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Predictors of Alcohol and Tobacco Use Prior to and During Pregnancy in the US: The Role of Maternal Stressors

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Abstract

Purpose—To understand the association between preconception stressful life events (PSLEs) and women's alcohol and tobacco use prior to and during pregnancy, and in the continuation of such use through pregnancy.

Methods—Data were from the *Early Childhood Longitudinal Study-Birth Cohort* (n=9,350). Data were collected in 2001. Exposure to PSLEs was defined by indications of death of a parent, spouse or previous live born child; divorce or marital separation; or fertility problems prior to conception. Survey data determined alcohol and tobacco usage during the three months prior to and in the final three months of pregnancy. Weighted regressions estimated the effect of PSLEs on alcohol and tobacco use at each time point and on the continuation of use, adjusting for confounders.

Results—Experiencing any PSLE increased the odds of tobacco use prior to (adjusted odds ratio [AOR]: 1.52, 95% CI: 1.23-1.87) and during pregnancy (AOR: 1.57, 95% CI: 1.19-2.07). Women exposed to PSLEs smoked nearly five additional packs of cigarettes in the 3 months prior to pregnancy (97 cigarettes, p=0.011) and consumed 0.31 additional alcoholic drinks during the last three months of pregnancy than unexposed women.

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Conclusions—PSLEs are associated with tobacco use before pregnancy and alcohol and tobacco use during pregnancy. Alcohol and tobacco screening and cessation services should be implemented prior to and during pregnancy, especially for women who have experienced PSLEs.

Keywords

Pregnancy; Preconception; Life course; Stress; Substance use

Introduction

Alcohol and tobacco use during pregnancy are known risk factors for adverse birth outcomes including low birth weight and birth abnormalities, as well as fetal and infant death (Kesmodel et al. 2002; Patra et al. 2011; Rogers 2009). In 2012, 24.6 percent of US women aged 15 to 44 reported using tobacco and more than 50 percent reported drinking alcohol (Substance Abuse and Mental Health Services Administration 2013). While many women discontinue their alcohol and tobacco use during pregnancy – perhaps due to the known deleterious consequences or social stigma of substance use during pregnancy – rates of alcohol and tobacco use during pregnancy among US women have remained unacceptably high at 8.5% and 15.9% respectively (Substance Abuse and Mental Health Services Administration 2013). Reducing alcohol and tobacco use during pregnancy may require the focus of cessation efforts to be shifted upstream to the preconception period, specifically targeted both to preventing the initiation of unhealthy alcohol and tobacco use, as well as to promoting the cessation of use prior to conception (Association of State and Territorial Health Officials 2013; US Surgeon General 2001; US Surgeon General 2005). Therefore, understanding the factors associated with alcohol and tobacco use before and during pregnancy, as well as disparities in alcohol and tobacco cessation during pregnancy, may be critical to improve intergenerational health outcomes.

Maternal stress may be an important factor in predicting substance use in the perinatal period. Theory suggests that some women use alcohol and tobacco to cope with stress (Niaura and Shiffman 1995), and previous clinic-based studies have found associations between perceived stress and tobacco use during pregnancy (Woods et al. 2010). Research has also demonstrated the health importance of exposure to stress across the lifecourse, particularly *prior* to conception, for both women and their children (Witt et al. 2014a; Witt et al. 2014b). However, no studies have examined how stressful life events *prior* to conception (PSLEs) influence the use of alcohol and tobacco immediately prior to and during pregnancy.

As such, this study sought to understand whether PSLEs affect women's health behaviors prior to and during pregnancy using a nationally representative, population-based sample. Specifically, this study examined whether and to what extent PSLEs are associated with tobacco or alcohol use in the three months prior to conception and with the continuation of tobacco and alcohol use through the final three months of pregnancy.

Materials and Methods

Data were from the first wave of the *Early Childhood Longitudinal Study, Birth Cohort* (ECLS-B), a nationally-representative cohort of children born in 2001 and their parents. The ECLS-B used a clustered, list-frame design to select a probability sample of the approximately four million children born in 2001, with oversampling of children from minority groups, twins, and children born very low birthweight and low birthweight (United States Department of Education 2001). Children born to mothers under 15 years of age, those who were adopted after the birth certificate was issued, and those who did not survive up to 9 months of age were not included in the sampling frame (Snow et al. 2009). Registered births were sampled within primary sampling units (counties or groups of contiguous counties) from the National Center for Health Statistics vital statistics system. Over 14,000 births were sampled and contacted, and the final study cohort (consisting of completed nine month interviews) of 10,700 was formed in 2001 and 2002 when the children were approximately nine months old.

Restricted data was obtained with permission and approval from the Institute for Education Sciences (IES) Data Security Office of the US Department of Education, National Center for Education Statistics (NCES). In accordance with NCES guidelines, all reported unweighted sample sizes were rounded to the nearest 50 (United States Department of Education 2001). The University of Wisconsin-Madison Health Sciences institutional review board considered this study exempt from review.

Participants were eligible for this study if the main survey respondent was the infant's biological mother ($n=10,550$); 450 additional records missing birth certificate data were subsequently excluded. ECLS-B included individual records for each child within twin pairs identified through oversampling; for this analysis, one twin was randomly selected from each pair to retain in the sample. For other multiples in the sample (i.e., not explicitly recruited as part of the oversampling), only one infant from the household was surveyed. The final sample contained 9,350 mother-child dyads, surveyed approximately 9 months after delivery.

Measures

Alcohol and tobacco use—Participants were asked about their alcohol and tobacco usage during the three months prior to pregnancy and in the final three months of pregnancy; responses were dichotomized as “any” versus “none.” Additionally, participants reported the total number of cigarettes smoked in an average day and the number of alcoholic drinks consumed in an average week both before and during pregnancy (alcohol use categories were operationalized ordinally at their midpoint). Continuation of use into pregnancy was derived from these variables.

Stressful life events prior to conception—The date of conception was derived using birth certificate data on the length of gestation and the infant's date of birth. Women were coded as having experienced a PSLE if they indicated that one or more of the following events occurred prior to conception: (1) death of the respondent's mother; (2) death of the respondent's father; (3) death of a previous live born child; (4) divorce; (5) separation from

partner; (6) death of a spouse; or (7) fertility problems. All of these experiences were considered or operationalized as stressful life events in previous research (Holmes and Rahe 1967; Witt et al. 2014a; Witt et al. 2014b). Death of a previous live born child was collected from the birth certificate and was assumed to have occurred prior to conception.

Prenatal health and stress—Birth certificate data determined if women had experienced any of the following pregnancy complications: anemia; diabetes; (oligo) hydramnios; hypertension during pregnancy; eclampsia; incompetent cervix; Rh sensitization, uterine bleeding; premature rupture of membranes; placental abruption; or placenta previa. Birth certificate data also identified women who had previously delivered a preterm or small for gestational age (SGA) infant and women with chronic conditions (including: cardiac disease; lung disease; genital herpes; hemoglobinopathy; chronic hypertension; renal disease; or other medical risk factors). Prepregnancy body mass index (BMI [kilograms divided by meters squared]) was calculated from the respondent's measured height and self-reported weight prior to pregnancy (less than 18.5 kg/m² [underweight]; between 18.5 and 24.9 kg/m² [normal]; between 25 and 29.9 kg/m² [overweight]; 30 kg/m² or more [obese]; and unknown) (National Heart Lung and Blood Institute 2000). The timing of prenatal care initiation (first trimester; second or third trimester; or did not receive prenatal care) and whether women had a previous live birth (any versus none) was also evaluated. Women were coded as having experienced a stressful life event during pregnancy if they indicated that any of the following events occurred during their pregnancy: (1) death of the respondent's mother; (2) death of the respondent's father; (3) divorce; (4) separation from partner; or (5) death of a spouse.

Maternal sociodemographic factors—Maternal sociodemographic factors included: race/ethnicity (White [non-Hispanic]; Black [non-Hispanic]; Asian/Pacific Islander [non-Hispanic]; Hispanic; or other race [non-Hispanic]); age (15–19; 20–24; 25–29; 30–34; or 35 years or older); marital status at the infant's birth (married or living with partner; separated; divorced; widowed; or never married); health insurance coverage during pregnancy (no health insurance; any publicly funded insurance; or private health insurance coverage only); US region of residence (Northeast; Midwest; South; or West); and socioeconomic status (SES). SES was defined using a 5-category composite index (quintiles) generated by the NCES that incorporated: (1) father's or male guardian's education; (2) mother's or female guardian's education; (3) father's or male guardian's occupation; (4) mother's or female guardian's occupation; and (5) household income (United States Department of Education 2001).

Statistical Analyses

Analyses were conducted using survey procedures from SAS version 9.2 (Cary, NC) and Stata SE 12 (College Station, TX). The standard errors were corrected due to clustering within strata and the primary sampling unit, and applied survey weights were used to produce estimates that accounted for the complex survey design, unequal probabilities of selection, and survey nonresponse.

Summary statistics were generated to describe sample characteristics; chi-square and Kruskal-Wallis tests determined significant differences in sociodemographic characteristics between women who did and did not experience any PSLE and by alcohol and tobacco use prior to and during pregnancy.

Four separate multivariable logistic regression models examined the impact of maternal exposure to PSLEs on the probability of any alcohol or tobacco use in the three months prior to pregnancy and in the final three months of pregnancy. Multivariable negative binomial regression examined the impact of maternal exposure to PSLEs on the mean number of alcoholic drinks ingested per week, and the mean number of cigarettes smoked per day. Using the results from the negative binomial model, marginal effects were used to estimate the total number of alcoholic drinks ingested and total number of cigarettes smoked during each 3 month period. Standard errors were estimated using the delta method (Agresti 2002).

To identify the predictors of the continuation of alcohol and tobacco use during pregnancy, separate multivariable logistic regression models and multivariable negative binomial regression models examined the predictors of continued use of alcohol or tobacco among a subsample of women who used either alcohol or tobacco prior to pregnancy. All models adjusted for concurrent alcohol or tobacco use, maternal chronic conditions, pre-pregnancy BMI, parity, race/ethnicity, age, marital status at birth, health insurance coverage, SES and region of residence. Models examining substance use in the final three months of pregnancy (including those examining continuation of use) also adjusted for exposure to any stressful life event during pregnancy and the initiation of prenatal care.

Results

Alcohol Use

Nearly 38% of women reported any alcohol use in the 3 months prior to pregnancy, while 3.3 % of women reported any alcohol use in the final 3 months of pregnancy (Table 1, Figure 1). Drinking before and during pregnancy was significantly more frequent among women who experienced PSLEs (all $p<0.01$); however, women who experienced SLEs *during* pregnancy were less likely to drink during the final three months of pregnancy ($p<0.001$). Women in the highest SES quintile were the most likely to drink prior to pregnancy (53.3%) and during pregnancy (6.6%); while women aged 35 years and older drank the most drinks on average during pregnancy. Of women who drank prior to pregnancy, those who did not receive prenatal care were the most likely to continue drinking into pregnancy (26.5%).

In multivariable analyses, PSLEs were not significantly associated with the odds of drinking prior to or during pregnancy; however, women who experienced any PSLEs consumed more alcoholic drinks on average *during* pregnancy (0.31 drinks over 3 months, $p=0.033$; Table 3) than women without any PSLEs. SLEs during pregnancy were not associated with consumption of alcoholic drinks in the adjusted analyses.

Concurrent tobacco use was associated with higher odds of drinking both prior to and during pregnancy, as well as higher odds of continuation and a greater number of alcoholic drinks

at both time points (Table 2). Women aged 30 years and older had higher odds of drinking during pregnancy and had higher odds of drinking continuation, compared to their younger (25-29 years) counterparts. Black, Asian/Pacific Islander and Hispanic women all had lower odds of drinking prior to pregnancy; however, only Asian/Pacific Islander women also had lower odds of drinking during pregnancy. Lower SES women had lower odds of drinking prior to and during pregnancy and tended to drink less (on average) than women in the highest SES quintile.

Tobacco Use

Over 23% of women reported any cigarette use in the three months prior to pregnancy, while 11.0% of women reported any cigarette use in the final three months of pregnancy (Table 3, Figure 1). Smoking before and during pregnancy was significantly more frequent among women who experienced PSLEs and SLEs during pregnancy (all $p < 0.01$); however, of women who smoked prior to pregnancy, only women who experienced SLEs *during* pregnancy were more likely to continue smoking into pregnancy ($p < 0.001$). Women who did not receive prenatal care were the most likely to smoke prior to pregnancy (44.9%) and during pregnancy (31.5%); these women also had the highest rate of continuation between the two time points (70.2%) and smoked more cigarettes on average at each time point. The prevalence of smoking before and during pregnancy was lowest for women in the highest SES quintile (7.1%) and for Asian/Pacific Islander women (1.2%), respectively.

Women who experienced any PSLEs had higher odds of ever smoking prior to pregnancy (adjusted odds ratio [AOR]: 1.52, 95% confidence interval [CI]: 1.23-1.87; Table 4) and smoked more prior to pregnancy on average (96.96 cigarettes over 3 months, $p = 0.011$). These women also had higher odds of smoking during the last three months of pregnancy (AOR: 1.57, 95% CI: 1.19-2.07) compared to women who did not experience PSLEs. Women who experienced SLEs during pregnancy had higher odds of smoking during pregnancy (AOR: 2.06, 95% CI: 1.42-2.98) and smoked more during pregnancy on average (84.73 cigarettes over 3 months, $p = 0.001$). Additionally, among women who smoked prior to pregnancy, women who experienced SLEs *during* pregnancy had higher odds of continuation of smoking into pregnancy (AOR: 1.99, 95% CI: 1.24-3.20) and smoked more on average during pregnancy (171.66 cigarettes over 3 months, $p = 0.018$) compared to women who did not experience SLEs during pregnancy.

Concurrent alcohol use was associated with higher odds of smoking both prior to and during pregnancy, as well as higher odds of continuation and a greater number of cigarettes smoked at both time points (Table 4). Black, Asian/Pacific Islander and Hispanic women all had lower odds of smoking both prior to and during pregnancy and smoked less on average compared to their white counterparts, while publicly insured women had higher odds of smoking and smoked more compared to privately insured women. There was a strong inverse relationship between SES and smoking such that lower SES women had substantially higher odds of smoking prior to and during pregnancy, smoked more on average and had higher odds of smoking continuation. Women living in the Northeast and Midwest had higher odds of smoking prior to and during pregnancy compared to women

living in the West, but only women living in the Midwest had higher odds of smoking continuation into pregnancy.

Discussion

This is the first population-based study, to our knowledge, to determine if exposure to PSLEs are associated with women's tobacco and alcohol use prior to, during, and continuing into pregnancy. The findings from this study indicate that mothers who experienced any PSLE were more likely to use tobacco before pregnancy and both alcohol and tobacco during pregnancy. Among women who smoked prior to pregnancy, women who experienced SLEs *during* pregnancy were more likely to continue smoking in the third trimester of pregnancy. Furthermore, concurrent substance use was highly predictive of tobacco and alcohol use prior to, during, and continuing into pregnancy.

In this national study of US women, 37.9% reported using alcohol and 23.2% reported using tobacco in the three months prior to pregnancy. Although prenatal substance use was found to be far less prevalent, the fact that 49.0% of pregnancies in the US in 2001 were unintended (Finer and Henshaw 2006) suggests that many women may have used substances during the early first trimester before realizing they were pregnant, a critical period when many fetal organ systems form (Moore et al. 1988). The preconception period thus provides a crucial opportunity for clinicians to identify substance use in women of childbearing age and intervene before there are deleterious health consequences for women and their babies. A number of validated alcohol screening instruments and evidence-based alcohol and tobacco guidelines have been developed for clinical settings, and studies have shown that brief interventions designed to reduce alcohol and tobacco use in women of childbearing age are both feasible and effective (Floyd et al. 2008; US Surgeon General 2001). Growing evidence also indicates that preconception care can modify women's risky behaviors, such as tobacco and alcohol use (Xaverius and Salas 2013) and it may be advantageous to incorporate PSLEs into existing screening tools.

This study also identifies two important risk factors for the continuation of either alcohol or tobacco use into pregnancy: stressful life events during pregnancy and the concurrent use of both of these substances. These findings, which are corroborated by previous clinic-based studies (Harrison and Sidebottom 2009; Pirie et al. 2000; Zimmerman et al. 1990), suggest that women who report these risk factors may need targeted interventions to achieve cessation. Furthermore, previous clinic-based research has found that these two groups of women are also less likely to respond positively to cessation interventions, suggesting that integrated approaches that address both stress and concurrent substance use may be warranted (Pirie et al. 2000).

It is known that prenatal tobacco and alcohol consumption are important risk factors for adverse neonatal outcomes, including low birth weight, premature birth, sudden infant death syndrome, and fetal alcohol syndrome (Cornelius and Day 2000; Dietz et al. 2010; Landesman-Dwyer 1982; Little and Wendt 1991; Yerushalmy 1971). The neonatal mortality and morbidity associated with these negative maternal health behaviors places a substantial economic strain on the US, both in terms of avoidable medical costs (Adams et al. 2002;

Centers for Disease Control and Prevention 2002) and indirect costs to society (Bouchery et al. 2011). Given these considerable consequences, reducing the burden of alcohol and tobacco use during pregnancy is one of the leading public health objectives. In fact, Healthy People 2020 outlines several objectives with the goal of reducing the prevalence of alcohol and tobacco use, particularly among reproductive aged adults and pregnant women (US Department of Health and Human Services and Office of Disease Prevention and Health Promotion 2013); and the Affordable Care Act requires that health plans provide universal alcohol and tobacco screening and cessation services for all adults, with expanded services for pregnant women (US Department of Health and Human Services 2010). Despite the fact that tobacco use and alcohol misuse screening and cessation counseling are considered to be particularly important and efficacious preventive health actions (The American College of Obstetricians and Gynecologists 2011), the prevalence of these negative health behaviors reported here and in other studies suggests that pervasive, long-term cessation among vulnerable populations has not been achieved through current efforts (Tong et al. 2013; US Preventive Services Task Force 2003; US Preventive Services Task Force 2004). As this study identified PSLEs as significant predictors of tobacco and alcohol use during pregnancy, it may be advantageous to incorporate PSLEs into existing screening tools in order to identify women who may require additional behavioral counseling interventions to reduce alcohol and tobacco use during pregnancy. Further, as cessation often requires multiple attempts (Centers for Disease Control and Prevention 2013), population-level interventions that are administered universally to reproductive aged women may demonstrate the greatest success at reducing these behaviors during pregnancy; alternatively, the use of PSLEs to identify high-risk reproductive aged women may be a particularly cost-effective way to utilize finite resources to tackle this important public health issue.

Several potential limitations should be considered when interpreting the results of this study. First, women may have underreported their alcohol and tobacco use (both any use and the amount of use) prior to conception and during pregnancy (Ebert and Fahy 2007; Jacobson et al. 2002). However, the prevalence of alcohol and tobacco use prior to and during pregnancy is similar to other national estimates (Muhuri and Gfroerer 2009; Substance Abuse and Mental Health Services Administration and Office of Applied Studies 2009). As few women reported using alcohol during pregnancy, these analyses may have been underpowered to detect effects for PSLEs on this health behavior. In addition, the ECLS-B collected categorical, rather than continuous, data on the exact numbers of alcoholic drinks. Therefore, estimates from the negative binomial models may not be precise. Analyses relied on self-reported data for factors like pre-pregnancy BMI, which may have biased the estimates in an unknown direction. The ECLS-B collected limited data on stressful life events and may not have comprehensively captured the spectrum of stressors some women experience, which might have resulted in misclassification.

Conclusion

This nationally-representative study shows that PSLEs are associated with increased tobacco use prior to and during pregnancy, as well as an increased amount of alcohol use during pregnancy among US women. The findings further suggest that the influence of PSLEs on health behaviors can last throughout a woman's pregnancy. Such results lend support for the

call to implement alcohol and tobacco screening and cessation services prior to pregnancy, as these services may improve the long-term health of these vulnerable women and their children.

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Figure 1. Prevalence of Alcohol and Tobacco Use Before and During Pregnancy, Early Childhood Longitudinal Study-Birth Cohort

Source: 2001 ECLS-B. Data are weighted percentages.

	Use in Three Months Prior to Pregnancy						Use in Final Three Months of Pregnancy						Continuation of Use in Final Three Months of Pregnancy							
	Alcohol Use			No. of Alcoholic Drinks			Alcohol Use			No. of Alcoholic Drinks			Alcohol Use			No. of Alcoholic Drinks				
	Total	None	Any	p-value	Mean	S.D.	p-value	None	Any	p-value	Mean	S.D.	p-value	Total	None	Any	p-value	Mean	S.D.	p-value
Age (years)				<0.001			<0.001			<0.001			<0.001				<0.001			<0.001
15-19	7.5%	82.0%	18.0%	***	6.8	30.4	**	99.3%	0.7%	**	0.1	1.5	***	3.5%	96.6%	3.4%		0.4	3.6	
20-24	24.2%	66.4%	33.6%	***	14.5	41.8	**	97.9%	2.1%	**	0.2	2.0	***	21.5%	94.7%	5.3%	*	0.6	3.4	
25-29	26.2%	63.1%	36.9%	***	9.5	24.0	***	97.6%	2.4%	*	0.4	3.9		25.5%	94.4%	5.6%	*	1.0	6.0	
30-34	25.0%	56.5%	43.5%	***	12.6	27.2		95.6%	4.4%	**	0.7	7.2		28.6%	90.2%	9.8%		1.6	9.8	
35+	17.1%	53.7%	46.3%	***	14.5	30.6	*	93.8%	6.2%	***	1.1	7.4	**	20.9%	87.1%	12.9%	***	2.4	9.9	
Race/Ethnicity				<0.001			<0.001			<0.001			<0.001				0.061			0.593
White (non-Hispanic)	57.4%	53.4%	46.6%	***	15.0	30.2	***	95.6%	4.4%	***	0.7	5.4	**	70.4%	91.0%	9.0%		1.5	7.7	
Black (non-Hispanic)	14.1%	70.5%	29.5%	***	8.7	27.2	***	98.2%	1.8%	**	0.4	5.3		11.0%	94.7%	5.3%		1.2	9.6	
Asian/Pacific Islander (non-Hispanic)	3.5%	81.5%	18.5%	***	4.3	32.6	***	97.9%	2.1%	*	0.2	4.3	***	1.7%	90.5%	9.5%		1.2	9.1	
Other (non-Hispanic)	2.5%	53.5%	46.5%	**	18.5	60.8	*	95.5%	4.5%		0.7	8.1		3.0%	94.6%	5.4%		1.0	9.0	
Hispanic	22.6%	76.7%	23.3%	***	7.6	23.9	***	98.2%	1.8%	**	0.2	2.2	**	13.9%	93.4%	6.6%		0.8	4.4	
Marital Status (at birth)				0.015			0.314			0.105			0.464				0.250			0.652
Married or living with partner	83.4%	61.2%	38.8%	**	11.8	29.4		96.5%	3.5%		0.6	5.3		85.3%	91.6%	8.4%		1.4	7.9	
Separated/divorced/widowed	3.1%	64.5%	35.5%		11.8	28.8		95.8%	4.2%		0.4	2.7		2.9%	89.0%	11.0%		1.1	4.4	
Never married	13.5%	66.8%	33.2%	**	14.3	42.2		97.9%	2.1%		0.4	5.1		11.8%	94.4%	5.6%		1.2	8.7	
Health Insurance Status				<0.001			<0.001			0.001			0.030				0.080			0.106
Private Only	59.1%	55.4%	44.6%	***	13.1	29.1	*	95.9%	4.1%	***	0.7	6.1	**	69.6%	91.2%	8.8%		1.5	8.4	
Any Public	37.4%	71.6%	28.4%	***	10.9	35.1		97.8%	2.2%	***	0.3	3.6	***	28.0%	93.8%	6.2%		1.0	6.5	
None	3.4%	73.4%	26.6%	**	8.6	25.9		96.7%	3.3%		0.2	1.5	*	2.4%	87.6%	12.4%		0.9	2.7	
Socioeconomic Status				<0.001			<0.001			<0.001			<0.001				0.003			0.006
First quintile (lowest)	19.7%	78.0%	22.0%	***	8.7	31.3	***	98.2%	1.8%	***	0.3	2.8	***	11.4%	93.0%	7.0%		1.1	5.6	
Second quintile	20.0%	69.6%	30.4%	***	11.2	35.6		97.4%	2.6%		0.3	2.9	*	16.0%	93.3%	6.7%		0.9	4.8	
Third quintile	20.1%	62.7%	37.3%		13.0	34.5		97.9%	2.1%	*	0.4	4.2		19.7%	95.0%	5.0%	*	1.0	6.7	
Fourth quintile	20.2%	53.7%	46.3%	***	13.2	26.2		96.4%	3.6%		0.7	7.6		24.6%	92.3%	7.7%		1.6	10.4	
Fifth quintile (highest)	20.1%	46.7%	53.3%	***	14.4	27.6	**	93.4%	6.6%	***	1.0	6.4	*	28.2%	87.9%	12.1%	**	1.8	7.6	
Region of Residence				<0.001			<0.001			0.035			<0.001				0.200			0.007
Northeast	17.1%	59.4%	40.6%		14.4	34.1	*	94.6%	5.4%	*	1.1	6.7		18.3%	88.8%	11.2%		2.4	9.6	
Midwest	22.3%	52.3%	47.7%	**	14.8	33.3	**	96.8%	3.2%		0.4	3.2		28.0%	93.5%	6.5%		0.9	4.2	

Use in Three Months Prior to Pregnancy										Use in Final Three Months of Pregnancy										Continuation of Use in Final Three Months of Pregnancy									
Alcohol Use					No. of Alcoholic Drinks					Alcohol Use					No. of Alcoholic Drinks					Alcohol Use					No. of Alcoholic Drinks				
Total	None	Any	p-value		Mean	S.D.	p-value			None	Any	p-value		Mean	S.D.	p-value			None	Any	p-value		Mean	S.D.	p-value				
South	66.1%	33.9%	***		10.2	26.9	**			97.5%	2.5%			0.3	3.2	*			92.6%	7.4%			1.0	5.2					
West	66.8%	33.2%	**		11.0	3.4				96.7%	3.3%			0.6	7.7				91.1%	8.9%			1.7	12.6					

Source: 2001 ECLS-B. Data are weighted percentages or means [SDs.] National Center for Education Statistics (NCES) rounding rules applied to unweighted Ns; unweighted subgroup Ns may not add to the total due to rounding error.

Subgroup post-hoc p-values:

* P<0.05;

** P<0.01;

*** P<0.001

Table 2
Multivariable Regression Predicting Alcohol Use Prior to and During Pregnancy, Early Childhood Longitudinal Study-Birth Cohort

	Use in Three Months Prior to Pregnancy					Use in Final Three Months of Pregnancy					Continuation of Use in Final Three Months of Pregnancy				
	Alcohol Use (Any vs. None)		# of Alcoholic Drinks			Alcohol Use (Any vs. None)		# of Alcoholic Drinks			Alcohol Use (Any vs. None)		# of Alcoholic Drinks		
	AOR	95% CI	Mean #	SE	p-value	AOR	95% CI	Mean #	SE	p-value	AOR	95% CI	Mean #	SE	p-value
<u>Stress and Obstetric Factors</u>															
Stressful Life Events Prior to Conception															
None	1.00	Reference			Reference	1.00	Reference			Reference	1.00	Reference			Reference
Any	1.09	0.92 1.29	1.12	0.97	0.250	1.14	0.82 1.60	0.31	0.14	0.033	1.07	0.74 1.54	0.63	0.36	0.083
Stressful Life Events During Pregnancy															
None						1.00	Reference			Reference	1.00	Reference			Reference
Any						0.50	0.21 1.18	-0.35	0.25	0.165	0.55	0.23 1.31	-0.86	0.62	0.163
Concurrent Tobacco Use															
None	1.00	Reference			Reference	1.00	Reference			Reference	1.00	Reference			Reference
Any	2.69	2.29 3.16	13.49	1.23	<.001	2.99	1.80 4.97	0.81	0.20	<.001	2.05	1.22 3.44	1.57	0.49	0.001
Maternal Chronic Conditions															
None	1.00	Reference			Reference	1.00	Reference			Reference	1.00	Reference			Reference
Any	0.93	0.83 1.06	0.05	0.85	0.950	1.30	0.89 1.90	0.20	0.12	0.083	1.36	0.89 2.08	0.52	0.32	0.098
Prepregnancy Body Mass Index															
BMI <18.5	0.67	0.46 0.98	-2.71	1.99	0.175	1.43	0.64 3.24	0.46	0.43	0.281	1.85	0.75 4.55	1.82	1.23	0.139
18.5 BMI < 25	1.00	Reference			Reference	1.00	Reference			Reference	1.00	Reference			Reference
25 BMI < 30	0.93	0.80 1.09	-1.39	0.95	0.143	0.71	0.46 1.10	-0.37	0.10	<.001	0.69	0.44 1.07	-0.89	0.25	<.001
BMI ≥ 30	0.81	0.68 0.95	-1.25	1.32	0.344	0.48	0.28 0.82	-0.33	0.14	0.018	0.47	0.25 0.88	-0.71	0.36	0.050
Unknown	0.42	0.28 0.62	-7.09	2.75	0.010	0.73	0.27 1.94	-0.48	0.13	<.001	1.65	0.54 5.08	-0.70	0.57	0.219
Initiation of Prenatal Care															
In the first trimester						1.00	Reference			Reference	1.00	Reference			Reference
In the second or third trimester						0.59	0.31 1.13	-0.06	0.17	0.734	0.70	0.30 1.67	0.05	0.58	0.937
Did not receive prenatal care						0.66	0.03 12.75	-0.37	0.31	0.236	4.70	0.41 54.26	0.43	1.22	0.722
Previous Live Birth															
No	1.00	Reference			Reference	1.00	Reference			Reference	1.00	Reference			Reference

	Use in Three Months Prior to Pregnancy					Use in Final Three Months of Pregnancy					Continuation of Use in Final Three Months of Pregnancy							
	Alcohol Use (Any vs. None)		# of Alcoholic Drinks			Alcohol Use (Any vs. None)		# of Alcoholic Drinks			Alcohol Use (Any vs. None)		# of Alcoholic Drinks					
	AOR	95% CI	Mean #	SE	p-value	AOR	95% CI	Mean #	SE	p-value	AOR	95% CI	Mean #	SE	p-value			
Yes	0.68	0.60	0.77	-4.57	0.85	<.001	0.74	0.53	1.02	-0.20	0.10	0.042	1.07	0.77	1.49	-0.20	0.23	0.386
Maternal Sociodemographic Factors																		
Age (years)																		
15-19	0.37	0.27	0.51	-4.23	1.40	0.003	0.24	0.08	0.74	-0.39	0.11	0.001	0.45	0.13	1.59	-0.71	0.32	0.027
20-24	0.89	0.77	1.04	1.98	1.20	0.099	0.83	0.49	1.41	-0.24	0.12	0.050	0.89	0.47	1.68	-0.54	0.30	0.073
25-29	1.00	Reference	Reference	Reference	Reference	Reference	1.00	Reference	Reference	Reference	Reference	Reference	1.00	Reference	Reference	Reference	Reference	Reference
30-34	1.19	0.98	1.45	3.60	1.18	0.002	1.61	1.12	2.33	0.17	0.11	0.112	1.61	1.08	2.41	0.38	0.27	0.150
35+	1.33	1.04	1.72	6.23	1.78	<.001	2.15	1.27	3.65	0.63	0.26	0.014	2.15	1.29	3.57	1.38	0.59	0.018
Race/Ethnicity																		
White (non-Hispanic)	1.00	Reference	Reference	Reference	Reference	Reference	1.00	Reference	Reference	Reference	Reference	Reference	1.00	Reference	Reference	Reference	Reference	Reference
Black (non-Hispanic)	0.79	0.64	0.98	-2.23	1.51	0.138	0.64	0.36	1.13	0.00	0.15	0.983	0.72	0.39	1.33	0.40	0.51	0.435
Asian/Pacific Islander (non-Hispanic)	0.24	0.20	0.31	-9.01	0.85	<.001	0.36	0.21	0.60	-0.38	0.09	<.001	0.83	0.44	1.56	-0.34	0.37	0.364
Other (non-Hispanic)	1.25	0.97	1.61	3.77	2.81	0.179	1.13	0.42	3.02	0.22	0.31	0.474	0.63	0.26	1.53	-0.15	0.56	0.783
Hispanic	0.68	0.56	0.83	-2.97	1.08	0.006	0.69	0.40	1.17	-0.13	0.13	0.304	0.99	0.58	1.71	-0.03	0.37	0.938
Marital Status (at birth)																		
Married or living with partner	1.00	Reference	Reference	Reference	Reference	Reference	1.00	Reference	Reference	Reference	Reference	Reference	1.00	Reference	Reference	Reference	Reference	Reference
Separated/divorced/widowed	1.18	0.82	1.69	2.74	2.31	0.235	2.33	0.92	5.92	0.14	0.28	0.610	2.14	0.72	6.39	0.24	0.73	0.743
Never married	1.60	1.31	1.96	6.31	2.38	0.008	1.58	0.88	2.84	0.69	0.41	0.094	1.28	0.65	2.50	1.18	0.87	0.176
Health Insurance Status																		
Private Only	1.00	Reference	Reference	Reference	Reference	Reference	1.00	Reference	Reference	Reference	Reference	Reference	1.00	Reference	Reference	Reference	Reference	Reference
Any Public	0.76	0.66	0.88	-1.14	1.19	0.341	1.01	0.63	1.60	-0.05	0.14	0.710	1.05	0.63	1.77	-0.07	0.38	0.858
None	0.68	0.44	1.04	-1.62	2.58	0.530	1.19	0.39	3.61	-0.21	0.18	0.239	1.63	0.58	4.57	-0.19	0.48	0.692
Socioeconomic Status																		
First quintile (lowest)	0.33	0.27	0.41	-7.64	1.69	<.001	0.41	0.21	0.80	-0.56	0.26	0.030	0.70	0.30	1.65	-0.76	0.62	0.216
Second quintile	0.42	0.35	0.52	-5.71	1.79	0.001	0.52	0.29	0.93	-0.46	0.24	0.059	0.72	0.38	1.37	-0.61	0.51	0.230
Third quintile	0.51	0.43	0.61	-4.53	1.55	0.004	0.37	0.19	0.71	-0.47	0.25	0.057	0.46	0.21	0.98	-0.67	0.55	0.227
Fourth quintile	0.74	0.62	0.88	-2.04	1.54	0.183	0.59	0.35	0.99	-0.28	0.24	0.246	0.68	0.39	1.17	-0.37	0.51	0.470
Fifth quintile (highest)	1.00	Reference	Reference	Reference	Reference	Reference	1.00	Reference	Reference	Reference	Reference	Reference	1.00	Reference	Reference	Reference	Reference	Reference

Region of Residence	Use in Three Months Prior to Pregnancy				Use in Final Three Months of Pregnancy				Continuation of Use in Final Three Months of Pregnancy			
	Alcohol Use (Any vs. None)		# of Alcoholic Drinks		Alcohol Use (Any vs. None)		# of Alcoholic Drinks		Alcohol Use (Any vs. None)		# of Alcoholic Drinks	
	AOR	95% CI	Mean #	SE	AOR	95% CI	Mean #	SE	AOR	95% CI	Mean #	p-value
Northeast	1.01	0.76 1.34	0.54	1.66	1.18	0.64 2.18	0.31	0.27	1.07	0.54 2.10	0.56	0.441
Midwest	1.34	1.01 1.77	0.85	1.56	0.75	0.47 1.19	-0.17	0.16	0.69	0.42 1.11	-0.62	0.116
South	0.88	0.68 1.14	-2.45	1.62	0.67	0.41 1.10	-0.21	0.13	0.75	0.45 1.24	-0.52	0.144
West	1.00	Reference	Reference	Reference	1.00	Reference	Reference	Reference	1.00	Reference	Reference	Reference

AOR-Adjusted Odds Ratio; CI-Confidence Interval; SE-Standard Error

Data are from the 2001 Early Childhood Longitudinal Study, Birth Cohort (ECLS-B). All models account for complex sampling design of the ECLS-B.

Counts of number of alcoholic drinks and their statistical significance (p-values) were estimated using multivariable negative binomial regression. Marginal effects per week were calculated and were then multiplied by 13 to estimate the effect over the full 3 month period. Standard errors were calculated using the delta method and were then multiplied by 13.

Table 3
Descriptive Statistics by Tobacco Use Prior to and During Pregnancy, Early Childhood Longitudinal Study-Birth Cohort

	Use in Three Months Prior to Pregnancy					Use in Final Three Months of Pregnancy					Continuation of Use in Final Three Months of Pregnancy				
	Cigarette Use		No. of Cigarettes Smoked			Cigarette Use		No. of Cigarettes Smoked			Cigarette Use		No. of Cigarettes Smoked		
	Total	None	Any	p-value	S.D.	Total	None	Any	p-value	S.D.	Total	None	Any	p-value	S.D.
TOTAL (weighted)	3,774,441	2,897,428	877,013												
%	100.0%	76.8%	23.2%		280.6	691.0	3,360,625	413,816		88.4	393.8	877,013	463,673	413,339	740.3
TOTAL (unweighted)	9,350	7,200	2,150		277.4	710.5	8,300	1,050		92.0	395.4	2,150	1,100	1,050	746.9
Stress and Obstetric Factors															
Stressful Life Events Prior to Conception				0.004					0.024					0.001	<0.001
None	80.3%	77.6%	22.4%		269.1	672.1	89.9%	10.1%		80.5	388.7	77.5%	55.2%	44.8%	759.6
Any	19.7%	73.5%	26.5%		327.2	765.4	85.3%	14.7%		120.6	413.2	22.5%	44.8%	55.2%	664.5
Stressful Life Events During Pregnancy				<0.001					<0.001					0.001	0.001
None	94.2%	77.5%	22.5%		266.1	671.4	89.7%	10.3%		82.2	385.3	91.1%	54.2%	45.8%	739.7
Any	5.8%	64.1%	35.9%		517.6	924.3	78.1%	21.9%		189.6	503.3	8.9%	38.9%	61.1%	729.1
Maternal Chronic Conditions				0.047					<0.001					0.090	0.524
None	79.4%	77.6%	22.4%		263.3	636.8	89.7%	10.3%		85.5	399.3	76.7%	54.1%	45.9%	765.5
Any	20.6%	73.6%	26.4%		347.5	887.7	86.5%	13.5%		99.7	361.9	23.3%	48.9%	51.1%	613.6
Prepregnancy Body Mass Index (BMI)				<0.001					<0.001					0.099	0.265
BMI <18.5	3.3%	58.9%	41.1%	***	538.6	967.9	77.3%	22.7%	***	166.6	439.4	5.9%	44.9%	55.1%	519.8
18.5 BMI < 25	49.5%	77.3%	22.7%		262.1	645.6	88.9%	11.1%	*	82.0	361.0	48.3%	51.0%	49.0%	671.4
25 BMI < 30	26.8%	78.6%	21.4%	*	265.2	692.9	91.4%	8.6%	***	81.8	380.3	24.7%	59.9%	40.1%	767.3
BMI 30	17.9%	73.9%	26.1%	**	329.5	759.6	87.2%	12.8%	**	105.9	486.9	20.1%	51.2%	48.8%	898.7
Unknown	2.5%	90.6%	9.4%	**	122.0	444.3	95.4%	4.6%	***	58.6	290.0	1.0%	51.2%	48.8%	773.7
Initiation of Prenatal Care				<0.001					<0.001					0.075	0.201
In the first trimester	95.5%	77.3%	22.7%	***	272.7	681.2	89.4%	10.6%	***	84.8	391.3	93.4%	53.6%	46.4%	744.9
In the second or third trimester	4.2%	66.4%	33.6%	***	417.0	809.8	81.2%	18.8%	**	157.7	427.6	6.0%	43.9%	56.1%	636.2
Did not receive prenatal care	0.3%	55.1%	44.9%	*	883.9	1520.9	68.5%	31.5%	*	275.3	607.3	0.6%	29.8%	70.2%	676.3
Previous Live Birth				0.041					0.974					<0.001	<0.001
Yes	40.7%	75.2%	24.8%		275.5	615.2	91.3%	8.7%		56.8	253.1	43.5%	64.9%	35.1%	452.3
No	59.3%	77.8%	22.2%		284.1	740.0	87.5%	12.5%		110.2	467.4	56.5%	43.6%	56.4%	901.2
Maternal Sociodemographic Factors															

	Use in Three Months Prior to Pregnancy						Use in Final Three Months of Pregnancy						Continuation of Use in Final Three Months of Pregnancy							
	Cigarette Use			No. of Cigarettes Smoked			Cigarette Use			No. of Cigarettes Smoked			Cigarette Use			No. of Cigarettes Smoked				
	Total	None	Any	p-value	Mean	S.D.	p-value	None	Any	p-value	Mean	S.D.	p-value	Total	None	Any	p-value	Mean	S.D.	p-value
Age (years)				<0.001			<0.001			<0.001			<0.001				0.470			0.001
15-19	7.5%	70.4%	29.6%	**	303.7	743.2	87.8%	12.2%			76.2	275.8		9.5%	58.9%	41.1%		257.5	460.6	**
20-24	24.2%	64.0%	36.0%	***	439.6	790.7	83.3%	16.7%			132.8	516.4	***	37.5%	53.8%	46.2%		368.3	814.4	
25-29	26.2%	76.5%	23.5%		293.2	687.4	88.7%	11.3%			91.0	328.8		26.5%	51.9%	48.1%		387.9	577.7	
30-34	25.0%	84.6%	15.4%	***	176.9	561.3	92.8%	7.2%			67.2	405.9	*	16.5%	53.2%	46.8%		435.6	938.1	
35+	17.1%	86.5%	13.5%	***	177.3	643.7	92.7%	7.3%			57.9	297.0	**	9.9%	45.4%	54.6%		430.5	680.7	
Race/Ethnicity				<0.001			<0.001			<0.001			<0.001				<0.001			<0.001
White (non-Hispanic)	57.4%	70.2%	29.8%	***	380.7	675.8	85.1%	14.9%			124.8	397.0	***	73.6%	50.0%	50.0%	***	417.8	675.4	
Black (non-Hispanic)	14.1%	82.8%	17.2%	***	184.7	653.3	92.1%	7.9%			48.5	353.0	***	10.4%	54.3%	45.7%		282.4	835.2	
Asian/Pacific Islander (non-Hispanic)	3.5%	92.8%	7.2%	***	66.9	756.2	98.8%	1.2%			5.1	142.1	***	1.1%	82.8%	17.2%	***	71.0	465.0	***
Other (non-Hispanic)	2.5%	59.8%	40.2%	***	522.5	1648.7	77.2%	22.8%			217.5	1206.7	*	4.3%	43.1%	56.9%	***	541.8	1831.7	
Hispanic	22.6%	89.1%	10.9%	***	92.4	374.8	97.0%	3.0%			19.7	154.0	***	10.6%	72.2%	27.8%		180.9	475.2	***
Marital Status (at birth)				<0.001			<0.001			<0.001			<0.001				0.015			<0.001
Married or living with partner	83.4%	78.3%	21.7%	***	263.2	676.8	89.8%	10.2%			85.5	389.4		78.0%	53.0%	47.0%		393.1	748.5	
Separated/divorced/widowed	3.1%	70.2%	29.8%		443.1	807.3	80.1%	19.9%			182.9	487.4	*	3.9%	33.1%	66.9%	**	613.8	805.7	*
Never married	13.5%	68.9%	31.1%	***	351.0	738.4	86.5%	13.5%			85.4	392.3		18.1%	56.8%	43.2%		274.5	660.1	***
Health Insurance Status				<0.001			<0.001			<0.001			<0.001				<0.001			<0.001
Private Only	59.1%	83.4%	16.6%	***	180.8	555.0	93.7%	6.3%			53.1	362.6	***	42.2%	61.9%	38.1%	***	320.0	810.4	*
Any Public	37.4%	65.7%	34.3%	***	445.7	857.6	81.6%	18.4%			144.4	436.1	***	55.3%	46.5%	53.5%	***	420.4	659.7	*
None	3.4%	83.0%	17.0%		197.8	535.4	90.0%	10.0%			87.3	381.1		2.5%	42.0%	58.0%		509.6	815.6	
Socioeconomic Status				<0.001			<0.001			<0.001			<0.001				<0.001			<0.001
First quintile (lowest)	19.7%	71.4%	28.6%	***	363.0	747.7	82.7%	17.3%			138.4	434.4	***	24.2%	39.5%	60.5%	***	484.5	738.8	**
Second quintile	20.0%	65.4%	34.6%	***	448.0	893.6	82.7%	17.3%			155.9	580.7	***	29.8%	50.3%	49.7%		449.1	925.3	*
Third quintile	20.1%	70.9%	29.1%	***	345.2	685.6	87.3%	12.7%			89.4	302.7	**	25.1%	56.3%	43.7%		307.3	489.6	***
Fourth quintile	20.2%	83.0%	17.0%	***	182.8	561.0	94.0%	6.0%			46.0	336.0	**	14.7%	64.9%	35.1%	***	270.7	739.1	
Fifth quintile (highest)	20.1%	92.9%	7.1%	***	66.6	369.1	98.2%	1.8%			14.0	159.8	***	6.2%	75.2%	24.8%	***	196.3	491.3	**
Region of Residence				<0.001			<0.001			<0.001			<0.001				0.033			<0.001
Northeast	17.1%	74.9%	25.1%		298.5	673.0	88.1%	11.9%			84.0	287.1		18.5%	52.7%	47.3%		334.0	482.2	
Midwest	22.3%	71.6%	28.4%		362.8	813.0	85.3%	14.7%			109.1	361.5	***	27.2%	48.1%	51.9%		384.3	592.7	

	Use in Three Months Prior to Pregnancy						Use in Final Three Months of Pregnancy						Continuation of Use in Final Three Months of Pregnancy						
	Cigarette Use			No. of Cigarettes Smoked			Cigarette Use			No. of Cigarettes Smoked			Cigarette Use			No. of Cigarettes Smoked			
	Total	None	Any	p-value	Mean	S.D.	Total	None	Any	p-value	Mean	S.D.	Total	None	Any	p-value	Mean	S.D.	p-value
South	36.9%	76.1%	23.9%	***	295.7	669.4					106.0	486.8	37.9%	51.9%	48.1%		443.4	935.4	
West	23.8%	83.9%	16.1%	***	167.2	570.6					45.0	295.9	16.4%	63.0%	37.0%	*	279.7	685.1	**

Source: 2001 ECLS-B. Data are weighted percentages or means [SDs.] National Center for Education Statistics (NCES) rounding rules applied to unweighted Ns; unweighted subgroup Ns may not add to the total due to rounding error.

Note: Bolded values indicate significantly significant group p-values. Subgroup post-hoc p-values:

* P<0.05;

** P<0.01;

*** P<0.001.

Number of cigarettes smoked refers to the number of cigarettes smoked during each 3 month period based on reported daily averages

Table 4
Multivariable Regression Predicting Cigarette Use Prior to and During Pregnancy, Early Childhood Longitudinal Study-Birth Cohort

	Use in Three Months Prior to Pregnancy					Use in Final Three Months of Pregnancy					Continuation of Use in Final Three Months of Pregnancy				
	Cigarette Use (Any vs. None)		# of Cigarettes Smoked			Cigarette Use (Any vs. None)		# of Cigarettes Smoked			Cigarette Use (Any vs. None)		# of Cigarettes Smoked		
	AOR	95% CI	Mean #	SE	p-value	AOR	95% CI	Mean #	SE	p-value	AOR	95% CI	Mean #	SE	p-value
<u>Stress and Obstetric Factors</u>															
Stressful Life Events Prior to Conception															
None	1.00	Reference	Reference	Reference		1.00	Reference	Reference	Reference		1.00	Reference	Reference	Reference	
Any	1.52	1.23 1.87	96.96	38.19	0.011	1.57	1.19 2.07	18.41	18.45	0.318	1.17	0.86 1.59	-27.81	55.72	0.618
Stressful Life Events During Pregnancy															
None						1.00	Reference	Reference	Reference		1.00	Reference	Reference	Reference	
Any						2.06	1.42 2.98	84.73	24.99	0.001	1.99	1.24 3.20	171.66	72.79	0.018
Concurrent Alcohol Use															
None	1.00	Reference	Reference	Reference		1.00	Reference	Reference	Reference		1.00	Reference	Reference	Reference	
Any	2.75	2.34 3.24	260.24	31.74	<.001	3.01	1.80 5.04	118.73	56.20	0.035	4.69	2.40 9.16	268.44	124.19	0.031
Maternal Chronic Conditions															
None	1.00	Reference	Reference	Reference		1.00	Reference	Reference	Reference		1.00	Reference	Reference	Reference	
Any	1.15	0.93 1.41	81.49	39.27	0.038	1.21	0.97 1.50	30.73	25.38	0.226	1.13	0.86 1.47	14.99	48.30	0.756
Prepregnancy Body Mass Index															
BMI <18.5	2.03	1.46 2.82	187.26	67.60	0.006	1.77	1.25 2.50	31.92	34.55	0.356	1.21	0.69 2.14	44.67	84.24	0.596
18.5 BMI < 25	1.00	Reference	Reference	Reference		1.00	Reference	Reference	Reference		1.00	Reference	Reference	Reference	
25 BMI < 30	0.96	0.81 1.14	73.62	34.65	0.034	0.70	0.56 0.88	-15.76	16.41	0.337	0.73	0.52 1.04	-14.27	55.25	0.796
BMI 30	1.19	0.99 1.43	163.76	48.22	0.001	0.99	0.79 1.24	39.82	19.98	0.046	1.08	0.81 1.44	74.13	51.16	0.147
Unknown	0.48	0.24 0.97	-85.45	63.93	0.181	0.45	0.18 1.13	-18.19	47.56	0.702	1.21	0.35 4.13	424.50	441.06	0.336
Initiation of Prenatal Care															
In the first trimester						1.00	Reference	Reference	Reference		1.00	Reference	Reference	Reference	
In the second or third trimester						1.27	0.82 1.98	30.72	31.86	0.335	1.30	0.79 2.14	84.82	75.97	0.264
Did not receive prenatal care						2.10	0.65 6.84	159.20	169.60	0.348	1.87	0.41 8.54	146.79	257.88	0.569
Previous Live Birth															
No	1.00	Reference	Reference	Reference		1.00	Reference	Reference	Reference		1.00	Reference	Reference	Reference	

	Use in Three Months Prior to Pregnancy					Use in Final Three Months of Pregnancy					Continuation of Use in Final Three Months of Pregnancy					Wit- ness p-value
	Cigarette Use (Any vs. None)		# of Cigarettes Smoked			Cigarette Use (Any vs. None)		# of Cigarettes Smoked			Cigarette Use (Any vs. None)		# of Cigarettes Smoked			
	AOR	95% CI	Mean #	SE	p-value	AOR	95% CI	Mean #	SE	p-value	AOR	95% CI	Mean #	SE	p-value	
Yes	0.97	0.82 1.15	15.45	33.22	0.642	1.50	1.15 1.95	82.25	21.72	<.001	0.48	0.35 0.67	285.45	70.27	<.001	
Maternal Sociodemographic Factors																
Age (years)																
15-19	1.06	0.76 1.46	12.21	55.83	0.827	0.75	0.48 1.16	3.32	29.54	0.910	0.83	0.50 1.39	-51.18	72.19	0.478	
20-24	1.35	1.10 1.65	67.74	37.31	0.069	1.07	0.84 1.36	31.10	20.06	0.121	0.92	0.65 1.28	-12.84	43.66	0.769	
25-29	1.00	Reference	Reference	Reference	Reference	1.00	Reference	Reference	Reference	Reference	1.00	Reference	Reference	Reference	Reference	
30-34	0.69	0.54 0.89	-51.20	40.42	0.205	0.84	0.59 1.19	3.68	20.37	0.857	1.21	0.73 2.02	119.49	86.54	0.167	
35+	0.61	0.44 0.84	-17.02	51.06	0.739	0.89	0.58 1.35	34.26	33.22	0.302	1.75	0.95 3.23	152.80	109.56	0.163	
Race/Ethnicity																
White (non-Hispanic)	1.00	Reference	Reference	Reference	Reference	1.00	Reference	Reference	Reference	Reference	1.00	Reference	Reference	Reference	Reference	
Black (non-Hispanic)	0.19	0.15 0.24	-354.49	39.42	<.001	0.20	0.14 0.26	-160.50	35.31	<.001	0.51	0.32 0.80	-252.67	52.79	<.001	
Asian/Pacific Islander (non-Hispanic)	0.28	0.20 0.38	-342.06	39.12	<.001	0.09	0.05 0.14	-178.82	30.70	<.001	0.25	0.14 0.44	-376.58	39.52	<.001	
Other (non-Hispanic)	0.90	0.70 1.16	9.54	93.34	0.919	0.94	0.67 1.31	19.76	69.19	0.775	1.05	0.62 1.75	53.39	144.34	0.711	
Hispanic	0.16	0.12 0.21	-421.48	30.45	<.001	0.09	0.07 0.13	-174.87	29.98	<.001	0.33	0.22 0.50	-254.89	56.32	0.001	
Marital Status (at birth)																
Married or living with partner	1.00	Reference	Reference	Reference	Reference	1.00	Reference	Reference	Reference	Reference	1.00	Reference	Reference	Reference	Reference	
Separated/divorced/widowed	1.07	0.72 1.60	179.56	99.79	0.072	0.68	0.45 1.01	55.25	87.97	0.530	0.97	0.39 2.39	58.70	154.56	0.704	
Never married	1.20	0.94 1.52	120.42	60.33	0.046	0.91	0.69 1.19	4.28	28.77	0.882	0.74	0.52 1.06	-95.80	57.36	0.095	
Health Insurance Status																
Private Only	1.00	Reference	Reference	Reference	Reference	1.00	Reference	Reference	Reference	Reference	1.00	Reference	Reference	Reference	Reference	
Any Public	2.07	1.71 2.51	217.04	33.94	<.001	2.15	1.63 2.85	65.69	18.67	<.001	1.55	1.13 2.12	81.44	50.36	0.106	
None	1.31	0.84 2.04	-20.50	46.29	0.658	1.76	0.95 3.26	50.29	62.99	0.425	2.13	0.93 4.85	192.16	147.84	0.194	
Socioeconomic Status																
First quintile (lowest)	7.52	5.38 10.51	319.82	36.41	<.001	16.73	9.20 30.42	150.20	33.28	<.001	6.03	2.93 12.37	399.34	72.65	<.001	
Second quintile	7.73	5.49 10.89	387.04	37.86	<.001	11.97	6.67 21.47	164.51	26.98	<.001	3.69	1.96 6.95	307.59	62.14	<.001	
Third quintile	5.38	3.94 7.34	274.86	26.15	<.001	8.08	4.67 14.00	85.63	14.39	<.001	3.01	1.62 5.56	178.69	45.35	<.001	
Fourth quintile	2.56	1.89 3.47	142.65	30.49	<.001	3.49	2.05 5.93	44.46	16.04	0.006	1.92	0.97 3.81	93.39	71.31	0.190	
Fifth quintile (highest)	1.00	Reference	Reference	Reference	Reference	1.00	Reference	Reference	Reference	Reference	1.00	Reference	Reference	Reference	Reference	

Region of Residence	Use in Three Months Prior to Pregnancy					Use in Final Three Months of Pregnancy					Continuation of Use in Final Three Months of Pregnancy					Weight		
	Cigarette Use (Any vs. None)		# of Cigarettes Smoked			Cigarette Use (Any vs. None)		# of Cigarettes Smoked			Cigarette Use (Any vs. None)		# of Cigarettes Smoked					
	AOR	95% CI	Mean #	SE	p-value	AOR	95% CI	Mean #	SE	p-value	AOR	95% CI	Mean #	SE	p-value			
Northeast	1.68	1.24	2.27	119.97	53.30	0.024	1.72	1.07	2.76	10.50	27.73	0.705	1.38	0.83	2.30	-25.76	82.40	0.755
Midwest	1.42	1.09	1.85	92.01	42.06	0.029	1.86	1.22	2.82	25.91	23.25	0.265	1.67	1.06	2.65	19.02	63.52	0.765
South	1.25	0.94	1.65	33.95	37.02	0.359	1.38	0.91	2.09	16.83	22.13	0.447	1.34	0.88	2.02	84.82	73.53	0.249
West	1.00	Reference	Reference	Reference	Reference		1.00	Reference	Reference	Reference	Reference		1.00	Reference	Reference	Reference	Reference	

AOR-Adjusted Odds Ratio; CI-Confidence Interval; SE-Standard Error

Data are from the 2001 Early Childhood Longitudinal Study, Birth Cohort (ECLS-B). All models account for complex sampling design of the ECLS-B.

Counts of cigarettes and their statistical significance (p-values) were estimated using multivariable negative binomial regression. Marginal effects per day were calculated and were then multiplied by 90 to estimate the effect over the full 3 month period. Standard errors were calculated using the delta method and were then multiplied by 90.