

Smoking and Drinking Behavior Before and During Pregnancy of Married Mothers of Live-Born Infants and Stillborn Infants

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Synopsis

Data from the 1980 National Natality Survey (NNS) and the 1980 National Fetal Mortality Survey (NFMS)

THE SURGEON GENERAL HAS WARNED women about the hazards to the infants of mothers who smoke cigarettes or consume alcohol before or during pregnancy (1):

Smoking slows fetal growth, doubles the chance of low birth weight, and increases the risk of stillbirth. Recent studies suggest that smoking may be a significant contributing factor in 20 to 40 percent of low weight infants born in the United States and Canada. Studies also indicate that infants of mothers regularly consuming large amounts of alcohol may suffer from low birth weight, birth defects, and/or mental retardation. Clearly, both previously developed habits need careful attention during pregnancy.

Excessive alcohol use is also associated with a pattern of abnormalities called fetal alcohol syndrome (FAS). The National Institute on Alcohol Abuse and Alcoholism has reported to Congress (2):

Some clinical studies of alcoholic mothers and some animal studies give evidence that heavy use of alcohol during preg-

are used to describe the drinking and smoking behavior of married mothers before and during pregnancy according to maternal race and Hispanic origin, age, and education. Typically, smokers were white mothers under 25 years of age with a high school education or less, and drinkers were white mothers 25 years of age and older with more than a high school education.

When pregnancy was confirmed, reductions in smoking and drinking occurred. However, mothers of stillborn infants were less likely to stop smoking than were the mothers of live-born infants.

Although the prevalence of drinking was much higher than was the prevalence of smoking among the mothers included in these surveys, the reduction in drinking was much more pronounced than was the reduction in smoking. For nearly every sociodemographic subgroup, the prevalence of smoking was higher and the prevalence of drinking was lower among mothers of stillborn infants than among mothers of live-born infants. Some of these differences are due to the age-race-health status makeup of the two NNS-NFMS populations sampled, and carefully controlled multivariate analyses are required to specify the relationship of maternal smoking and drinking to birth outcome. This descriptive analysis is the first step in that process.

nancy may result in a pattern of various abnormalities in the offspring. . . . Current estimates conservatively suggest an incidence on the order of magnitude of 1 per 2,000 live births. Some evidence suggests that among 100 mothers drinking more than 1 ounce of absolute alcohol per day one might find one case of FAS. On this basis, FAS would be the third leading cause of birth defects associated with mental retardation, exceeded only by Down's syndrome and spina bifida. Of the three, only FAS is preventable.

Although researchers have reported a decrease in drinking (3) and smoking during pregnancy (4), the studies have been based on small numbers of women in selected localities. We report on changes in drinking and smoking behaviors during pregnancy for a national sample of married mothers who delivered either live births or stillbirths in 1980. Late fetal deaths are also called "stillbirths" and will be referred to as such in this paper. Variations in smoking and drinking are examined before and during pregnancy according to maternal race and Hispanic origin, age, and education.

'We report on changes in drinking and smoking behavior during pregnancy for a national sample of married mothers who delivered live births or stillbirths in 1980 . . . Variations in smoking and drinking are examined before and during pregnancy according to maternal race and Hispanic origin, age, and education.'

Data Source

Data used in this article are based on unweighted respondent questionnaires from the 1980 National Natality Survey and the 1980 National Fetal Mortality Survey. Details of the national surveys' design and sampling techniques are discussed elsewhere in this issue (5). About 6 months after delivery, 7,825 married mothers of live-born infants and 4,814 married mothers of stillborn infants were mailed a questionnaire to assess social and demographic characteristics and prenatal behavior, including smoking and drinking. Nonrespondents to two mailings received telephone interviews using an abbreviated version of the mailed questionnaire. However, the telephone interview did not include questions on smoking and drinking behavior *before* pregnancy—only *after*. Therefore, this article is based on the 4,405 married mothers of live-born infants and 2,616 married mothers of stillborn infants who responded to the mailed questionnaire. Item nonresponse on returned questionnaires was uniformly low. For the critical behavioral variables related to smoking and drinking, item nonresponse among mothers of live-born infants did not exceed 2.0 percent and averaged 1.3 percent. Among mothers experiencing stillbirths, item nonresponse averaged 1.4 percent. In this analysis, values were imputed for those few items for which there was no response.

Several things are important to note. The proportion of births to unmarried mothers varies widely by race, age, and other variables. For example, in 1980, 89 percent of all white mothers were married at the time of delivery as compared with only 45 percent of black mothers (6). The smoking and drinking behaviors of unmarried mothers may differ from those of married mothers. It is also important to note that the sample data in this article are not weighted to reflect national estimates, but selected comparisons with weighted data did not reveal any serious differences.

Mothers were asked which national origin they identified with most. Nearly two-thirds of those who identified

with the Hispanic origin reported their race as white. Approximately one-third reported their race as other than black or white, and about 1 percent reported themselves as black. In this paper, we combined race and Hispanic origin to create four mutually exclusive race-ethnicity categories: white non-Hispanic, black non-Hispanic, Hispanic, and other. In the presentation and discussion of the results that follow, it should be emphasized that white refers to white non-Hispanic and that black refers to black non-Hispanic. The residual other category is a heterogeneous group including American Indians, Alaskan Natives, Asians, and Pacific Islanders. When white is contrasted with all other races in the presentation of data on age and educational attainment, the all other group includes Hispanic, black non-Hispanic, and other non-Hispanic.

Regarding smoking, mothers were asked, "On the average, how many cigarettes did you smoke per day before you found out that you were pregnant?" and "On the average, how many cigarettes did you smoke per day after you found out that you were pregnant?" Women who reported smoking one or more cigarettes per day were defined as smokers.

Regarding drinking, women were asked, "Did you drink any alcoholic beverages (beer, wine, or liquor) during the 12 months before your 1980 delivery?" and if yes, "How often did you usually drink alcoholic beverages, that is, beer, wine, and/or liquor?" and "On the day or days that you drank, how much did you drink on the average per day?" Identical questions were asked for the periods before pregnancy and during pregnancy. Convenient check boxes were provided, with 8 possible responses ranging from "every day" to "did not drink at all", and with 12 possible responses ranging from "12 or more drinks" to "did not drink at all."

Alcohol consumption, defined as the average daily consumption of absolute alcohol expressed in ounces, was calculated as follows from responses to the questions regarding drinking:

$$\begin{aligned} \text{alcohol consumption} &= \text{ounces of absolute alcohol consumed per day on the average} \\ &= 0.5 \times \text{quantity factor} \times \text{frequency factor} \end{aligned}$$

The factor of 0.5 ounces per drink is used to translate the questionnaire response to ounces of alcohol consumed. This 0.5 factor is approximately the ounces of absolute alcohol contained in one beer, one glass of wine, or one mixed drink. The quantity factor is the average number of drinks per day. The frequency factor translates the answer to "How often do you drink?" into number of drinking occasions. A mother who had one drink three times a week or three drinks once a week would have had the same average daily consumption of alcohol.

Findings—Live Births

Prepregnancy smoking and drinking behavior. Figure 1 shows the distribution of mothers experiencing live births according to both smoking and drinking habits. Before pregnancy, nearly one-third of mothers smoked and more than one-half drank. More than one-third of mothers abstained from both smoking and drinking, and one-fifth both smoked and drank. However, these behaviors varied substantially among different subgroups of mothers.

Smoking. The prevalence of smoking was highest among white mothers (table 1). Almost one-third of these mothers smoked before pregnancy, compared with about one-fourth of black mothers. Less than one-quarter of Hispanic mothers and about one-fifth of the mothers of other races smoked.

Smoking prevalence decreased with age among white mothers. Nearly 1 out of 2 mothers under 20 years of age smoked, but about 1 out of 4 mothers age 25 and older smoked. Among all other mothers, the same pattern of decreased smoking with increased age prevailed.

Mothers under 20 years of age are excluded from the analysis according to educational attainment because some women would not have had a chance to complete their education. The prevalence of smoking declined steadily with increased education among white mothers; 60 percent of mothers with less than 12 years of educa-

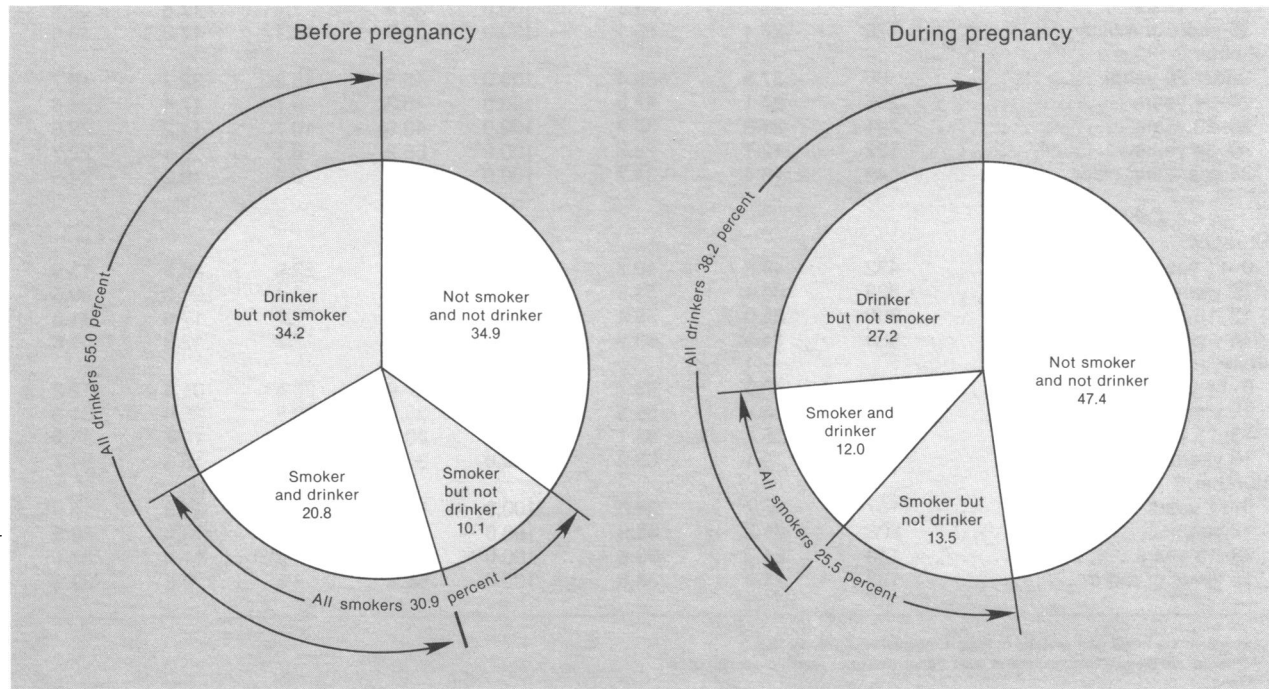
tion smoked as compared with only 15 percent of those with 16 years' education or more. Among the all other group of mothers, college graduates were the least likely to smoke, but no other differences by years of education were found.

Drinking. As with smoking, drinking was most common among white mothers. More than 58 percent of white mothers drank, compared with 39 percent of black mothers and 40 percent of Hispanic mothers.

Although smoking was less prevalent among older and better educated mothers, drinking was more prevalent among this group. Among white mothers, drinking prevalence increased from 44 percent for mothers with less

'Mothers may have underreported their behavior because of guilt feelings aroused by media campaigns to persuade them to reduce smoking and drinking during pregnancy. If so, these estimates of smoking and drinking could be considered minimum estimates.'

Figure 1. Percent distribution of married mothers of live-born infants according to smoking and drinking behaviors before and during pregnancy; United States, 1980



SOURCE: National Center for Health Statistics data from the 1980 National Natality Survey.

than 12 years of education to 68 percent for mothers with 16 or more years of education. Among the all other group, drinking was less prevalent for those 30 years of age and older but did not vary by education.

mothers. The combination of behaviors decreased with increased age and education for both white mothers and all other mothers.

Abstinence. Abstinence from smoking and drinking before pregnancy was high among Hispanic mothers, black mothers, and mothers of other races. About one-half of Hispanic mothers and black mothers abstained.

Table 1. Smoking¹ and drinking² behavior, before pregnancy, of married mothers of live-born infants, according to selected characteristics, United States, 1980

Characteristic	Number	Percentage of mothers		Total	Percentage distribution			
		All smokers	All drinkers		Neither smoked nor drank	Smoker but not drinker	Smoker and drinker	Drinker but not smoker
All married mothers	4,405	30.9	55.0	100.0	34.9	10.0	20.8	34.2
<i>Race, ethnicity</i>								
White, non-Hispanic	3,727	32.4	58.1	100.0	31.7	10.2	22.2	36.0
Black, non-Hispanic	247	24.7	39.2	100.0	49.4	11.3	13.4	25.9
Hispanic	253	23.3	39.9	100.0	51.0	9.1	14.2	25.7
Other ³	178	19.7	33.2	100.0	58.4	8.2	11.2	21.9
<i>Age</i>								
All races:								
Under 20 years	330	47.3	40.3	100.0	39.1	20.6	26.7	13.6
20–24 years	1,393	36.8	53.0	100.0	35.1	11.9	24.8	28.1
25–29 years	1,608	27.3	58.2	100.0	33.8	8.0	19.3	38.9
30–34 years	846	23.2	58.6	100.0	34.2	7.2	16.0	42.7
35 years and older	228	25.4	53.1	100.0	37.3	9.7	15.8	37.3
White, non-Hispanic:								
Under 20 years	264	49.6	40.5	100.0	37.5	22.0	27.7	12.9
20–24 years	1,186	38.4	54.9	100.0	32.8	12.3	26.1	28.8
25–29 years	1,384	28.2	61.2	100.0	31.3	7.5	20.7	40.5
30–34 years	714	25.2	64.1	100.0	28.4	7.4	17.8	46.4
35 years and older	179	27.4	58.1	100.0	31.8	10.1	17.3	40.8
All other: ³								
Under 20 years	66	37.9	39.4	100.0	45.5	15.2	22.7	16.7
20–24 years	207	27.1	42.0	100.0	48.3	9.7	17.4	24.6
25–29 years	224	21.9	39.7	100.0	49.6	10.7	11.2	28.6
30–34 years	132	12.1	28.8	100.0	65.2	6.1	6.1	22.7
35 years and older	49	18.4	34.7	100.0	57.1	8.2	10.2	24.5
<i>Education⁴</i>								
All races:								
0–11 years	432	49.8	40.7	100.0	36.3	22.9	26.9	13.9
12 years	1,823	34.4	54.5	100.0	35.1	10.4	24.0	30.5
13–15 years	936	25.0	59.4	100.0	33.2	7.4	17.6	41.8
16 years or more	884	14.5	63.9	100.0	33.9	2.2	12.3	51.6
White, non-Hispanic:								
0–11 years	295	60.0	43.7	100.0	27.8	28.5	31.5	12.2
12 years	1,615	36.2	56.5	100.0	32.7	10.8	25.4	31.2
13–15 years	796	25.1	63.1	100.0	30.5	6.4	18.7	44.4
16 years or more	757	15.1	68.2	100.0	30.3	1.6	13.5	54.7
All other: ³								
0–11 years	137	27.7	34.3	100.0	54.7	10.9	16.8	17.5
12 years	208	21.2	38.9	100.0	54.3	7.7	13.5	25.5
13–15 years	140	24.3	38.6	100.0	48.6	12.9	11.4	27.1
16 years or more	127	11.0	38.6	100.0	55.9	5.5	5.5	33.1

¹ Smokers are those who smoked at least 1 tobacco cigarette per day.

² Drinkers are those who consumed at least 1 drink (0.5 oz of absolute alcohol) once a month.

³ Includes all other races and other ethnic groups not shown separately.

⁴ Includes only mothers who are 20 years of age and older.

Nearly three-fifths of other mothers abstained, but less than one-third of white mothers abstained from smoking and drinking before pregnancy.

Through the 30–34 year age group, abstention increased with age for all other mothers and decreased with increasing age for white mothers, but varied little by educational attainment for either race group.

Typically, smokers were white mothers under 25 years with a high school education or less, and drinkers were white mothers 25 years and older with more than a high school education. Younger white mothers and white mothers with 12 years of education or less were most likely to consume both alcohol and cigarettes. Hispanic mothers, black mothers, and other mothers were more likely to abstain and less likely to either smoke or drink than white mothers.

Change in smoking and drinking behavior during pregnancy. Mothers were much more likely to stop drinking than to stop smoking during pregnancy (table 2). Of those who had the habit before pregnancy, 30 percent stopped drinking and 18 percent stopped smoking. Of mothers who both smoked and drank prior to pregnancy, 43 percent gave up either cigarettes or alcohol or both, reducing the prevalence of both habits from 1 out of 5 pregnant women to 1 out of 8 (fig. 1). Twenty percent of mothers with either of these habits before pregnancy became abstinent during pregnancy, increasing the prevalence of abstinence from 1 out of 3 to 1 out of 2 mothers.

Change in smoking. More than 25 percent of the Hispanic mothers who smoked stopped smoking during pregnancy, compared with 18 percent of white mothers and 13 percent of black mothers. No significant differences by age were found in the proportion who stopped smoking. However, educational attainment was directly related to the tendency to stop smoking. Of white mothers who smoked, 10 percent of mothers with the least education stopped and 25 percent of mothers with the most education stopped. Thus, the difference between the highest and lowest educational groups in the prevalence of smoking became even greater during pregnancy than it was before pregnancy.

Change in drinking. Nearly 30 percent of white and Hispanic mothers and almost 40 percent of black and other mothers who drank stopped drinking during pregnancy. For mothers under 35 years, the age of the mothers who drank was inversely related to the tendency to stop drinking; in short, older mothers were less likely to stop drinking than younger mothers. However, there were no significant differences by education in the proportion who stopped drinking.

Of those who had the habit before pregnancy, 30 percent stopped drinking and 18 percent stopped smoking. Of mothers who both smoked and drank prior to pregnancy, 43 percent gave up either cigarettes or alcohol or both, reducing the prevalence of both habits from 1 out of 5 pregnant women to 1 out of 8.

Table 2. Change in smoking¹ and drinking² behavior, during pregnancy, of married mothers of live-born infants, according to selected characteristics, United States, 1980

Characteristic	With 1 or both habits (percent)			With both habits and stopped 1 or both (percent)
	Stopped smoking	Stopped drinking	Became abstinent	
All married mothers	17.6	29.6	19.6	43.1
<i>Race, ethnicity</i>				
White, non-Hispanic	17.7	29.2	19.2	43.0
Black, non-Hispanic	13.1	37.1	26.4	33.3
Hispanic	25.4	27.7	20.2	50.0
Other ³	8.6	37.3	20.3	50.0
<i>Age⁴</i>				
All races:				
Under 20 years	19.9	39.1	17.4	54.5
20–24 years	17.4	33.2	19.1	46.5
25–29 years	18.0	29.5	21.3	41.2
30–34 years	18.9	22.4	18.5	33.3
35 years and older	6.9	28.1	17.5	36.1
White, non-Hispanic:				
Under 20 years	21.4	41.1	18.2	57.5
20–24 years	17.1	32.6	18.4	46.1
25–29 years	17.7	29.8	21.3	41.3
30–34 years	19.4	21.4	17.8	33.1
35 years and older	8.2	25.0	15.6	35.5
<i>Education^{4,5}</i>				
All races:				
0–11 years	9.8	29.5	9.5	40.5
12 years	16.9	30.8	19.3	42.0
13–15 years	21.8	25.2	20.0	40.0
16 years or more	24.2	29.7	25.5	45.9
White, non-Hispanic:				
0–11 years	10.2	31.0	9.4	40.9
12 years	15.9	30.2	18.4	41.2
13–15 years	23.5	24.7	19.9	40.9
16 years or more	24.6	28.7	24.6	40.1

¹ Smokers are those who smoked at least 1 tobacco cigarette per day.
² Drinkers are those who consumed at least 1 drink (0.5 oz of absolute alcohol) once a month.
³ Includes all other races and other ethnic groups not shown separately.
⁴ For all other races, number of cases was too small to meet standards for precision or reliability. Therefore, data for all other races are not shown.
⁵ Includes mothers who are 20 years of age or older.

Change in behavior of mothers who smoked and drank. Mothers who both smoked and drank before pregnancy were more likely to give up alcohol than cigarettes during pregnancy. Of these mothers, 43 percent of white mothers and 33 percent of black mothers gave up one or both behaviors during pregnancy, compared with 50 percent of Hispanic and other mothers (table 2).

Percent becoming abstinent. Of mothers who either smoked or drank or had both habits before pregnancy, about one of every five became abstinent during pregnancy.

Quantity and frequency of cigarettes and alcohol consumed. Table 3 shows the changes in amount of smoking

Table 3. Smoking and drinking behavior, during pregnancy, of married mothers of live-born infants, according to behavior before pregnancy, United States, 1980

Behavior	Before pregnancy		During pregnancy (percent)			
	Number	Percent	Total	None	Level 1	Level 2
<i>Average daily smoking</i>						
All behaviors	4,405	100.0	100.0	74.5	12.0	13.5
None ¹	3,044	69.1	100.0	99.9	0.1	0.0
1-10 cigarettes (Level 1)	412	9.4	100.0	31.3	65.8	2.9
11 cigarettes or more (Level 2)	949	21.5	100.0	11.8	26.8	61.4
<i>Average weekly drinking</i>						
All behaviors	4,405	100.0	100.0	60.9	35.9	3.2
None ²	1,981	45.0	100.0	99.1	0.8	0.1
Less than 3 drinks (Level 1) ³	1,741	39.5	100.0	34.5	64.6	0.9
3 drinks or more (Level 2) ⁴	683	15.5	100.0	17.4	64.6	18.0

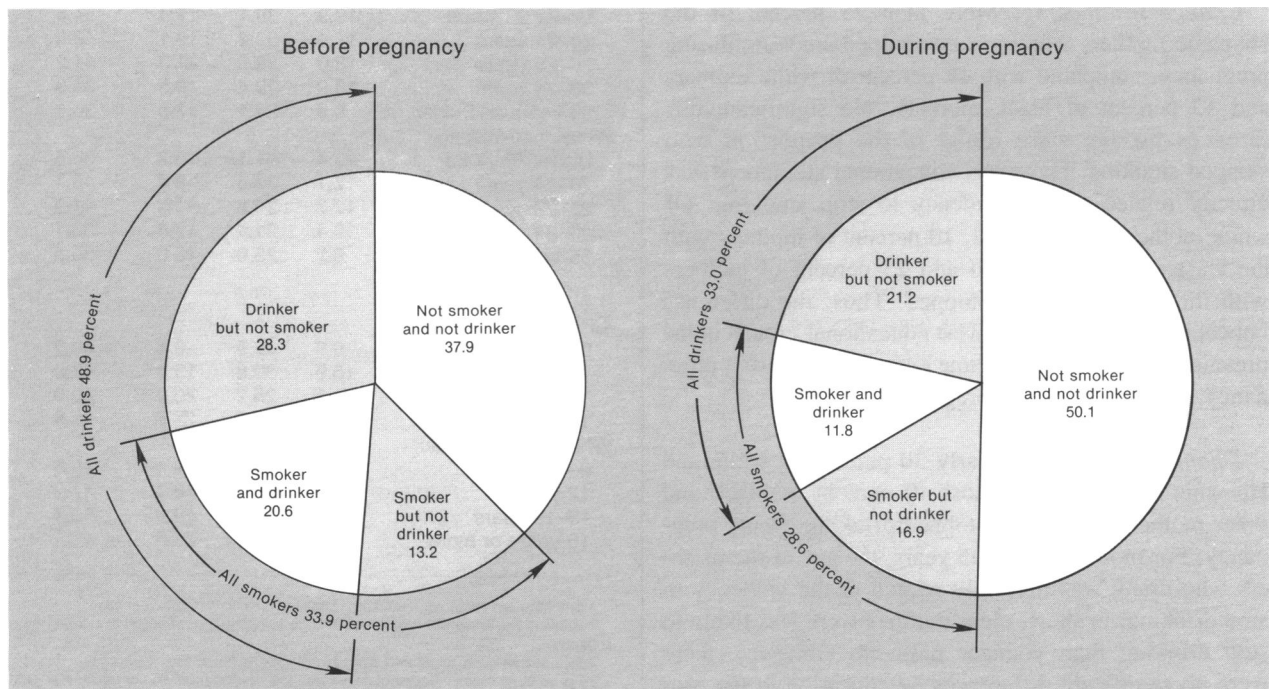
¹ Did not smoke even 1 cigarette a day.

² Consumed less than 1 drink (0.5 oz of absolute alcohol) less than once a month.

³ Consumed 0.01-0.19 oz of absolute alcohol each day on the average.

⁴ Consumed 0.19 oz or more of absolute alcohol each day on the average.

Figure 2. Percent distribution of married mothers of stillborn infants according to smoking and drinking behaviors before and during pregnancy: United States, 1980



SOURCE: National Center for Health Statistics data from the 1980 National Fetal Mortality Survey.

and drinking after pregnancy was confirmed according to smoking and drinking levels before pregnancy. Of the 31 percent of mothers who smoked before pregnancy, most smoked more than 10 cigarettes per day. Of these smokers, about 12 percent stopped smoking during pregnancy, and an additional 27 percent reduced their consumption. In addition, one-third of those who smoked fewer than 10 cigarettes per day stopped smoking during pregnancy. The prevalence of mothers who smoked more than 10 cigarettes per day during pregnancy dropped from 22 percent before pregnancy to about 14 percent during pregnancy, and the prevalence of non-smokers increased from 69 percent to 75 percent.

Fifty-five percent of mothers drank before pregnancy, but only 16 percent had three drinks or more per week. About 17 percent of these level 2 drinkers stopped their drinking during pregnancy, and another 65 percent reduced their consumption. In addition, one-third of level 1 drinkers stopped drinking altogether during pregnancy. The prevalence of women drinking three or more drinks per week dropped during pregnancy to only 3 percent, while the prevalence of nondrinkers increased from 45 percent to 61 percent.

Findings—Stillbirths

Prepregnancy smoking and drinking among mothers of stillborn infants. As can be seen in figure 2, the distribution of prepregnancy smoking and drinking behaviors of mothers who experienced stillbirths is quite similar to that of mothers of live-born infants. (It should be stressed that while these live birth-stillbirth data are presented in a parallel fashion, they are intended to be only descriptive in nature. This analysis is not designed to study the relationship of smoking and drinking to birth outcome because such an analysis would have to control carefully for race, age, socioeconomic status, and maternal health factors.)

As with mothers of live-born infants, about one-third of the mothers experiencing stillbirths smoked (34 percent) and about half of them drank (49 percent); one-fifth engaged in both behaviors before pregnancy (21 percent). Comparisons between mothers of live-born and stillborn infants revealed only small differences. Before pregnancy, more mothers of stillborn infants abstained from both smoking and drinking (38 percent) than did mothers of live-born infants (35 percent). Also, fewer mothers of stillborn infants drank (49 percent) than did mothers of live-born infants (55 percent). However, mothers experiencing stillbirths more often smoked (34 percent) than did mothers of live-born infants (31 percent).

Smoking. As with mothers of live-born infants, smoking was more common among white mothers (35 per-

cent) than among black (30 percent), Hispanic (27 percent), or other mothers (20 percent), as table 4 indicates. The largest proportion of smokers was in the under 20 years age group; smoking prevalence declined through ages 25–29 years, but it was higher for mothers 35 years and older. This pattern held for white and all other mothers.

The prevalence of smoking declined steadily with increasing education among white mothers; among white and all other mothers, college graduates were the least likely to smoke. The most striking and consistent behavioral difference between mothers experiencing stillbirths and the live-birth group is that, for nearly every subgroup, prevalence of smoking was generally higher among the stillbirth group than the live-birth group. Otherwise, the differences between the two groups of mothers were fairly small. There were some exceptions, however. For example, among all other mothers 35 years and older, 33 percent of mothers of stillbirths smoked compared to only 18 percent of mothers of live-born infants. Among all other mothers who were high school graduates, 31 percent of mothers experiencing stillbirths smoked compared with only 21 percent of mothers experiencing live births.

Drinking. Drinking was most prevalent among white mothers. More than half of the white mothers (52 percent) drank before pregnancy, compared with 34 percent of black mothers, 35 percent of Hispanic mothers, and 27 percent of other mothers. Among whites, drinking was most prevalent among the 25–29 year old group (57 percent) while, among all others, drinking did not vary by age. The prevalence of drinking increased with years of education (in contrast to smoking, which decreased with more years of education).

Smoking and drinking. About 22 percent of white mothers both smoked and drank, compared with 19 percent of black mothers, 16 percent of Hispanic mothers, and 11 percent of all other mothers. The prevalence of this combination was highest among teenage mothers and decreased with age. Mothers who were college-educated were least likely to combine smoking and drinking. The total proportion of mothers who both smoked and drank was the same for mothers experiencing stillbirths as for mothers of live-born infants (21 percent).

Abstention. Abstention from smoking and drinking before pregnancy was much lower for white mothers (34 percent) than for black (55 percent), Hispanic (54 percent), or other (65 percent) mothers. Abstention was more prevalent among older white mothers, but varied little by education. For most subgroups, abstention rates

before pregnancy were higher among mothers who experienced fetal deaths than among those who bore live infants. This apparent anomaly from what might otherwise be expected reinforces our earlier caution against drawing inferences about birth outcome from these descriptive data.

Changes in smoking and drinking behavior during pregnancy. Mothers of stillborn infants were more

likely to stop drinking (33 percent) than to stop smoking (16 percent) during pregnancy (table 5). The reduction in drinking was slightly greater for mothers of stillborn infants than for mothers of live-born infants (33 percent compared with 30 percent), but the reduction in smoking was slightly smaller (16 percent compared with 18 percent). Forty-four percent of the mothers experiencing stillbirths who both smoked and drank gave up either cigarettes or alcohol or both, compared with 43 percent

Table 4. Smoking¹ and drinking² behavior, before pregnancy, of married mothers of stillborn infants, according to selected characteristics, United States, 1980

Characteristic	Number	Percent of mothers		Total	Percent distribution			
		All smokers	All drinkers		Neither smoked nor drank	Smoker but not drinker	Smoker and drinker	Drinker but not smoker
All married mothers	2,616	33.9	48.9	100.0	37.9	13.2	20.6	28.3
<i>Race, ethnicity</i>								
White, non-Hispanic	2,154	35.2	52.3	100.0	34.0	13.7	21.5	30.8
Black, non-Hispanic	247	30.0	34.0	100.0	54.7	11.3	18.6	15.4
Hispanic	136	27.2	35.3	100.0	53.7	11.0	16.2	19.1
Other ³	79	20.3	26.6	100.0	64.6	8.9	11.4	15.2
<i>Age</i>								
All races:								
Under 20 years	211	55.5	45.0	100.0	30.8	24.2	31.3	13.7
20-24 years	792	39.3	47.3	100.0	36.9	15.8	23.5	23.9
25-29 years	866	27.3	52.4	100.0	38.7	8.9	18.4	34.1
30-34 years	520	27.7	49.4	100.0	39.2	11.4	16.4	33.1
35 years and older	227	34.4	43.2	100.0	41.9	15.0	19.4	23.8
White, non-Hispanic:								
Under 20 years	176	58.5	47.7	100.0	27.3	25.0	33.5	14.2
20-24 years	675	40.3	49.6	100.0	34.1	16.3	24.0	25.6
25-29 years	713	27.9	56.7	100.0	34.6	8.7	19.2	37.5
30-34 years	427	30.0	53.2	100.0	34.4	12.4	17.6	35.6
35 years and older	163	35.0	46.6	100.0	36.8	16.6	18.4	28.2
All other: ³								
Under 20 years	35	40.0	31.4	100.0	48.6	20.0	20.0	11.4
20-24 years	117	33.3	34.2	100.0	53.0	12.8	20.5	13.7
25-29 years	153	24.2	32.7	100.0	57.5	9.8	14.4	18.3
30-34 years	93	17.2	32.3	100.0	61.3	6.5	10.8	21.5
35 years and older	64	32.8	34.4	100.0	54.7	10.9	21.9	12.5
<i>Education⁴</i>								
All races:								
0-11 years	349	45.8	30.9	100.0	42.1	26.9	18.9	12.0
12 years	1,102	36.1	46.8	100.0	38.9	14.3	21.9	25.0
13-15 years	460	25.9	55.9	100.0	38.3	5.9	20.0	35.9
16 years or more	494	18.6	61.3	100.0	35.2	3.4	15.2	46.2
White, non-Hispanic:								
0-11 years	236	54.2	36.0	100.0	30.9	33.1	21.2	14.8
12 years	948	36.9	48.6	100.0	36.5	14.9	22.1	26.6
13-15 years	374	25.7	60.2	100.0	35.3	4.6	21.1	39.0
16 years or more	420	19.5	64.5	100.0	31.7	3.8	15.7	48.8
All other: ³								
0-11 years	113	28.3	20.4	100.0	65.5	14.2	14.2	6.2
12 years	154	31.2	35.7	100.0	53.9	10.4	20.8	14.9
13-15 years	86	26.7	37.2	100.0	51.2	11.6	15.1	22.1
16 years or more	74	13.5	43.2	100.0	55.4	1.4	12.2	31.1

¹ Smokers are those who smoked at least 1 tobacco cigarette per day.

³ Includes all other races and other ethnic groups not shown separately.

² Drinkers are those who consumed at least 1 drink (0.5 oz of absolute alcohol once a month).

⁴ Includes only mothers who are 20 years of age and older.

of the mothers of live-born infants; the same proportion of mothers in both groups became totally abstinent (20 percent).

Changes in smoking. The proportion of Hispanic mothers who stopped smoking (46 percent) was more than three times that of white (14 percent) or black (15 percent) mothers of stillborn infants. Also, mothers 35 years and older were less likely to give up smoking than mothers under 35. Finally, better educated mothers were more likely to stop smoking than less educated mothers.

Changes in drinking. As with mothers of live-born infants, white mothers, older mothers, and more educated mothers were less likely to stop drinking during pregnancy.

Table 5. Change in smoking¹ and drinking² behavior, during pregnancy, of married mothers of stillborn infants, according to selected characteristics, United States, 1980

Characteristic	With 1 or both habits (percent)			With both habits and stopped 1 or both (percent)
	Stopped smoking	Stopped drinking	Became abstinent	
All married mothers	15.5	33.2	20.1	43.5
<i>Race, ethnicity</i>				
White, non-Hispanic . . .	13.8	31.9	19.2	41.3
Black, non-Hispanic . . .	14.9	44.0	21.4	52.2
Hispanic	45.9	45.8	39.7	63.6
Other ³	25.0	33.3	17.9	66.7
<i>Age⁴</i>				
All races:				
Under 20 years	12.0	44.2	16.4	48.5
20-24 years	14.5	39.2	20.8	47.3
25-29 years	20.3	31.5	22.8	44.0
30-34 years	16.0	27.2	19.3	37.6
35 years and older . . .	9.0	23.5	12.9	29.5
White, non-Hispanic:				
Under 20 years	9.7	45.2	14.8	49.2
20-24 years	12.1	38.5	20.0	45.1
25-29 years	19.6	28.5	21.0	40.9
30-34 years	14.1	26.0	18.2	34.7
35 years and older . . .	8.8	23.7	15.5	23.3
<i>Education^{4,5}</i>				
All races:				
0-11 years	10.0	36.1	13.4	42.4
12 years	15.3	36.6	20.5	46.5
13-15 years	20.2	30.0	22.9	39.1
16 years or more	23.9	25.7	22.8	36.0
White, non-Hispanic:				
0-11 years	8.6	37.6	12.9	44.0
12 years	13.4	35.4	19.8	43.5
13-15 years	19.8	28.0	22.3	35.4
16 years or more	22.0	23.2	20.9	31.8

¹ Smokers are those who smoked at least 1 tobacco cigarette per day.

² Drinkers are those who consumed at least 1 drink (0.5 oz of absolute alcohol) once a month.

³ Includes all other races and other ethnic groups not shown separately.

⁴ For all other races, number of cases was too small to meet standards for precision or reliability. Therefore, data for all other races are not shown.

⁵ Includes only mothers who are 20 years of age and older.

Changes in behavior of mothers who smoked and drank. Of the mothers of stillborn infants who both smoked and drank before pregnancy, 41 percent of white mothers, 52 percent of black mothers, 64 percent of Hispanic mothers, and 67 percent of other mothers gave up one or both behaviors during pregnancy.

Percent becoming abstinent. As occurred among the mothers of live-born infants, one out of five mothers who smoked or drank or engaged in both behaviors before pregnancy became abstinent during pregnancy. However, two out of five Hispanic mothers became abstinent.

Quantity and frequency of cigarettes and alcohol consumed. The change in the amount of drinking and smoking after pregnancy for mothers of stillborn infants was similar to the change observed for mothers of live-born infants (table 6). Before pregnancy, 24 percent of mothers of stillborn infants smoked more than 10 cigarettes per day. About 9 percent of these mothers stopped smoking during pregnancy, and 29 percent reduced their consumption. Of women who smoked 1 to 10 cigarettes per day before pregnancy, 30 percent stopped smoking during pregnancy. Overall, the prevalence of nonsmokers increased from 66 percent before pregnancy to 71 percent during pregnancy.

Before pregnancy, 15 percent of the mothers drank three drinks or more per week. About two-thirds (66 percent) of these reduced their consumption, and 18 percent stopped drinking entirely. Only 3 percent of mothers of stillborn infants had three or more drinks per week during pregnancy. The prevalence of nondrinkers increased from 51 percent before pregnancy to 67 percent during pregnancy.

Discussion

This report has shown major differences in smoking and drinking by maternal race, ethnicity, age, and education for mothers experiencing stillbirths and live births. However, certain limitations of the data should be noted. First, these differences are based on married mothers only. Since the proportions of births to unmarried mothers vary substantially by these same variables, the differences in smoking and drinking should not be generalized to all mothers. Second, the response rate to two mailings of the questionnaire was only 56 percent (mothers interviewed by telephone were excluded from this analysis). If nonresponding mothers are more likely to be smokers or drinkers, the estimates we present will be low. Finally, mothers may have underreported their behavior because of guilt feelings aroused by media campaigns to persuade them to reduce smoking and drinking

during pregnancy. If so, these estimates of smoking and drinking could be considered minimum estimates.

Despite these limitations, however, the results obtained for married mothers' smoking and drinking behaviors before pregnancy resemble those of the general population of women in the reproductive years (7-10). Smokers, regardless of birth outcome, are typically white, under 25 years of age, and have a high school education or less. Drinkers are typically white and have more than a high school education. The age profile of drinkers among mothers of live-born infants is 25 years and older; white mothers of stillborn infants who drink are more often in the 25-29 year age group, but drinking does not vary by age among other mothers who experience stillbirths. The mothers most likely to consume both alcohol and cigarettes are white and younger. The mothers most likely to abstain are Hispanic, black, and of other races.

Although the before-pregnancy profile of smokers and drinkers among mothers of live-born and stillborn infants is similar, the most striking and consistent difference is that for nearly every subgroup, the prevalence of smoking is higher and the prevalence of drinking is lower among mothers experiencing stillbirths than among mothers of live-born infants. Abstention rates are also generally higher among mothers experiencing stillbirths than among mothers of live-born infants. The prevalence of the combination of smoking and drinking is the same for both categories of mothers. However, additional analyses are needed to assess the extent of association between smoking or drinking, or both, and birth outcome.

When pregnancy is confirmed, reductions in smoking and drinking occur. However, mothers of stillborn infants are less likely to stop smoking than are mothers of

live-born infants. Regardless of birth outcome, the tendency to stop smoking is directly related to educational attainment, and the tendency to stop drinking is inversely related to age for women under 35 years. Overall, the prevalence of drinking is much higher than the prevalence of smoking, and the reduction in drinking is much more pronounced than the reduction in smoking. This change is opposite to what might have been expected. Media messages have documented the deleterious effects of maternal smoking for two decades, while messages concerning the hazards of drinking during pregnancy have been more recent and more modest. However, it is likely that giving up nicotine is more difficult than giving up light or moderate alcohol consumption. (11).

Since smoking is usually a daily habit, a strong psychological and physiological dependency can be created. Most of the mothers in this survey who smoked did so daily, but most of the mothers who drank did so less frequently. In fact, most drinking mothers consumed the equivalent of only one or two drinks weekly. Drinking three or more alcoholic beverages per week was relatively rare among the women in these surveys. Therefore, alcohol addiction probably was not a factor for the majority of drinking mothers and may have accounted in part for the larger reduction in drinking than smoking. Furthermore, one study suggested that moderate to heavy drinkers may decrease their drinking during pregnancy because alcohol becomes distasteful or causes adverse physiological effects (3).

A recent review of studies varying in design, population base, and analytic procedures shows consistent relationships between maternal smoking during pregnancy and reduction in birth weight of the offspring, and between maternal smoking and increased risk of pregnancy

Table 6. Smoking and drinking behavior, during pregnancy, of married mothers of stillborn infants, according to behavior before pregnancy, United States, 1980

Behavior	Before pregnancy		During pregnancy (percent)			
	Number	Percent	Total	None	Level 1	Level 2
<i>Average daily smoking</i>						
All behaviors	2,616	100.0	100.0	71.4	13.9	14.7
None ¹	1,730	66.1	100.0	100.0	0.0	0.0
1-10 cigarettes (level 1)	270	10.3	100.0	30.0	68.1	1.9
11 cigarettes or more (level 2)	616	23.5	100.0	9.1	29.2	61.7
<i>Average weekly drinking</i>						
All behaviors	2,616	100.0	100.0	67.0	30.0	3.0
None ²	1,337	51.1	100.0	99.3	0.4	0.3
Less than 3 drinks (level 1) ³	897	34.3	100.0	39.6	59.1	1.3
3 drinks or more (level 2) ⁴	382	14.6	100.0	18.3	66.0	15.7

¹ Did not smoke even 1 cigarette a day.

² Consumed less than 1 drink (0.5 oz of absolute alcohol) less than once a month.

³ Consumed 0.01-0.19 oz of absolute alcohol each day on the average.

⁴ Consumed 0.19 oz or more of absolute alcohol each day on the average.

loss (12). However, the findings on alcohol consumption during pregnancy are much less consistent. Typically, study design and measurement problems are confounding factors in drinking studies. Also, inconsistent findings have been attributed to inattention to the timing of fetal exposure to maternal drinking in relation to the phase of pregnancy.

This report and an earlier study (13) of the smoking and drinking behavior of mothers of live-born infants are but the first steps to researching the effects of maternal behavior on fetal growth, development, and survival. The next step, already underway, is to explore the effects of smoking and drinking on pregnancy outcome, that is, on birth weight and survival. Our preliminary regression analysis showed that smoking, and to a lesser extent drinking, are independently and additively associated with low birth weight, after controlling for a large number of demographic, maternal, and infant characteristics (14). These data are now being re-analyzed to specify better the effects. Our analyses are constrained by the limited range of drinking levels observed in these data (a preponderance of light to moderate over heavy drinking). Furthermore, these data do not allow us to measure effects in relation to drinking before conception and drinking in early or late pregnancy. We are, however, looking at differential outcome effects from consuming different types of beverages: beer, wine, and liquor. These analyses will include appropriate controls for sociodemographic, maternal health, and infant health characteristics to allow us to specify precisely the effect of maternal smoking and drinking on birth weight or survival.

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