (all else equal) for high-risk women with these 7 risk factors set equal to 1 were at least 10 times the predicted prevalence rates for low-risk women with none of these risk factors (Tables 3 and 4).

DISCUSSION

We evaluated socioeconomic, social support, and paternal and maternal health factors that influenced the continuation of substance use during pregnancy within Black, White, and Hispanic populations. Three central findings emerged.

First, our research confirmed that, adjusted for key confounders, US-born and foreign-born (mostly Hispanic) women were at equal risk of alcohol use during pregnancy.[12] We also confirmed that Hispanic and Black women did not differ significantly in their adjusted risks for smoking during pregnancy.[16] Thus, despite the overall lower prevalence rates of substance use during pregnancy

among Hispanic women, interventions should be designed and evaluated for high-risk women within this population. These women include US-born Hispanics over age 21 with an unwanted pregnancy and a partner who smokes regularly or has used illicit drugs, who is significantly older or younger, and who is not emotionally supportive.

Second, regardless of marital status, a woman's substance use during pregnancy was highly correlated with her partner's substance use and the degree of emotional support he provided. Among Black and White women, a history of partner violence was associated with substance use. Among Hispanic women, the absence of domestic violence (i.e., receiving love and affection from their partner) was associated with less risk of prenatal substance use. Given the significance of this finding, attention should be given to intervention efforts that include women's partners.

Third, many risk factors clustered together. Women at risk for prenatal substance use tended to have partners with a history of substance use, an unwanted pregnancy, and previous participation in alcohol or drug treatment programs. Moreover, they were women who typically had not received early prenatal care. Prenatal care and health education programs can be most cost-effective when focused on these high-risk women.[44-46]

Although the Fragile Families and Child Wellbeing Study data have allowed us to evaluate the relative importance of a wide variety of factors that influence alcohol and tobacco use during pregnancy, the substance use data rely on retrospective self-reports and do not provide information on the timing of substance use during pregnancy. Although no other method of measuring substance use during pregnancy—medical records, clinical interviews, laboratory assessments—can be considered a gold standard,[17,21,29] self-reports are subject to recall biases that may lead to underreporting, especially with respect to level of use.[47] If nonresponders are also more at risk of substance use, then this would further decrease our prevalence estimates. Despite these potential limitations, prevalence estimates from the Fragile Families and Child Wellbeing Study data were comparable to those estimated from the 1999 National Household Survey on Drug Abuse. According

to this survey, 13.8% of pregnant women reported alcohol use, 17.6% reported tobacco use, and 3.4% reported illegal drug use.[47]

Our research shows the importance of identifying risk and protective factors within racial/ethnic groups. We were able to conduct separate analyses for Black, White, and Hispanic populations. Future data collection efforts should include larger subsamples of Asians, the second fastest growing population group in the United States,[4] and should collect information on immigrant status and country of origin, which will allow researchers to move away from treating Asian and Hispanic populations as panethnic groups. This information is needed to ensure that prevention and intervention programs are well targeted and responsive to changes in population demographics. ■

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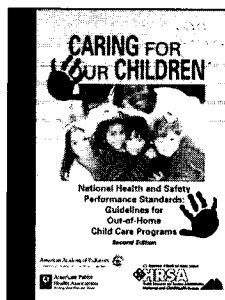
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