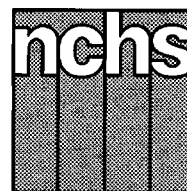


Advance Data



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Smoking Behavior of Recent Mothers, 18–44 Years of Age, Before and After Pregnancy: United States, 1990

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Abstract

Objective—This report presents a comprehensive review of data on the smoking behaviors of women with a recent birth from the 1990 National Health Interview Survey. Data on current and lifetime smoking status and smoking behaviors before and after learning of pregnancy are presented. Selected demographic characteristics of women—including age, race, education, and family income—are also presented.

Methods—Data presented in this report are from the 1990 National Health Interview Survey on Health Promotion and Disease Prevention (NHIS-HPDP). Questions on pregnancy and smoking were administered as part of this supplement to women 18–44 years of age who either had a live birth in the 5 years preceding the interview, or who were pregnant at the time of the interview. These analyses were limited to women with a live birth in the 5 years preceding the 1990 NHIS who were not currently pregnant.

Results—Of 13,674,000 women with a recent live birth, about 39 percent had ever smoked, 25 percent smoked in the year before they became pregnant, and 15 percent smoked during their most recent pregnancy. Women who smoked prior to learning of their pregnancy were most likely to be moderate smokers, white women, never married, and of lower income. Women who smoked after learning of their pregnancy were most likely to be light smokers, representing a shift in smoking behaviors after learning of pregnancy. Nearly 23 percent of women reported that they stopped smoking altogether after learning of their pregnancy.

Conclusions—These findings are consistent with data from other sources and provide support for recently observed trends in smoking and pregnancy. A majority of women who had ever smoked continued to smoke throughout pregnancy. Although many women altered their smoking behaviors, only about one quarter of women reported that they stopped smoking entirely. Public health service messages must continue to encourage women to stop smoking entirely during pregnancy to maximize the health benefits to their infants.

Keywords: smoking • pregnancy • demographics

Introduction

Smoking during pregnancy has been linked to a variety of adverse pregnancy outcomes—including low birthweight, spontaneous abortion, and infant death (1–5). Some biological mechanisms, which have been clinically confirmed, link cigarette smoke to fetal health and include an association between nicotine and decreased placental blood flow and an elevation in fetal heart rate (2). Of the fetal outcomes documented, low birthweight shows the clearest and most consistent association with maternal smoking (1,5). Birthweight is linked not only with whether the mother smoked, but also with the other aspects of her smoking behavior, including the gestational timing of smoking cessation and cigarette consumption and gestational age (3,4). Evidence suggests that a dose-response relationship exists between cigarette consumption, especially in the third trimester, and weight at birth (1,4). Recent reports show that even those women who smoke fewer than six cigarettes a day have about a two-thirds increased risk of giving birth to a child of low birthweight (5). Total cessation of



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smoking in pregnancy, therefore, would maximize the health benefits to infants and considerably reduce the risk of low birthweight (4). To address this preventable risk factor associated with low birthweight, smoking abstinence by pregnant women was set as a national health priority in the National Health Objectives for the Year 2000 (6).

The prevalence of smoking during pregnancy has been estimated between 15–30 percent of all pregnant women, with the estimates varying depending on the source of the data and maternal characteristics of the study population (5–8). Information about smoking during pregnancy was recently added to the data collected on birth certificates for most States beginning in 1989. Birth certificate data on smoking, for approximately 79 percent of all births annually on which this information is available, show a decline in smoking prevalence during pregnancy from 19.5 percent reported in 1989 to 14.6 percent of women giving birth in 1994 (5). Women who are most likely to smoke during pregnancy are poorly educated white women (5,8–10). Data also show that women with mistimed or unwanted pregnancies are also more likely to smoke during pregnancy when compared with those women who reported that their most recent pregnancy was intended (8). Marital status and age among white women are also related to whether smokers continue to smoke throughout their pregnancies, with young unmarried women being the most likely to continue smoking (5,10). In local studies in Missouri (11), Washington (12), and Arizona (13), and at the national level (5)—based on both birth certificate data and clinical evidence—black and Hispanic women were found to have much lower smoking prevalence rates during pregnancy. Both groups were less likely to be smoking at the time they became pregnant and were more likely to quit during pregnancy. Smoking rates for women who gave birth between 1989 and 1994 also declined most rapidly among black women and younger women (5).

Cigarette consumption during pregnancy followed similar patterns, with white women consuming more

cigarettes on average per day than black women (11). Maternal age was also found to be associated with heavier smoking during pregnancy, with older women more likely to be heavy smokers (5). Heavy smokers were also much less likely to quit during pregnancy and more likely to relapse after the birth of the child (14).

Data on smoking during pregnancy come from a variety of sources—including birth certificates, clinical records, and retrospective self-reports from sample surveys. (See description of recent data available on smoking during pregnancy available from the National Center for Health Statistics in the [Technical notes](#) portion of this report). Each data source provides different types of information about smoking behavior and has different strengths. Birth records contain information relevant to the birth event and the pregnancy related to that birth. Thus, risk behaviors during pregnancy can be directly linked to outcomes for the child (8). Clinical data, in general, come from patient data in prenatal clinics or from examination surveys and have the asset of often including lab test for cotinine levels, which can be used to validate self-reported smoking behavior. Finally, retrospective survey data allow pregnancy-related smoking behavior to be put into the context of current and lifetime smoking patterns.

The purpose of this report is to provide national estimates by selected sociodemographic factors of both the current and lifetime smoking behavior of recent mothers as well as their behavior before and during pregnancy. This report also provides validation of prevalence estimates of smoking during pregnancy made from other sources. This report is based on data from a nationally representative survey, the 1990 National Health Interview Survey (NHIS) on Pregnancy and Smoking. Although portions of these data have been published previously (15,16), this report represents the first comprehensive review of pregnancy and smoking data from the 1990 NHIS.

Methods

The NHIS collects demographic and health data annually on the

noninstitutionalized, civilian population of the United States from which national estimates of household and individual characteristics, disease incidence and prevalence, general health status measures and health services utilization are made. From 1982–96 the interview contained two portions each year: the basic questionnaire, which collects similar information each year, and topic-specific annual questionnaires. In 1990, to monitor the National Health Objectives for the Year 2000, randomly selected adults from households in the NHIS sample were also administered a special questionnaire on Health Promotion and Disease Prevention (HPDP) (15,17). As part of this monitoring initiative, data related to smoking during pregnancy were collected for all women 18–44 years of age residing in NHIS sample households, who were currently pregnant or had given birth to a child in the past 5 years. All women who were either currently pregnant or had a live birth in the preceding 5 years were administered the full questionnaire about overall smoking behavior, as well as smoking behavior before and after learning about their pregnancy. For women who reported smoking in the 12 months predating the most recent birth, additional questions were asked about whether they smoked during most of that pregnancy and, if so, how many cigarettes they smoked on average per day both before and after they learned of the pregnancy. The data collected in this questionnaire, although collected under the umbrella of the HPDP supplemental questionnaires, are issued in separate data files and are weighted differently than the general 1990 NHIS-HPDP. The data used for this report will be called the NHIS on Pregnancy and Smoking in order to distinguish them from the more general NHIS-HPDP.

Due to the association between gestational age, smoking, and birthweight (3), currently pregnant women should be analyzed separately from other women. However, because the number of currently pregnant women in the 1990 NHIS sample was too small to make reliable estimates, they were excluded from these analyses.

In most cases, however, patterns of smoking behaviors among currently pregnant women in 1990 were similar to those observed in women with a recent live birth in 1990 (results not shown). The complete text of the questionnaires for both the 1990 NHIS-HPDP and Pregnancy and Smoking are available in the 1990 edition of Current Estimates from the NHIS (17).

In this report, data are presented on current and lifetime smoking behavior of women who have had a birth in the last 5 years as well as before and after they learned of their pregnancies. Prevalence estimates and percentages are presented by selected socio-demographic characteristics that have a demonstrated relationship to smoking behavior—including age, race, Hispanic ethnicity, marital status, family income, education, and place of residence. This report includes the data on reported smoking prevalence during pregnancy and number of cigarettes consumed. The percent of all recent mothers who smoked during pregnancy is also calculated. Retrospective and current information about smoking behavior before and after pregnancy identifies the temporal patterns of smoking as they relate to pregnancy as well as the population at risk of smoking during pregnancy.

The [Technical notes](#) at the end of this report detail information regarding the survey design, sampling procedure, and the NHIS questionnaire document. They also describe the weighting procedures, the reliability of the estimates, and the adjustment of the standard errors required by the sampling design. The means of determining statistical significance are also included. All comparisons reported in the text are statistically significant at the 0.05 level unless otherwise noted. It should be noted that because of small sample sizes and the high intercorrelation between education, income, and race, many of the findings in this report may reflect the relationship among these variables rather than discrete effects on the smoking outcomes. This caveat should be borne in mind when interpreting the effects of income, race, or education separately. [Table 1](#) contains national estimates of the number and percent of

recent mothers in various smoking statuses. [Table 2](#) contains information about pregnancy-related smoking behavior for those women who reported ever smoking in their lifetime and in the year before the most recent pregnancy. In [table 3](#), data about cigarette consumption by women who report smoking in the year before their recent pregnancies are presented.

Definition of smoking terms

The definitions of the smoking statuses and other applicable terms used in this report are included below:

Never smoked—Women who report never smoking at least 100 cigarettes in their lifetime.

Current smoker—A current smoker is a woman who has smoked at least 100 cigarettes in her lifetime and was smoking at the time of the interview.

Former smoker—Women who report having smoked at least 100 cigarettes in their lifetime and are not smoking at the time of the interview.

Those women who have *ever smoked* include current and former smokers.

Smoked in the year before pregnancy—A woman with a live birth in the 5 years preceding the interview and who responded that she had smoked in the year before her most recent pregnancy.

Smoked during most of pregnancy—A woman with a live birth in the 5 years preceding the interview and who responded that she had smoked for most of her most recent pregnancy.

Cigarette consumption—Number of cigarettes smoked per day. Women who reported smoking less than one cigarette per day on average or not smoking regularly are classified separately from those women who report average daily consumption of more than one cigarette. In this report, women who smoked less than half a pack a day (less than 11 cigarettes per day) were considered *light smokers*, those who smoked 11 to 20 cigarettes a day were considered *moderate smokers*, and those women whom smoked 21 cigarettes or more per day were considered *heavy smokers*. These categories are consistent with the categories reported on birth certificates

to provide for comparability. Other reports based on data from the NHIS, however, use different cigarette consumption categories to avoid misreporting due to digit heaping (5,15,18). The data in this report are based on current and retrospective information provided by respondents on their smoking behavior. Studies of smoking behavior that have used biochemical markers, such as cotinine level from saliva samples to confirm self-response, have shown that smoking prevalence rates based on self-response are underestimated by between 3 and 5 percent (19). Underreporting is especially problematic when the respondents are involved in smoking cessation programs or where smoking is considered problematic, such as among teenagers and pregnant women. Current biochemical tests cannot yet be used to validate reports by smokers of daily cigarette consumption. Therefore, there is no method by which to judge the reliability of self-reported cigarette consumption. It is reasonable to assume that smoking prevalence and the average number of cigarettes smoked per day, especially during pregnancy, have been underreported by women in this survey.

Results

Smoking status

As shown in [table 1](#), of the approximately 13.7 million women in the United States 18–44 years of age in 1990 who had a baby in the preceding 5 years, 15.4 percent (or 2.1 million) smoked during most of their most recent pregnancy and 24.6 percent reported that they were currently smoking. Of recent mothers, 38.8 percent reported that they had ever smoked, suggesting that pregnancy may, in fact, prompt many women to quit—at least temporarily ([table 1](#)).

Young mothers 18–24 years of age were more likely than older mothers to be smoking currently and to have smoked during their pregnancies. Over 30 percent of young mothers were current smokers, and 19.4 percent (or 0.6 million) reported smoking during pregnancy. Older mothers 35–44 years of age were less likely to smoke

Table 1. Number, percent, and standard error of women 18–44 years of age who have had a live birth in the last 5 years, by smoking status and selected sociodemographic characteristics: United States, 1990

Characteristic	All smoking Number in thousands	Never smoked status Percent and standard error	Ever smoked							
			Total		Current smoker	Former smoker	Smoked in year before most recent pregnancy		Smoked during most recent pregnancy	
			Number in thousands	Percent and standard error	Percent and standard error	Percent and standard error	Number in thousands	Percent and standard error	Number in thousands	Percent and standard error
All women ^{1,2}	13,674	61.2 (0.65)	5,302	38.8 (0.65)	23.9 (0.57)	14.9 (0.49)	3,365	24.6 (0.59)	2,110	15.4 (0.51)
Age										
18–24 years	3,037	59.3 (1.38)	1,236	40.7 (1.38)	31.3 (1.34)	9.4 (0.77)	921	30.3 (1.39)	590	19.4 (1.21)
25–34 years	8,177	61.2 (0.80)	3,175	38.8 (0.80)	23.2 (0.68)	15.6 (0.63)	1,989	24.3 (0.74)	1,208	14.8 (0.61)
35–44 years	2,460	63.8 (1.45)	891	36.2 (1.45)	17.2 (1.11)	19.0 (1.31)	455	18.5 (1.13)	312	12.7 (1.01)
Race										
White	11,183	58.7 (0.73)	4,618	41.3 (0.73)	24.6 (0.63)	16.7 (0.56)	2,915	26.1 (0.67)	1,857	16.6 (0.58)
Black	1,963	70.5 (1.50)	579	29.5 (1.50)	23.0 (1.37)	6.5 (0.89)	398	20.3 (1.27)	221	11.3 (0.98)
Hispanic origin										
Hispanic	1,785	76.6 (1.64)	417	23.4 (1.64)	13.4 (1.43)	10.0 (1.04)	225	12.6 (1.27)	112	6.3 (0.90)
Non-Hispanic	11,888	58.9 (0.70)	4,885	41.1 (0.70)	25.5 (0.59)	15.6 (0.53)	3,146	26.4 (0.64)	1,998	16.8 (0.56)
Marital status										
Currently married	10,901	63.3 (0.73)	4,001	36.7 (0.73)	20.6 (0.60)	16.1 (0.56)	2,386	21.9 (0.61)	1,456	13.4 (0.53)
Previously married	1,230	47.4 (2.04)	647	52.6 (2.04)	40.2 (2.02)	12.5 (1.40)	472	38.4 (2.14)	326	26.5 (1.77)
Never married	1,541	57.6 (1.80)	654	42.4 (1.80)	34.6 (1.73)	7.9 (0.99)	506	32.9 (1.74)	328	21.3 (1.60)
Family income										
Less than \$15,000	2,781	54.9 (1.46)	1,254	45.1 (1.46)	36.3 (1.49)	8.8 (0.85)	957	34.4 (1.45)	684	24.6 (1.31)
\$15,000–\$24,999	2,316	57.5 (1.59)	983	42.5 (1.59)	28.9 (1.41)	13.6 (1.11)	678	29.3 (1.49)	433	18.7 (1.26)
\$25,000–\$34,999	2,255	60.6 (1.72)	887	39.4 (1.72)	23.6 (1.45)	15.8 (1.23)	572	25.4 (1.44)	360	15.9 (1.29)
\$35,000–\$49,999	2,395	64.1 (1.54)	861	35.9 (1.72)	17.1 (1.19)	18.8 (1.21)	445	18.6 (1.23)	228	9.5 (0.94)
\$50,000 and over	2,407	66.5 (1.50)	805	33.5 (1.50)	12.6 (0.98)	20.9 (1.24)	353	14.6 (1.02)	197	8.2 (0.94)
Poverty status										
At or above poverty threshold	10,570	62.2 (0.75)	3,999	37.8 (0.75)	21.1 (0.58)	16.7 (0.58)	2,352	22.3 (0.61)	1,414	13.4 (0.51)
Below poverty threshold	2,308	56.4 (1.62)	1,006	43.6 (1.62)	35.6 (1.54)	8.0 (0.88)	783	33.9 (1.60)	561	24.3 (1.45)
Education										
Less than 12 years	2,444	53.0 (1.69)	1,148	47.0 (1.69)	37.9 (1.63)	9.1 (0.84)	898	36.7 (1.70)	673	27.6 (1.61)
12 years	5,672	56.1 (0.96)	2,490	43.9 (0.96)	28.3 (0.90)	15.6 (0.75)	1,656	29.2 (0.96)	992	17.5 (0.80)
13–15 years	2,943	64.6 (1.42)	1,042	35.4 (1.42)	18.7 (1.10)	16.8 (1.06)	599	20.4 (1.16)	331	11.2 (0.82)
16 years or more	2,614	76.2 (1.31)	623	23.8 (1.31)	7.3 (0.73)	16.5 (1.15)	213	8.1 (0.79)	114	4.4 (0.59)
Residence										
Metropolitan, central city	4,270	63.6 (1.12)	1,553	36.4 (1.12)	23.0 (1.12)	13.4 (0.82)	960	22.5 (1.06)	608	14.2 (0.88)
Metropolitan, noncentral city	6,553	59.5 (0.94)	2,656	40.5 (0.94)	23.3 (0.83)	17.3 (0.72)	1,621	24.7 (0.87)	995	15.2 (0.71)
Nonmetropolitan	2,744	61.1 (1.48)	1,067	38.9 (1.48)	27.3 (1.10)	11.6 (1.13)	769	28.0 (1.35)	502	18.3 (1.32)
Region										
Northeast	2,509	57.5 (1.45)	1,067	42.5 (1.45)	24.8 (1.22)	17.8 (1.20)	644	25.7 (1.27)	408	16.2 (1.30)
Midwest	3,370	56.1 (1.37)	1,480	43.9 (1.37)	28.6 (1.13)	15.3 (0.97)	1,009	29.9 (1.15)	680	20.2 (1.03)
South	4,751	62.8 (1.02)	1,769	37.2 (1.02)	24.2 (0.96)	13.1 (0.82)	1,147	24.1 (1.08)	689	14.5 (0.90)
West	3,043	67.6 (1.44)	985	32.4 (1.44)	17.8 (1.22)	14.7 (1.00)	565	18.6 (1.14)	333	10.9 (0.90)

¹Includes women with unknown demographic characteristics.²Includes women of races other than white and black.

NOTE: Denominator for each cell excludes unknowns.

Table 2. Number, percent, and standard error of women 18–44 years who have had a live birth in the last 5 years and have ever smoked, by selected sociodemographic characteristics: United States, 1990

Characteristic	Total ever smoked	Ever smoked—	
		In year before pregnancy	Most of recent pregnancy
	Number in thousands	Percent and standard error	
All women ^{1,2}	5,302	63.5 (1.06)	62.7 (1.34)
Age			
18–24 years	1,236	74.6 (1.93)	64.0 (2.63)
25–34 years	3,175	62.6 (1.41)	60.7 (1.68)
35–44 years	891	51.1 (2.59)	68.9 (3.25)
Race			
White	4,618	63.1 (1.14)	63.7 (1.42)
Black	579	68.7 (2.61)	55.6 (1.42)
Other	105	48.8 (6.75)	61.5 (10.88)
Hispanic origin			
Hispanic	417	54.0 (3.50)	49.9 (4.82)
Non-Hispanic	4,885	64.3 (1.11)	63.7 (1.38)
Marital status			
Currently married	4,001	59.6 (1.19)	61.0 (1.59)
Previously married	647	73.0 (2.81)	69.0 (2.96)
Never married	654	77.4 (2.37)	64.9 (3.24)
Family income			
Less than \$15,000	1,254	76.3 (1.88)	71.5 (2.10)
\$15,000–\$24,999	983	69.0 (2.24)	64.1 (2.90)
\$25,000–\$34,999	887	64.5 (2.36)	62.8 (3.21)
\$35,000–\$49,999	861	51.7 (2.53)	51.2 (3.71)
\$50,000 and over	805	43.8 (2.52)	56.0 (3.85)
Poverty status			
At or above poverty threshold	3,999	58.8 (1.17)	60.1 (1.52)
Below poverty threshold	1,006	77.8 (2.02)	71.8 (2.30)
Education			
Less than 12 years	1,148	78.2 (1.87)	75.1 (2.32)
12 years	2,490	66.5 (1.56)	59.9 (1.77)
13–15 years	1,042	57.5 (2.26)	55.2 (2.89)
16 years or more	623	34.2 (2.83)	53.6 (4.82)
Residence			
Metropolitan, central city	1,553	61.8 (2.02)	63.3 (2.24)
Metropolitan, noncentral city	2,656	61.0 (1.56)	61.5 (1.95)
Nonmetropolitan	1,067	72.1 (2.01)	65.2 (2.66)
Region			
Northeast	1,067	60.4 (2.26)	63.3 (3.82)
Midwest	1,480	68.2 (1.84)	67.4 (2.41)
South	1,769	64.8 (2.05)	60.1 (2.12)
West	985	57.3 (2.23)	59.2 (2.94)

¹Includes women with unknown demographic characteristics.²Includes women of races other than white and black.

NOTE: Denominator for each cell excludes unknowns.

Table 3. Percent and standard error of women 18–44 years of age who smoked in the year before pregnancy and had a live birth in the last 5 years before and after learning of pregnancy, by selected sociodemographic characteristics: United States, 1990

Characteristic	Amount smoked per day before learned of pregnancy				Amount smoked per day after learned of pregnancy				
	Not regular ¹	1–10 cigarettes	11–20 cigarettes	21 or more cigarettes	None	Not regular	1–10 cigarettes	11–20 cigarettes	21 or more cigarettes
	Percent and standard error								
All women ^{2,3}	3.0 (0.44)	36.0 (1.36)	46.7 (1.33)	14.2 (0.91)	22.6 (1.21)	7.9 (0.74)	41.2 (1.32)	21.8 (1.17)	6.5 (0.61)
Age									
18–24 years	3.1 (0.88)	38.2 (2.63)	47.0 (2.65)	11.6 (1.67)	23.3 (2.23)	6.6 (1.36)	47.2 (2.95)	18.0 (2.27)	4.9 (1.10)
25–34 years	2.8 (0.51)	36.6 (1.68)	46.6 (1.75)	14.0 (1.13)	23.4 (1.57)	8.5 (0.98)	38.0 (1.59)	23.9 (1.51)	6.1 (0.76)
35–44 years	*3.6 (1.20)	29.4 (3.21)	46.9 (3.60)	20.1 (3.02)	17.9 (2.59)	8.4 (1.81)	42.5 (3.51)	19.7 (2.62)	11.5 (2.26)
Race									
White	2.9 (0.46)	32.1 (1.45)	49.3 (1.44)	15.7 (1.03)	22.5 (1.26)	7.6 (0.81)	40.2 (1.39)	22.9 (1.22)	6.9 (0.67)
Black	*3.9 (1.33)	63.6 (3.51)	28.6 (3.36)	*4.0 (1.29)	24.7 (3.61)	9.3 (1.87)	50.0 (3.86)	12.0 (2.43)	*4.0 (1.45)
Hispanic origin									
Hispanic	*7.9 (3.24)	56.0 (5.31)	27.7 (4.38)	*8.5 (3.30)	33.1 (5.23)	*10.3 (3.21)	45.5 (5.35)	*8.2 (2.98)	*2.9 (1.64)
Non-Hispanic	2.7 (0.41)	34.6 (1.40)	48.1 (1.38)	14.6 (0.93)	21.9 (1.23)	7.8 (0.77)	40.9 (1.36)	22.7 (1.23)	6.8 (0.66)
Marital status									
Currently married	3.1 (0.49)	34.1 (1.60)	47.8 (1.54)	14.9 (1.12)	24.3 (1.46)	8.3 (0.92)	39.0 (1.58)	22.7 (1.45)	5.7 (0.71)
Previously married	*2.1 (0.90)	34.8 (3.33)	48.5 (3.55)	14.6 (2.29)	18.3 (2.51)	*4.1 (1.32)	46.5 (3.39)	22.2 (2.87)	8.9 (1.84)
Never married	*3.5 (1.22)	46.2 (3.31)	39.8 (3.21)	10.6 (2.07)	18.8 (2.82)	9.9 (1.79)	46.5 (3.46)	16.8 (2.45)	8.0 (1.89)
Family income									
Less than \$15,000	*2.7 (0.89)	39.3 (2.31)	43.7 (2.38)	14.2 (1.68)	17.5 (1.94)	6.1 (1.10)	47.2 (2.49)	21.4 (2.18)	7.7 (1.22)
\$15,000–\$24,999	*2.3 (0.81)	30.6 (2.70)	53.3 (2.79)	13.8 (1.98)	21.1 (2.30)	8.0 (1.57)	37.1 (2.67)	26.8 (2.48)	7.1 (1.69)
\$25,000–\$34,999	*2.1 (0.88)	33.5 (3.28)	50.6 (3.32)	13.7 (2.23)	22.6 (2.81)	7.7 (1.57)	38.5 (3.29)	24.3 (3.26)	6.8 (1.52)
\$35,000–\$49,999	*2.3 (1.03)	39.1 (3.42)	43.5 (3.57)	15.0 (2.56)	27.8 (3.33)	8.5 (2.37)	41.6 (3.51)	18.2 (2.79)	*3.9 (1.31)
\$50,000 and over	*4.4 (1.54)	39.7 (3.95)	43.0 (4.01)	12.9 (2.83)	32.2 (3.57)	10.7 (2.32)	36.6 (3.84)	16.5 (3.23)	*4.0 (1.49)
Poverty status									
At or above poverty threshold	2.7 (0.48)	34.6 (1.54)	48.8 (1.56)	14.0 (1.07)	25.1 (1.42)	8.6 (0.90)	38.7 (1.59)	21.9 (1.38)	5.7 (0.73)
Below poverty threshold	*3.6 (1.11)	40.0 (2.72)	42.3 (2.77)	14.1 (1.85)	15.8 (1.98)	6.3 (1.21)	47.1 (2.79)	22.6 (2.31)	8.2 (1.44)
Education									
Less than 12 years	*3.4 (1.01)	34.5 (2.39)	46.1 (2.37)	16.0 (1.86)	13.8 (1.95)	6.5 (1.19)	44.1 (2.53)	27.6 (2.41)	8.0 (1.39)
12 years	2.4 (0.55)	32.8 (1.81)	50.3 (1.89)	14.4 (1.31)	24.2 (1.59)	7.6 (0.96)	40.1 (1.77)	22.0 (1.60)	6.1 (0.85)
13–15 years	*3.7 (1.17)	43.3 (3.13)	40.8 (3.06)	12.1 (1.74)	27.9 (2.91)	10.4 (2.15)	39.4 (3.10)	15.9 (2.14)	6.5 (1.27)
16 years or more	*3.9 (1.93)	46.7 (4.88)	38.3 (4.53)	11.1 (2.84)	33.1 (4.56)	10.1 (2.82)	41.7 (4.85)	12.2 (2.85)	3.0 (1.71)
Residence									
Metropolitan, central city	4.7 (1.11)	38.7 (2.30)	44.1 (2.52)	12.4 (1.87)	18.5 (1.92)	10.1 (1.40)	41.9 (2.47)	23.4 (2.03)	6.1 (1.13)
Metropolitan, noncentral city	2.7 (0.58)	37.9 (1.84)	45.9 (1.96)	13.5 (1.32)	25.1 (1.80)	6.7 (1.06)	43.8 (1.91)	18.1 (1.36)	6.3 (0.94)
Nonmetropolitan	*1.8 (0.66)	29.0 (3.42)	51.3 (3.02)	17.9 (1.59)	22.4 (2.42)	7.8 (1.39)	34.7 (2.58)	27.8 (3.14)	7.2 (1.20)
Region									
Northeast	*2.9 (1.20)	40.0 (3.39)	44.5 (3.33)	12.6 (2.09)	22.9 (2.90)	8.6 (1.60)	44.5 (2.82)	18.0 (2.40)	6.1 (1.34)
Midwest	*1.9 (1.20)	30.1 (2.18)	52.8 (2.33)	15.2 (1.43)	19.6 (1.91)	6.4 (1.22)	41.9 (2.43)	24.9 (1.87)	7.2 (1.09)
South	3.1 (0.72)	37.3 (2.42)	43.5 (2.24)	16.1 (1.83)	23.2 (2.27)	9.0 (1.40)	39.2 (2.15)	21.9 (2.28)	6.7 (1.16)
West	5.0 (1.19)	39.5 (3.25)	45.0 (3.10)	10.5 (1.63)	26.7 (2.82)	7.7 (1.81)	40.0 (3.71)	20.3 (2.94)	5.3 (1.21)

*Figure does not meet standard of reliability or precision.

¹Did not smoke regularly during most recent pregnancy.²Includes women with unknown demographic characteristics.³Includes women of races other than white and black.

NOTE: Denominator for each cell excludes unknowns.

currently (17.2 percent) and to have smoked during pregnancy (12.7 percent) when compared with young mothers and women 25–34 years of age. Variations in smoking rates by age of mother may

be related to their educational attainment. Mothers who are older when they give birth are better educated (20). Educational levels bear a strong inverse relationship to smoking behavior and

may be responsible for the lower smoking prevalence rates among older mothers (5,8).

Black mothers, although not significantly less likely to be smoking

currently than white mothers (23.0 versus 24.6 percent), were much less likely to have smoked during their most recent pregnancy (11.3 versus 16.6 percent). About 71 percent of black women reported never smoking more than 100 cigarettes in their lives compared with about 59 percent of white women. Thus, although they were as likely to be smoking at the time of the survey interview, black mothers were less likely to have ever smoked and to have been smoking at the time of their most recent pregnancy.

Hispanic mothers, when compared with non-Hispanic mothers, report significantly lower rates of smoking during pregnancy. Only about 6 percent of recent mothers who identified themselves as Hispanic smoked during their most recent pregnancy compared with under 17 percent of mothers who did not identify themselves as Hispanic (table 1). This differential between Hispanic and non-Hispanic mothers is shown in current and past smoking behavior as well. Only 13.4 percent of Hispanic mothers reported smoking currently compared with 25.5 percent of non-Hispanic mothers (table 1). Nearly one-quarter of Hispanic mothers (23.4 percent, table 1) reported smoking more than 100 cigarettes in their lifetime, which was well below the total rate for all recent mothers (38.8 percent).

Current marital status was also related to current, lifetime, and pregnancy-related smoking behaviors of recent mothers. Almost 27 percent of mothers who were divorced, separated, or widowed smoked during their most recent pregnancy compared with only 13.4 percent of those mothers who were currently married. Previously married mothers were also more likely to be smoking currently (40.2 percent) and to have ever smoked (52.6 percent) when compared to both currently and never married mothers.

Education, income, and poverty are significantly related to smoking behavior. High income and highly educated mothers were least likely to have ever smoked, to be a current smoker, or to have smoked during their most recent pregnancy. Only 4.4 percent of mothers who have 16 years or more

of education reported smoking during pregnancy compared with 27.6 percent of mothers with less than a high school education. Highly educated mothers were also least likely to report ever having smoked more than 100 cigarettes in their lifetime and were, thus, less likely to be smoking before they became pregnant. Family income was also significantly related to smoking behavior at all income levels. Low income mothers (those in families earning less than \$15,000 a year) were the most likely to smoke both currently and during pregnancy when compared with mothers at all other levels of income. Recent mothers living in the Midwest and in nonmetropolitan areas were more likely to report smoking during pregnancy (20.2 and 18.3 percent, respectively) than those mothers in other regions of the country and those living in metropolitan areas. They were also comparatively more likely to smoke currently and to report ever having smoked. At least part of this differential may be due to population composition. Recent mothers in the Midwest and nonmetropolitan areas are also more likely to be white and poorly educated (5).

Pregnancy-related smoking behavior

Table 2 contains information about mothers' smoking behavior in the year before pregnancy among those who reported ever having smoked. Whereas, table 1 gives the proportion of all mothers who smoked during pregnancy (the total prevalence rates), the rates in column 2 of table 2 identify the proportion of women who ever smoked and who were smoking in the 12 months before their most recent pregnancy. The final column in table 2 is the proportion who were smoking in the year before pregnancy who reported that they continued to smoke during their most recent pregnancy.

Of the 5.3 million mothers who reported ever smoking, 63.5 percent were still smoking in the year before their most recent birth (table 2). In patterns consistent with those reported for overall prevalence, young mothers, poor mothers, poorly educated mothers,

non-Hispanic mothers, women who lived in nonmetropolitan areas, and those living in the Midwest were all more likely to smoke during the year before pregnancy. Of those mothers who reported ever smoking 100 cigarettes in their lifetime, about 78 percent of women in families below the poverty threshold—as well as 78 percent of those mothers with less than a high school education—smoked in the year before pregnancy. Comparatively, only 44 percent of recent mothers in families that earned more than \$50,000 a year and 34.1 percent of mothers with at least a bachelor's degree reported still smoking in the year before pregnancy. From the information in this table and the previous one, it is clear that well-educated and higher income mothers are both less likely to smoke at all and less likely to still be smoking by the time they become pregnant.

Some groups of mothers, despite having lower smoking prevalence rates overall, were more likely to still be smoking during the year before pregnancy. Of women who reported smoking at least 100 cigarettes in their lifetime, black mothers and never-married mothers were more likely to have smoked in the year before their pregnancies than white mothers and their married or previously married counterparts (table 2).

Of those women who continued to smoke during the year before their most recent pregnancy, just under two-thirds (62.7 percent) reported that they also smoked during most of that pregnancy as well. This suggests that one-third of the women quit smoking just before or during their pregnancy.

Older mothers (35–44 years of age) were more likely to continue smoking throughout their pregnancies despite being both less likely to ever smoke and to have smoked in the year prior to the pregnancy. Aside from this difference, mothers who continued to smoke throughout their pregnancies were similar to those mothers identified as most likely to be currently smoking and to have smoked in the year before the most recent pregnancy. Non-Hispanic women, white women, women who were previously married, poor women, and poorly educated women were all

more likely to continue smoking than their counterparts (table 2). Mothers in the Midwest were also more likely to report that they continued smoking throughout their pregnancies than mothers in other regions of the country.

Given the evidence that there is a dose-response relationship between the number of cigarettes smoked during the pregnancy and the birthweight of the baby (1,4,5), both cutting down on cigarette consumption and cessation of smoking during pregnancy are critical goals in improving birth outcomes.

Table 3 presents information about cigarette consumption for those women who reported that they smoked in the year before pregnancy and throughout most of their recent pregnancies. The figures are reported for both before and after women became aware of their pregnancies. The percentages reported for cigarette consumption in table 3, therefore, include women who may have quit sometime during their pregnancy and report smoking no cigarettes after learning of their pregnancies.

Figure 1 illustrates the changes in cigarette consumption among women who report smoking throughout their pregnancies. Before learning of their pregnancies, about 47 percent of women smokers could be considered moderate smokers, consuming a half a pack or more per day on average. After learning of their pregnancy, only about 22 percent of women consumed half a pack to a pack per day. In addition, more than one-half of the women who were heavy smokers before learning of their pregnancy changed their smoking behavior after learning of their pregnancy (14.2 percent versus 6.5 percent, respectively, table 3). Most importantly, nearly one-quarter of women who reported smoking during their pregnancy said they did not smoke at all after learning of their pregnancy (22.6 percent, table 3).

Consistent with other findings in this report, white women and non-Hispanic women were more likely to remain heavy smokers through their pregnancies. About one-quarter of both groups continued to smoke a half a pack or more of cigarettes a day after learning of their pregnancies (22.9 percent and 22.7, respectively,

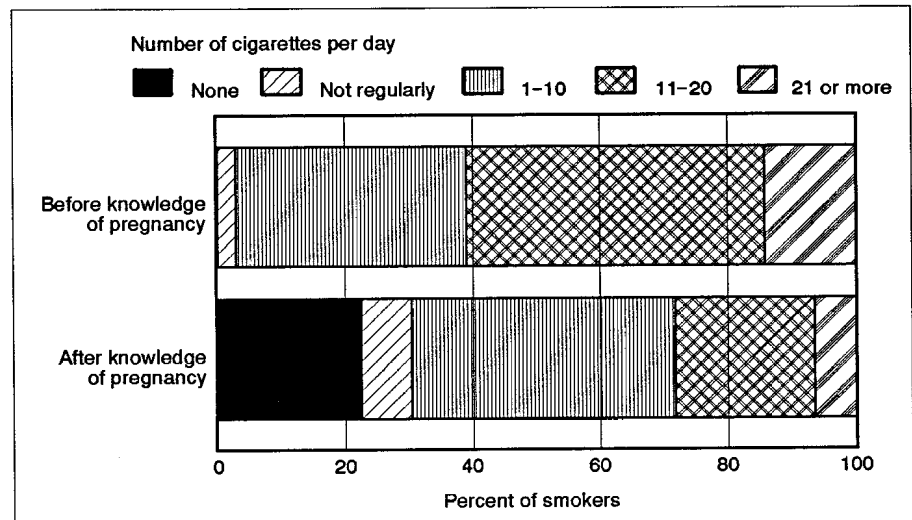


Figure 1. Cigarette consumption before and after learning of most recent pregnancy for recent mothers, 18–44 years of age, United States, 1990

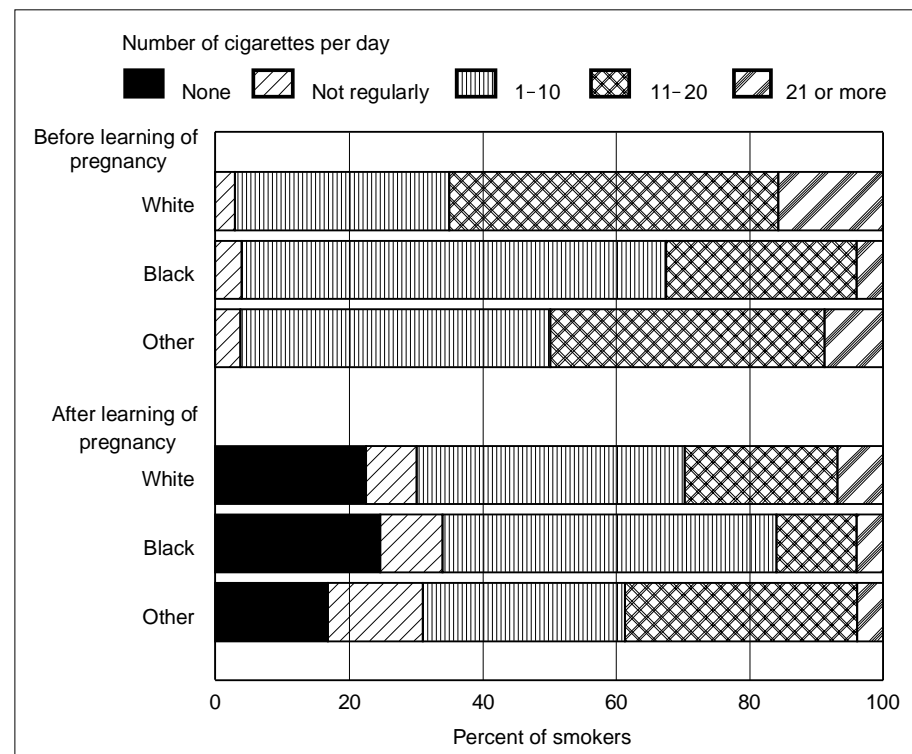


Figure 2. Cigarette consumption before and after learning of most recent pregnancy by race for recent mothers, 18–44 years of age, United States, 1990

table 3). Figure 2 illustrates changes in cigarette consumption by race. By way of contrast, only 12 percent of black women smokers remained moderate smokers during their pregnancies. In addition, about one-quarter of black women did not smoke at all after learning of their pregnancy

(24.7 percent, table 3), although in the year before they became pregnant they were more likely to have smoked than their white counterparts. Figure 3 illustrates changes in cigarette consumption for mothers of various ages. Older women who were smoking at the time they became pregnant were

more likely to be heavy smokers before learning of their pregnancy and to remain so after. Just under 12 percent of women 35–44 years of age continued to smoke more than a pack a day on average after they learned of their pregnancy compared with 5 percent of women 18–24 years of age. Younger women were also more likely to stop smoking altogether after learning of their pregnancy than older mothers (23.3 percent versus 17.9 percent, table 3).

Educational status also appeared to determine changes in cigarette consumption as shown in figure 4. Before learning of their pregnancies, 46.1 percent of recent mothers with less than a high school education were moderate smokers compared with 38.3 percent of recent mothers with at least a bachelor's degree. After learning of the pregnancy, 27.6 percent of the poorly educated mothers continued to smoke moderately compared with 12.2 percent of the highly educated mothers. In addition, almost one-third of college educated mothers stopped smoking altogether after learning of their pregnancy compared with about 14 percent of poorly educated mothers.

Income also plays a role in the changes in cigarette consumption. Low-income women were significantly less likely to stop smoking altogether during pregnancy than women with higher incomes (17.5 percent versus 32.2 percent). Conversely, low-income women were more likely to be light or moderate smokers than higher income women after learning of their pregnancies (table 3). Place of residence and region were highly related to changes in cigarette consumption.

Discussion

Data from the 1990 NHIS on Pregnancy and Smoking questionnaire have been used in this report to present a profile of the smoking behavior of women who had given birth in the previous 5 years. Self-reported smoking behavior before, during, and after pregnancy provides prevalence estimates of current smoking, smoking during pregnancy, smoking continuation, and cigarette consumption during pregnancy.

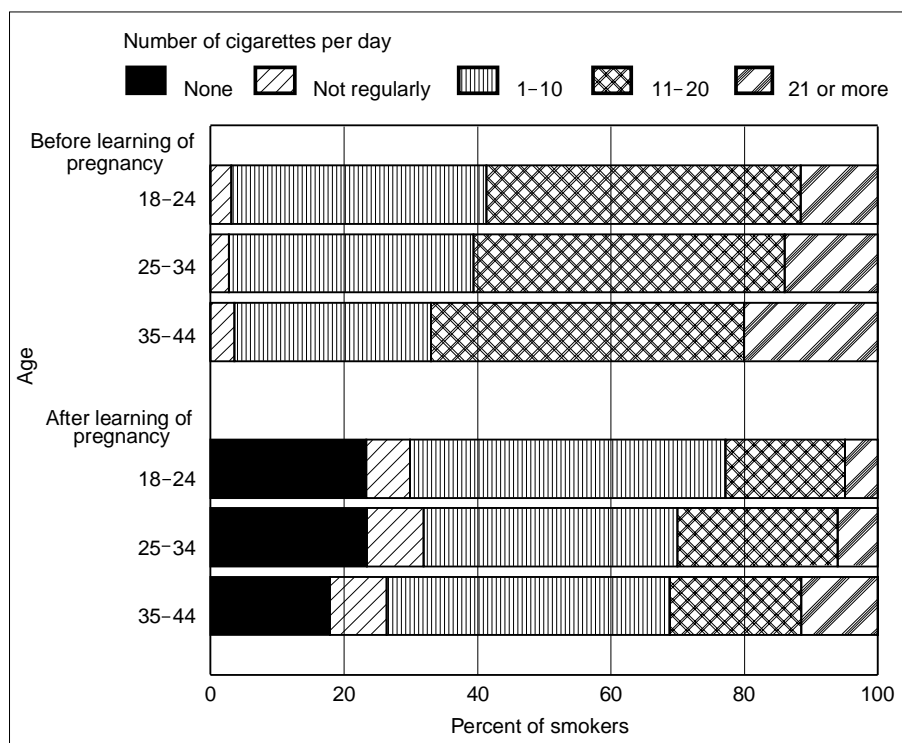


Figure 3. Cigarette consumption before and after learning of most recent pregnancy by race for recent mothers, 18–44 years of age, United States, 1990

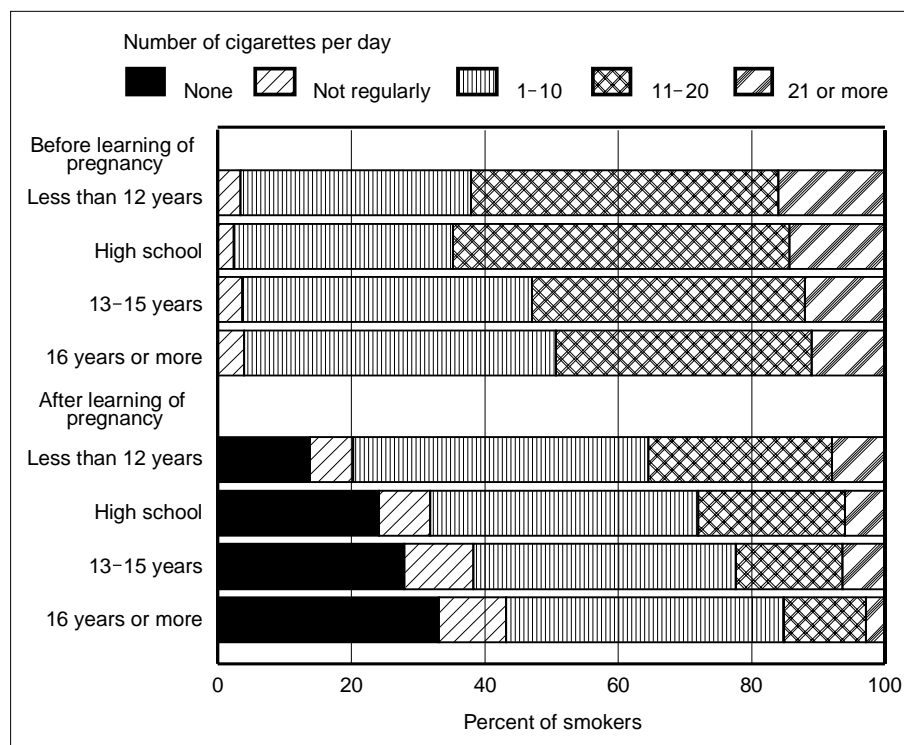


Figure 4. Cigarette consumption before and after learning of most recent pregnancy by educational level for recent mothers, 18–44 years of age, United States, 1990

About 15 percent of recent mothers report smoking during their most recent pregnancy. This is approximately similar

to estimates from other studies based on birth certificates and retrospective sample surveys (5,8). Of the women

who reported smoking in the year before pregnancy, nearly a third reported that they did not smoke during their most recent pregnancy and an additional 8 percent did not smoke regularly. Both of these findings suggest that the public health message about the dangers of smoking during pregnancy have resulted in behavioral change among women, and most importantly in smoking cessation. This behavioral change, however, is more likely to occur among well-educated women with more income who are currently married. These data show that goals set by the Year 2000 Health Objectives for the Nation have not yet been reached, and that additional work remains to be done so that an effective message reaches all pregnant women.

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Technical notes

Source and description of data

The estimates presented in this report are based on data collected in the 1990 National Health Interview Survey (NHIS) on Pregnancy and Smoking. Performed by the National Center for Health Statistics, the NHIS is an ongoing survey of the civilian, noninstitutionalized population of the United States. The interviews are performed in households weekly by personnel of the United States Bureau of the Census.

For the past several years, the NHIS has consisted of two sections: (a) the basic questionnaire, which remains the same each year and (b) special topic questionnaires, which vary from year to year. The survey collects individual and household data on health status and behaviors, medical care utilization, and individual and household characteristics. The special topic questionnaires explore specific areas in greater detail. In 1990, the special topics questionnaires included Assistive Devices, Hearing, Podiatry, Family Resources, Health Promotion and Disease Prevention, which included the Injury Control and Child Health questionnaire, and AIDS Knowledge and Attitudes. Additional information on the 1990 NHIS survey design and data collection methods has been published elsewhere (15,17). In order to address changing health priorities and increasingly diverse data needs, the NHIS was redesigned in 1996 and questions on pregnancy and smoking are a planned part of the special topics module in 1998.

The interviewed sample for the 1990 questionnaire on Pregnancy and Smoking was composed of 46,476 households containing 119,631 persons. A record exists for every woman 18–44 years of age in the NHIS sample. For women not eligible for interview in the Pregnancy and Smoking questionnaire, a dummy record was constructed. Smoking questions were asked only of women who had a live-born child in the 5 years preceding the interview or were pregnant at the time of the interview.

The response rate for the pregnancy and smoking portion of the NHIS Health Promotion and Disease Prevention questionnaire was 88.6 percent. The response rate was calculated by taking the response rate for the household core questionnaire (95.5 percent) times the response rate for the Pregnancy and Smoking questionnaire (92.8 percent).

Sampling errors

Since the estimates shown in this report are based on a sample population, they are subject to sampling error. In the case of small estimates, sampling errors may be relatively high. Further, estimates based on complex, multistage sampling designs such as the NHIS lead to larger sampling errors than those based on simple random samples. The standard errors shown in tables 1–3 of this report were calculated using SUDAAN (Survey Data Analysis) developed by Research Triangle Institute for analysis of complex sample surveys. The procedure used was CROSSTAB, and the design was UNEQWOR (without replacement sampling with unequal probabilities of selection at the first stage) (21).

Tests of statistical significance were performed using the difference of means tests (t-test). The standard error used for performing this procedure was derived from the pooled variances of the populations being compared. Differences between means that were at least twice as large as the pooled standard error were considered to be significant at the 0.05 percent level. The Bonferroni inequality was used to establish the critical value for statistically significant differences based on the number of possible comparisons within a particular variable (or combination of variables) of interest. In this procedure, the significant alpha level is divided by the number of tests being performed to determine the adjusted significance level. Lack of comment regarding the difference between any two estimates does not mean that the difference was tested and found not to be statistically significant. Estimates that do not meet the reliability criteria of 30 percent relative standard error are marked on the table.

Availability of data and related data sources

A public-use data file based on the 1990 NHIS-HPDP containing items on pregnancy and smoking, as well as other data from the NHIS are available from the Division of Health Interview Statistics. Information about this data file and others may be obtained by writing to the Systems and Programming Branch, Division of Health Interview Statistics, 6525 Belcrest Road, Hyattsville, MD 20782 or from the home page of the National Center for Health Statistics at <http://www.cdc.gov/nchswww/nchshome.htm>. The NHIS-HPDP is also available on CD-ROM from the U.S. Government Printing Office and from the National Technical Information Service. Information on ordering the CD-ROM and publications from the NHIS can be obtained by contacting the National Center for Health Statistics Data Dissemination Branch (301) 436-8500.

Other sources of data from the National Center for Health Statistics that deal with smoking in pregnancy include data from birth certificates (5), retrospective survey data from the National Survey of Family Growth, Cycles 4 and 5 (8,22), and lab and survey data from the third National Health and Nutrition Examination Survey (23).

Suggested citation

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