Family Planning Perspectives
Volume 30, Number 2, March/April 1998

Predicting Maternal Behaviors During Pregnancy: Does Intention Status Matter?

By Kathryn Kost, David J. Landry and Jacqueline E. Darroch

Context: Women's behavior during pregnancy, which can affect the health of their infant, may be influenced by their attitude toward the pregnancy.

Methods: Multivariate analyses of data from the 1988 National Maternal and Infant Health Survey and the 1988 National Survey of Family Growth were conducted to investigate whether women with unplanned births differ from other women in their pregnancy behavior, independent of their social and demographic characteristics.

Results: Women with intended conceptions are more likely than similar women with unintended pregnancies to recognize early signs of pregnancy and to seek out early prenatal care, and somewhat more likely to quit smoking, but they are not more likely than women with comparable social and demographic characteristics to adhere to a recommended schedule of prenatal visits once they begin care, to reduce alcohol intake, or to follow their clinician's advice about taking vitamins and gaining weight. Social and demographic differences in these behaviors are largely unaffected by planning status, indicating that these differences are independently related to pregnancy behaviors.

Conclusions: Both the intendedness of a pregnancy and the mother's social and demographic characteristics are important predictors of pregnancy-related behavior.

Family Planning Perspectives, 1998, 30(2):79-88

In the past decade, evidence has accumulated that women's behavior during pregnancy can strongly affect the health of their infants.[1] For example, maternal smoking and poor weight gain during pregnancy have consistently been shown to increase an infant's risk of low birth weight.[2] Nevertheless, very little is known about why some women avoid detrimental behaviors and engage in beneficial ones, while others do not.

A woman's attitude toward her pregnancy is likely to affect her behavior; however, the standard measure of her feelings is an imperfect one—a postpartum report of how she felt before the pregnancy about whether and when she wanted to have a child. Still, this measure—intention status, which indicates whether the pregnancy was intended or unintended—has been found to be related to pregnancy behavior.[3]

Research findings indicate that some disadvantaged social and demographic subgroups of women are less likely to engage in beneficial behaviors during pregnancy.[4]

Intention status also varies widely according to some social and demographic characteristics,[5] and the subgroups least likely to carry out positive pregnancy behaviors have the highest rates of unintended pregnancies. As a result, it is unclear whether the "effects" of intention status actually reflect social and demographic differences among the intention, or planning, status groups or whether women with unplanned pregnancies actually behave differently during their pregnancies in ways that contribute to less healthy outcomes.

Previous studies of the effects of intention status have had severe limitations. Generally, study samples have been drawn from specific subgroups in the population, such as married women, or have focused on subgroups that are not representative of all births, such as first births or births drawn from hospital records in a particular area.[6]

In this study, we use nationally representative data to investigate whether women with unplanned pregnancies differ from other women in their pregnancy behavior, independent of their social and demographic characteristics. We expect that differences in the planning status of births among population subgroups, rather than any intrinsic property of their social and demographic characteristics, predict which women will (or will not) engage in particular behaviors during pregnancy. Unintended pregnancy may be associated with lower personal commitment to promote the baby's health both during pregnancy and after the baby is born. Women may be reluctant to accept a pregnancy that they would have liked to avoid and thus may miss opportunities to ensure a healthy pregnancy and outcome. Other factors, such as socioeconomic or financial constraints, may also make it difficult for women to do everything they should to promote the health of the infant, and such constraints may be more difficult to overcome for women whose pregnancy is unintended.

Specifically, we explore whether women carrying unintended (mistimed or unwanted) pregnancies to term make less use of prenatal care services and conform less closely to recommended personal practices, such as those related to smoking and weight gain, than do women with intended pregnancies. We expect unwanted pregnancies to be more strongly associated than mistimed pregnancies with poor prenatal behavior. We do not expect planning status to account for all social and demographic effects, however, because access to reproductive health services and other environmental constraints may differ among population subgroups.

METHODOLOGY

Data

We use data from two nationally representative samples of women and their births—the 1988 National Maternal and Infant Health Survey (NMIHS) and the 1988 National Survey of Family Growth (NSFG). By conducting separate yet similar analyses within one analytical framework, we can examine the size and direction of the relationships found. If the findings are similar, we will gain support for their validity, while differences will point to possible weaknesses in the variables or data sets available.

The 9,953 women in the NMIHS data set are representative of resident U.S. women in 48 states who had a live birth in 1988.[7] The survey questionnaire was mailed to a sample of women aged 15-49 drawn from live birth, late fetal death and infant death

vital records. Data from the vital records themselves are also included in the data file.

The data file for the 1988 NSFG, which is representative of U.S. women of reproductive age, contains information from interviews with 8,450 women aged 15-44. The interviewer asked each respondent about her reproductive history, including pregnancy intentions, health care and behavior during pregnancy. For our analyses of the NSFG, information on live births comes from the women's reproductive histories, which are limited to births occurring between January 1984 and the time of the survey. Our analyses of both the NMIHS and the NSFG data include only women who had live births because there are very few fetal deaths or stillbirths in the NSFG.

Both the 1988 NSFG and the NMIHS asked questions about the planning status of at least one birth, about the woman's behaviors during pregnancy and about the health of the infant. However, the two surveys differ substantially in numerous ways, including the size and design of the samples, the design and administration of the survey questionnaire and the definition and quality of specific measures. Moreover, far more births are available for analysis in the NMIHS than in the NSFG.

With respect to behavior during pregnancy, the NSFG included questions on the timing of pregnancy recognition and the initiation of prenatal care services and on the number of prenatal care visits for all births after January 1984. Information on smoking and alcohol use is available only for the most recent pregnancy.

The NMIHS contains all of the variables we use from the NSFG, plus data on smoking, drinking and vitamin use (both before and during pregnancy) and information on weight gain. The two surveys often differ in the questions used to elicit information, and the source of the information may differ as well. The data from the NSFG are drawn only from women's reported behaviors. Although we rely primarily on self-reports from the NMIHS mother's questionnaire, some information in the data set is taken from the infant's birth certificate.

Because poor pregnancy outcomes and infant health problems as well as unintended pregnancies are concentrated among women in disadvantaged groups, it was essential to include women's social and demographic characteristics in our analyses. Data are available in both surveys on age and parity at delivery, race and ethnicity, education, marital and poverty status, and prior negative pregnancy experiences (see Appendix). In addition, the NMIHS contains information on employment during the pregnancy, on whether the mother received any form of public assistance during the pregnancy, on whether the mother received any advice regarding smoking, alcohol use, vitamins and weight gain from a prenatal care provider and, if so, on what she was advised to do.

SELECTION OF OBSERVATIONS

Births are the unit of analysis in both the NMIHS and the NSFG. In each case, we excluded multiple live births because the woman's prenatal behavior is likely to have been affected by the common knowledge that such births are at high risk for low birth weight. In the NMIHS data set, the sample of 9,122 births may be considered roughly representative of all singleton live births occurring in a period of one year among women aged 15-49. (Only 0.3% of all U.S. births are to women outside this age range.[8]) The 2,586 births selected for analysis in the NSFG are a representative sample of the population of births occurring in the United States in the four-year

period 1984-1988.

Both the NSFG and the NMIHS oversampled specific groups of women—black women in the NSFG and black women and women who had low-birth-weight infants in the NMIHS—to increase the reliability of statistics for these groups. Both data sets contain the appropriate population weights so that statistical analyses can take the oversampling into account and estimates will be applicable to the national population of U.S. women.

MEASUREMENT OF INTENTION STATUS

In this study, as in most demographic research, the intention, or planning, status of a birth is a measure of the woman's reproductive intention prior to the pregnancy resulting in that birth. Both the NSFG and the NMIHS provide information on the planning status of births. The NSFG contains a series of questions on whether, just before she became pregnant, the respondent wanted to become pregnant, would have preferred the pregnancy to occur earlier or later, or did not want it at all. The NMIHS mother's questionnaire includes a similar question asking whether the woman wanted to become pregnant at the time she conceived, would have preferred it to happen later or did not want to become pregnant again or ever.

Thus, births can be divided into three categories: intended births, those occurring to women who wanted to become pregnant when they did; mistimed births, those occurring to women who, before they became pregnant, did not want to have a child at that time but did want one in the future; and unwanted births, those occurring to women who did not want to have any (or any more) children.

Classifying a pregnancy as unwanted does not necessarily imply an unwanted child, because the planning status of a birth refers to the woman's intention prior to the pregnancy. Some women may change their attitude—and perhaps also their memory of that attitude—either during the pregnancy or after delivery. We expect that some (but not many) women incorrectly reported their original attitude, and that these women were most likely to have misclassified unintended births as intended ones.[9] If this is the case, our estimates of the effects of planning status on prenatal behavior will be conservative.*

OUTCOME MEASURES

The pregnancy behavior measures we examine fall into four broad categories—recognition of pregnancy symptoms, medical prenatal visits, avoidance of unhealthy behavior and compliance with medical recommendations. These pregnancy behaviors were chosen because other studies show that they are related to infants' birth outcomes and because they represent a variety of aspects of pregnancy behavior.[10]

Women who recognize relatively quickly that they are pregnant are able to obtain early medical care and advice. Women who intend to become pregnant are probably most likely to recognize a pregnancy early because they are eagerly awaiting telltale symptoms; thus, they may be able to make behavioral changes during the first months of pregnancy. They may also be the most motivated to adapt their behavior during pregnancy to optimize the infant's well-being. We considered early pregnancy recognition to have occurred if the woman knew she had conceived within the first six

weeks of pregnancy.

We hypothesize that women whose pregnancies are unplanned will be less likely than others to meet standards of recommended prenatal care, even after we control for their social and demographic characteristics. In the following analyses, we consider an early prenatal visit to be one that is made within the first eight weeks of pregnancy. For each woman, the recommended total number of visits depends on both the duration of pregnancy and the point at which she initiates prenatal care.† We consider that a woman made the recommended number of visits if she made at least 90% of the number recommended. For example, the recommended number of visits for a woman who had her first prenatal visit in the eighth week of pregnancy and delivered in the 40th week would be greater than the number for a woman who made her first visit in the 15th week and delivered in the 37th week. Thus, we adjust for the "window of opportunity" during which the woman could have made visits and calculate the recommended number of visits for that period of time.

Women are commonly advised not to smoke and to avoid more than light drinking during pregnancy. We assess the extent to which pregnancy planning status is independently related to specific measures of tobacco and alcohol consumption. Again, we expect that women whose pregnancies were unplanned will be less likely to conform to these recommended behaviors.

Finally, we examine whether planning status affects how well women conform to their clinicians' advice about broader health behaviors, such as taking vitamins and gaining weight.

ANALYSES

For all analyses, we used the STATA program, which allows for the inclusion of population weights and correctly calculates standard errors. In addition, STATA can adjust for the six sampling strata included in the NMIHS survey design. In the following tables, we present national estimates based on weighted data and report the unweighted sample size upon which the estimates are based.

We first look at the prevalence of beneficial pregnancy behaviors in the three intention status groups. We then use a two-stage multivariate logistic regression analysis to examine how accounting for the intention status of the birth changes the effects of the mother's social and demographic characteristics. The two-stage multivariate analysis also allows us to examine whether the relationships between intention status and behaviors remain after the women's social and demographic characteristics are held constant, and if so, how the relationships are affected.

In a third multivariate step, we included interaction terms—planning status with selected social and demographic characteristics—to test the hypothesis that the effect of planning status differs among demographic subgroups of women. Although some of the interaction terms we tested were statistically significant, their inclusion in the models did not alter the substantive interpretation of the results. We therefore chose not to include interaction terms in the final models.

In the following discussion, we place more confidence in the findings from the NMIHS because it contains a far larger sample than the NSFG. However, some findings are

statistically significant in both data sets but are contradictory. Thus, it is not clear whether the NMIHS findings are always more robust. Obviously, we have the most confidence in findings in which the relationship operates in the same direction and is statistically significant in both data sets.

BIVARIATE RESULTS

Intention status is significantly related to each of the pregnancy-related behaviors studied (Table 1). For example, 73% of the NMIHS respondents with intended births had recognized their pregnancy in the first six weeks, compared with 61% of women with mistimed births and only 56% of women with unwanted births.

Table 1. Percentage of U.S. women of reproductive age who reported having engaged in selected pregnancy-related behaviors, by survey, according to the intention status of the birth

Behavior	Survey	Total	Intended	Mistimed	Unwanted	N
Recognized pregnancy in first 6 weeks	NMIHS	67.7	73.2*,**	61.1**	56.1	9,122
	NSFG	55.9	63.1*,**	45.8	43.2	2,535
Made prenatal care visit in first 8 weeks of pregnancy	NMIHS	60.1	67.2*,**	51.1	48.3	9,055
	NSFG	40.8	45.1*,**	36.0	30.7	2,547
Made recommended no. of prenatal care visits†	NMIHS	67.3	69.4*,**	64.9	62.3	8,840
	NSFG	76.5	78.2*	73.2	75.2	2,548
Quit smoking‡	NMIHS	26.4	30.4*,**	23.3	19.6	2,732
	NSFG	15.4	16.9**	17.8**	7.9	496
Reduced or quit alcohol use§	NMIHS	94.0	94.8**	94.0**	85.7	3,460
	NSFG	na	na	na	na	na
Took vitamins††	NMIHS	91.1	92.5*,**	89.7**	87.0	8,524
	NSFG	na	na	na	na	na
Gained weight within 5 lbs. of advice received‡‡	NMIHS	41.9	43.9*,**	39.7	35.4	6,199
	NSFG	na	na	na	na	na

*Proportion is significantly different from proportion mistimed at p<.05. **Proportion is significantly different from proportion unwanted at p<.05. †Among those who received any prenatal care. ‡Among smokers only. §Among those who drank prior to pregnancy. ††Among those who were advised to take vitamins. ‡‡Among those who received prenatal care advice on weight gain. *Notes:* All percentages shown here are weighted. NMIHS=National Maternal and Infant Health Survey. NSFG=National Survey of Family Growth. na=not applicable, because not measured in NSFG.

In both surveys, women with intended births were the group most likely to have recognized their pregnancy within the first six weeks,[‡] to have made a prenatal visit within the first two months and to have made at least 90% of the recommended number of visits. In addition, the NMIHS data show that women with intended births were the most likely to have quit smoking if they had smoked prior to pregnancy, to have taken vitamins during pregnancy and to have gained weight as advised by a prenatal care provider. In the NMIHS, women with wanted (intended or mistimed) births who had drunk alcohol prior to pregnancy were more likely to have quit drinking or reduced their consumption during pregnancy than were similar women with unwanted births.

Women with unwanted births were the least likely to have recognized the pregnancy in the first six weeks, to have reduced or quit alcohol use or to have taken vitamins. There was no significant difference between women with mistimed births and women with unwanted births for the other outcomes in the NMIHS data; in the NSFG data,

only the difference between the two groups in the proportion of smokers who quit smoking during pregnancy was significant.

MULTIVARIATE RESULTS

Prenatal Care Behaviors

Table 2 shows the odds ratios for three measured prenatal care behaviors by the mother's characteristics, before and after adjustment for planning status.

Table 2. Odds ratios from logistic regression analyses predicting whether women reported selected pregnancy-related behaviors, before and after adjustment for planning status of birth, according to women's characteristics, NMIHS and NSFG

Characterisitic	Recognized pregnancy in first 6 weeks		Prenatal care visit in first 8 weeks				After starting prenatal care, made recommended no. of visits†			
	NMIHS (N=9,017)		NMIHS (N=8,893)		NSFG (N=2,547)		NMIHS (N=8,743)		NSFG (N=2,520)	
	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted
Planning status of birth										
Intended	na	1.00	na	1.00	na	1.00	na	1.00	na	1.00
Mistimed	na	0.78**	na	0.69**	na	0.88	na	0.95	na	0.84
Unwanted	na	0.60**	na	0.67**	na	0.77	na	0.87	na	0.96
Age of mother at infant's birth										
<20	0.85	0.88	0.59**	0.65*	0.43**	0.46*	0.84	0.84	0.93	1.01
20-24	0.94	0.93	1.00	1.04	0.71	0.72	0.73*	0.72*	0.91	0.94
25-29	1.13	1.09	1.15	1.14	0.88	0.88	0.76*	0.75*	1.16	1.18
30-34	1.43**	1.40*	1.04	1.04	1.03	1.01	0.76*	0.75*	1.20	1.20
>=35	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Mother's race/ethnicity										
Non-Hispanic black	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hispanic	0.94	0.91	0.85	0.84	0.88	0.85	0.86	0.85	0.53**	0.53**
Non-Hispanic white/other	1.24**	1.20*	0.93	0.91	1.20	1.18	1.07	1.06	0.97	0.97
Marital status										
Never-married	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Currently married	1.46**	1.37**	1.38**	1.27*	1.12	1.09	1.32**	1.30*	1.53*	1.50*
Formerly married	0.82	0.81	1.13	1.11	1.02	1.01	0.95	0.95	1.5	1.50
Mother's education										
<12	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
12	1.14	1.15	1.08	1.10	1.36*	1.36*	1.28**	1.28**	1.32	1.33
13-15	1.41**	1.42**	0.91	0.93	1.46*	1.46*	1.56**	1.56**	1.32	1.35
>=16	1.52**	1.51**	1.04	1.04	1.63**	1.62*	1.31*	1.30*	1.19	1.20
Poverty status‡										
<100%	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
100-199%	1.12	1.12	1.18	1.19	1.08	1.07	1.03	1.03	0.76	0.76
>=200%	1.34**	1.31**	1.55**	1.50**	1.35	1.35	1.15	1.14	0.79	0.79
Received public assistance										
Yes	1.01	1.02	1.34**	1.37**	na	na	1.08	1.09	na	na
No	1.00	1.00	1.00	1.00	na	na	1.00	1.00	na	na

Worked during pregnancy										
Yes	0.94	0.95	1.11	1.13	na	na	1.12	1.12	na	na
No	1.00	1.00	1.00	1.00	na	na	1.00	1.00	na	na
No. of previous live births										
0	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1	1.19*	1.22*	0.97	1.00	0.94	0.95	0.94	0.94	1.16	1.16
2	1.04	1.11	0.90	0.97	0.80	0.85	0.89	0.91	1.28	1.31
>=3	1.15	1.27*	0.65**	0.72**	0.74	0.82	0.78*	0.80	1.07	1.09
Had prior negative pregnancy experience										
Yes	1.10	1.08	0.99	0.97	0.91	0.90	1.19*	1.19*	0.80	0.80
No	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Recognized pregnancy in first 6 weeks										
Yes	na	na	8.27**	8.19**	na	na	na	na	na	na
No	na	na	1.00	1.00	na	na	na	na	na	na

*Statistically significant at p<.05. **Statistically significant at p<.01. †Includes only women who received prenatal care. ‡Income as percentage of federal poverty level. *Note:* na=not applicable.

•*Timing of pregnancy recognition*. The first set of analyses, for which we used only NMIHS data,§ shows that planning status was strongly related to the odds that a woman would realize in the first six weeks of pregnancy that she had conceived, even after adjustment for the effects of social and demographic variables. Women with unplanned (mistimed or unwanted) births were significantly less likely than women with intended births to have recognized their pregnancy early.

A comparison of the results obtained before and after adjustment for planning status shows that some effects of social and demographic factors on the odds of early pregnancy recognition were relatively unaffected by the inclusion of planning status in the model. Women who were white or of origins other than Hispanic or black, those who were currently married, those who had at least some college education and those whose annual income was at least twice the federal poverty level were most likely to have recognized their pregnancy in its early stages.

In contrast, the relationships of age and parity with early pregnancy recognition were weak. Only women aged 30-34 were significantly more likely than women aged 35 or older to have recognized their pregnancy early. Likewise, only women with one previous live birth and those with three or more were significantly more likely than women having their first birth to recognize their pregnancy in the first six weeks. Moreover, some social and demographic factors—receipt of public assistance, working during pregnancy and previous negative pregnancy outcomes—had no effect on the odds of early pregnancy recognition.

•*Timing of the first prenatal visit*. The analysis of NMIHS data finds that women with unintended births were significantly less likely than women with intended ones to have made an early visit;** the results from the NSFG show a similar tendency but the difference was not significant.

The NMIHS results also indicate that women who were married, those whose income was at least 200% of the federal poverty level and those who received some form of public assistance were most likely to have made their first prenatal visit within the first eight weeks of pregnancy, while women younger than 20 and those with three or more previous live births were among the least likely to have made a visit within that period.

Most of the estimated effects of the social and demographic factors were consistent in the two data sets. As in the NMIHS, teenage women in the NSFG were significantly less likely than the oldest women to have made a visit within the first eight weeks of pregnancy. However, increasing levels of education were associated with rising odds of early prenatal visits in the NSFG, but not in the NMIHS.

In both data sets, social and demographic effects were not greatly affected by the inclusion of intention status in the model, and the effects of intention status remained significant even when the women's background characteristics were accounted for. These findings indicate that the timing of a woman's first prenatal visit was affected both by her social and demographic characteristics and by whether she had intended to become pregnant.

In the NMIHS analyses, we included a dummy variable reflecting whether the mother had recognized her pregnancy within the first six weeks. Not surprisingly, when this variable was introduced into the analysis, early pregnancy recognition was a strong predictor of early entry into prenatal care: Women who recognized they were pregnant within the first six weeks were about eight times as likely to have made their first prenatal visit within the first eight weeks. However, the inclusion of this variable did not affect the estimated effects of the social and demographic factors, nor did it remove the effects of planning status (not shown). Thus, even after controls were introduced for the fact that women who had intended to conceive tended to recognize their pregnancies earlier than women who had not, such women were still more likely to have entered into early prenatal care than women with unintended pregnancies.

•*Making the recommended number of prenatal visits*. The planning status of the pregnancy had no effect on whether a woman made the recommended number of visits. Once they had begun prenatal care, women with unintended pregnancies were no less likely to follow the recommended schedule of visits than were women with intended pregnancies.

Like the results for the other two pregnancy behaviors, these findings indicate relatively strong social and demographic effects that were not attenuated by the inclusion of planning status in the model. In both sets of data, social and demographic characteristics did affect the odds of adhering to a recommended schedule of prenatal visits. Nevertheless, the direction and statistical significance of the estimated effects of several factors (age, race and ethnicity, education, number of previous births, and negative pregnancy experience) were not consistent in the two data sets.

In the NMIHS but not in the NFSG, women aged 20-34 were less likely than women aged 35 or older to have made the recommended number of visits once care had begun. Also, the NMIHS data yielded no differences between racial and ethnic groups, but the NSFG data indicated that Hispanic women were significantly less likely than black women to have adhered to the recommended schedule of visits. In both data sets, currently married women were more likely than never-married women to have made the recommended number of visits. In the NMIHS but not in the NSFG, increased levels of education were associated with greater odds of having made the recommended number of prenatal visits, particularly among women who had at least a high school education. Parity was not associated with greater odds of making the

recommended number of visits among women in either data set after planning status was accounted for. Finally, in the NMIHS but not in the NSFG, women who had had a negative pregnancy outcome were more likely to have made the recommended number of prenatal visits than were women without such experience.

HEALTH BEHAVIORS

Table 3 (page 84) presents findings from four sets of logistic regression analyses. The outcome variables for the first two sets—cessation of smoking and cessation or reduction of drinking during pregnancy—were used to measure avoidance of unhealthy behavior during pregnancy. The outcome variables for the third and fourth sets of analyses—vitamin intake and weight gain—measured whether the mother adhered to advice she received from a prenatal care provider. Data for the last three outcome variables were available only from the NMIHS.

Table 3. Odds ratios from logistic regression analyses predicting whether women adhered to healthy behaviors during pregnancy, before and after adjustment for planning status of birth, according to women's characteristics, NMIHS and NSFG

Characteristic	Quit smoking†,‡				Had ¾1 alcoholic drinks per month§		Took vitamins††		Gained weight within 5 lbs. of advice‡‡	
	NMIHS (N=2,697)		NSFG (N=492)		NMIHS (N=3,431)		NMIHS (N=8,432)		NMIHS (N=6,135)	
	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted
Planning status of birth										
Intended	na	1.00	na	1.00	na	1.00	na	1.00	na	1.00
Mistimed	na	0.74*	na	0.92	na	1.00	na	0.92	na	0.96
Unwanted	na	0.89	na	0.54	na	0.63	na	0.72	na	0.79
Age of mother at infant's birth										
<20	3.04**	3.42**	1.35	1.44	2.97*	2.78*	0.49*	0.48*	0.50**	0.49**
20-24	1.45	1.56	1.20	1.25	2.89**	2.71**	0.62	0.60*	0.77	0.76
25-29	1.98*	2.05*	0.90	0.90	2.23*	2.11*	0.68	0.65	0.88	0.86
30-34	1.03	1.07	‡	‡	1.54	1.47	0.97	0.94	0.90	0.88
>=35	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Mother's race/ethnicity										
Non-Hispanic black	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hispanic	2.23**	2.25**	1.35	1.24	2.29	2.22	1.53*	1.48*	1.00	0.98
Non-Hispanic white/other	0.84	0.85	0.52	0.51	0.98	0.93	1.04	1.02	1.14	1.12
Marital status										
Never-married	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Currently married	1.00	0.93	0.97	0.97	1.30	1.30	1.06	1.04	1.07	1.06
Formerly married	0.79	0.78	‡	‡	1.73	1.72	0.84	0.83	0.90	0.90
Mother's education										
<12	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
12	2.25**	2.29**	2.42	2.43	1.28	1.28	1.40*	1.40*	1.06	1.06
13-15	3.13**	3.22**	4.83**	4.96**	1.79	1.80	1.91**	1.90**	1.03	1.02
>=16	5.29**	5.46**	4.80*	4.89*	2.82*	2.76*	1.70*	1.67*	1.13	1.13
Poverty status										
<100%	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

100-199%	1.26	1.27	1.81	1.77	1.14	1.16	1.26	1.26	0.82	0.82
>=200%	1.48	1.45	1.82	1.78	1.16	1.15	1.23	1.22	0.92	0.91
Received public assistance										
Yes	0.71	0.71	na	na	0.76	0.77	0.77	0.77	0.87	0.88
No	1.00	1.00	na	na	1.00	1.00	1.00	1.00	1.00	1.00
Worked during pregnancy										
Yes	1.21	1.21	na	na	1.40	1.40	0.71**	0.72**	1.02	1.02
No	1.00	1.00	na	na	1.00	1.00	1.00	1.00	1.00	1.00
No. of previous live births										
0	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1	0.72*	0.73	0.68	0.70	0.50*	0.50*	0.91	0.92	1.10	1.10
2	0.60*	0.62*	0.47	0.55	0.40**	0.42**	0.83	0.86	1.02	1.05
>=3	0.74	0.76	0.55	0.72	0.26**	0.28**	0.58**	0.61*	0.99	1.03
Had prior negative pregnancy experience										
Yes	1.03	1.03	0.61	0.59	1.14	1.10	1.17	1.16	0.87	0.86
No	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Made prenatal care visits										
Yes	1.96	1.98	na	na	1.23	1.21	na	na	na	na
No	1.00	1.00	na	na	1.00	1.00	na	na	na	na
Smoking advice										
None/not advised to stop	1.00	1.00	na	na	na	na	na	na	na	na
Advised to stop	0.52**	0.51**	na	na	na	na	na	na	na	na
Alcohol advice										
None/not advised to stop or reduce	na	na	na	na	1.00	1.00	na	na	na	na
Advised to stop	na	na	na	na	1.33	1.33	na	na	na	na
Body mass index										
Average	na	na	na	na	na	na	na	na	1.00	1.00
Underweight	na	na	na	na	na	na	na	na	1.13	1.13
Overweight	na	na	na	na	na	na	na	na	0.81	0.81
Obese	na	na	na	na	na	na	na	na	0.73*	0.73*

*Statistically significant at p<.05. **Statistically significant at p<.01. †Model includes only women who smoked prior to pregnancy. ‡Information on smoking during pregnancy was available only for the woman's last live birth in the NSFG. Because the sample size for smokers in the NSFG is small, the number of observations in the two oldest age categories—30-34 and >=35—and in two marital status categories—currently married and formerly married—was too small to warrant separate categories and the categories were therefore combined for the analysis. Similarly, because only eight women had not received prenatal care, this variable was omitted from the NSFG models. §Alcohol measure not compatible in NSFG. Model includes only women who drank before pregnancy. ††Model includes only women who received prenatal care and advice about vitamins. ‡‡Model includes only women who received prenatal care and advice about weight gain. *Note:* na=not applicable.

•*Quitting smoking during pregnancy*. In the NMIHS data, only women with mistimed births were less likely than women with intended births to have quit smoking when they learned they were pregnant; in the NSFG data, intention status had no independent effect on the odds that a smoker would quit smoking once she discovered that she was pregnant (Table 3).

The NMIHS and NSFG findings also differ somewhat on the effects of social and

demographic factors; however, since the relationships usually were in the same direction, most of these differences may have resulted from the much smaller sample size for the NSFG. The NMIHS results in Table 3 indicate that age was related to the odds of quitting smoking: Women younger than 20 and those aged 25-29 were far more likely to quit than those aged 35 or older. Older women are likely to have been smokers for a longer time than younger ones and may therefore have more difficulty quitting.

In the NMIHS, Hispanic smokers were more likely to have quit than black smokers, but there was no significant difference between black smokers and smokers who were white or of other races in the odds of quitting.

In both data sets, increasing levels of education were associated with rising odds that a smoker would quit during pregnancy. Women who had already had a child were less likely to have quit smoking than were those pregnant with their first child, but the difference in the NSFG analysis was not significant. In the NMIHS, after adjustment for planning status, the relationship was significant only for smokers who had had two prior births.

Finally, the NMIHS data indicate that smokers who were advised to stop smoking were significantly less likely to do so than those who either did not receive any advice about smoking or those who reported that they were not advised to quit. This probably reflects differences in smoking frequency, and therefore addiction; heavy or longtime smokers were probably more likely to be advised to stop smoking—and to have more difficulty doing so—than light smokers or those who had only been smoking a short time.

•*Reducing alcohol use during pregnancy*. The NMIHS included questions on whether the mother had drunk alcohol before she became pregnant and whether she continued to drink after she learned she was pregnant. If a woman did drink during pregnancy, she was asked about the amount as well as whether she had reduced her intake during pregnancy. For the NMIHS analyses, therefore, we included only women who drank before pregnancy and examined the odds that they quit drinking or reduced their alcohol consumption during pregnancy.*†

As Table 3 shows, planning status itself had no effect on the odds that a woman who had drunk alcohol prior to pregnancy either avoided or reduced consumption during pregnancy. Still, several social and demographic factors did affect the odds of having quit or reduced alcohol intake.

For example, all drinkers younger than 30 were significantly more likely to have quit drinking or reduced their alcohol intake than were drinkers aged 35 or older. Perhaps, like smoking, drinking is more difficult for older women to stop (presumably because the habit has been in place for a longer time).

Only the most educated drinkers—those with four or more years of college—were more likely to have quit drinking or reduced their consumption than were the least educated women (those who had not graduated from high school). The most educated women were, at the time of their pregnancy in 1987 or 1988, probably more likely to be aware of public health recommendations on drinking during pregnancy.

Finally, the more children a woman had already had, the less likely she was to have quit drinking or reduced her alcohol consumption. Women who had had at least one birth may have continued drinking during previous pregnancies without apparent negative consequences and therefore may have felt less concern about drinking during subsequent pregnancies.

•*Adherence to advice on vitamin intake*. For the analysis of the odds of having taken vitamins, only women who were advised to take vitamins were included,[*‡] so the model predicts the odds that women adhered to the advice they were given. Planning status had no effect on the odds of having taken vitamins, and the inclusion of planning status in the model had almost no effect on the estimated effects of the social and demographic variables.

Three factors were associated with diminished odds of taking vitamins—young maternal age (younger than 25), having worked during pregnancy and having had three or more previous live births. Two factors were associated with a greater likelihood of having taken vitamins as advised—race and ethnicity, and education. Hispanic women were more likely than black women to have taken vitamins as advised; there was no difference between black women and white women. Finally, women who had had at least a high school education were more likely to have taken vitamins than were those who had not graduated from high school.

•*Adherence to advice on weight gain*. The last set of analyses in Table 3 estimates the odds that women followed their prenatal care provider's advice on weight gain to within five pounds. (Only women who received advice on weight gain from a prenatal provider were included in the analysis.[*§]) The results from the multivariate models indicate that pregnancy intentions and social and demographic characteristics were not strong predictors of the likelihood of adherence to weight-gain advice.

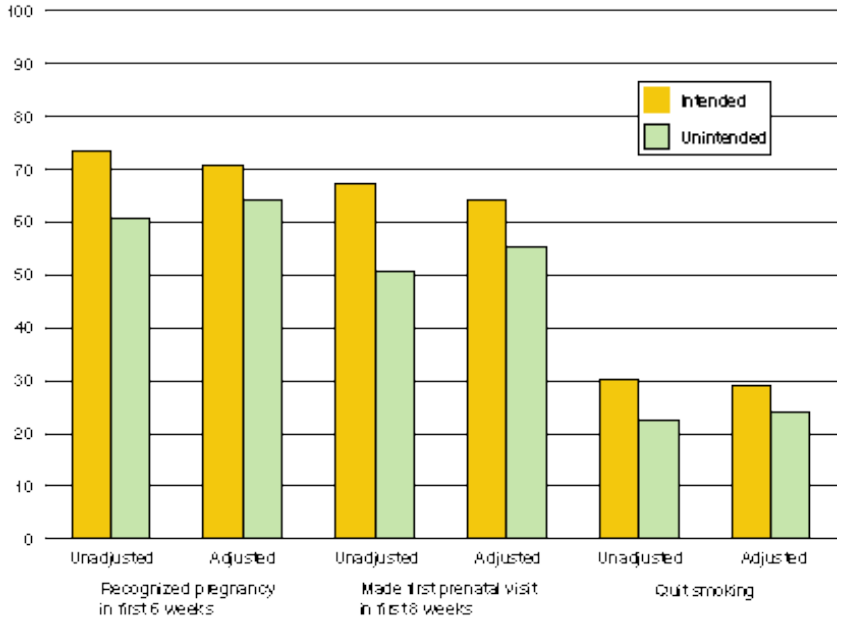
The planning status of the birth had no effect on the odds of adhering to weight-gain advice and virtually no effect on the estimates of the other variables. Only the mother's age and her body mass index (a measure relating her weight to her height) were significantly related to the odds that she was able to adhere to advice on weight gain: Teenage women were significantly less likely to have adhered to weight-gain advice than were women aged 35 or older, and women who had been obese prior to pregnancy were less likely to have adhered to weight-gain advice than were those who had had an appropriate weight for their height.

EFFECTS OF PLANNING STATUS

In our multivariate analyses, planning status had a significant effect on only three of the pregnancy-related behaviors and only in the NMIHS data. Figure 1 shows the proportions of women with intended and unintended (mistimed or unwanted) pregnancies who engaged in these behaviors, before and after adjustment for social and demographic factors.

Figure 1. Percentage of women who engaged in selected pregnancy-related behaviors, by planning status of birth, before and after adjustment for social and demographic characteristics, NMIHS

%



The unadjusted percentages indicate that women with intended pregnancies were more than 12 percentage points more likely than women with unintended pregnancies to have recognized their pregnancy within the first six weeks, more than 16 percentage points more likely to have initiated prenatal care in the first eight weeks and almost eight percentage points more likely to have adhered to medical advice to stop smoking. Once the effects of social and demographic factors were controlled for, however, these differences were reduced by 49%, 46% and 32%, respectively. Thus, planning status alone accounted for a substantial portion of the difference in the unadjusted percentages.

DISCUSSION

These analyses indicate that, as expected, women with an intended pregnancy are more likely than those with a mistimed or unwanted conception to recognize their pregnancy in its earliest stages and to initiate early prenatal care, factors shown to affect the health of infants. Contrary to expectations, once women have begun prenatal care, those with an unintended pregnancy appear to be as likely to meet the recommended schedule of visits, to reduce alcohol consumption, to take vitamins and to gain weight as advised by their prenatal care provider as are similar women with an intended pregnancy. If a woman's attitude toward her pregnancy does influence these behaviors, the effects may be too small to be statistically significant, even in the large samples used in our analyses. We did find some evidence that smokers with mistimed births may be less likely to quit smoking than similar women with intended births.

The National Academy of Sciences has asserted that "...unintendedness itself poses an added, independent burden beyond whatever might be present because of other factors, including the social and economic attributes of the mother in particular."[11] That mothers of unintended births are slower to recognize their pregnancy and to obtain medical attention increases their health risks and those of their baby. This underscores the need for increased support for couples' ability to plan whether and when to have a child, through increased information about and access to contraception and other family planning services, as well as toward providing general health information about pregnancy, early pregnancy testing and easy access to prenatal care. Such information and services provided outside prenatal care settings have a role

to play in increasing the proportions of women who begin prenatal care early in their pregnancy.

Given the expected findings that intention status has independent effects on women's recognition of pregnancy and on the timing of prenatal care initiation, and the significant bivariate relationships between intention status and the other variables measured in this study, it is surprising that only the relationship between mistimed births and smoking cessation remained significant once we controlled for women's social and demographic characteristics.

Certainly, further work is needed on the measurement of intention status. Surveys that collect retrospective reports of intention status do not necessarily reflect the mother's commitment to the pregnancy and child once pregnancy occurs. Furthermore, a woman's feelings about the pregnancy can vary over time—both during the pregnancy and afterwards. We need measures that are more sensitive to such fluctuations and allow us to capture different aspects of attitudes toward pregnancy and childbirth.

Moreover, intention status may have less impact than expected because the study population, by definition, includes women who are relatively positive about their pregnancies. Although some women with unintended pregnancies are unable to obtain abortions in the United States, most who want to do so are able to terminate pregnancies they do not wish to carry to term. In earlier times (and even today in most developing countries), women with unwanted pregnancies had little alternative to childbirth other than clandestine and medically unsafe abortion. Today, in contrast, fewer than half of U.S. women with unplanned conceptions carry their pregnancies to term.[12] Even though women in the United States today who opt to carry unplanned pregnancies to term start with some disadvantage from later recognition of pregnancy and later entry into prenatal care, there appears to be little residual effect of intention status on their behavior once they enter prenatal care.

Like other work, these analyses show effects of women's social and demographic characteristics on the timing of their recognition of pregnancy and initiation of prenatal care, as well as on their behaviors during pregnancy. The social and demographic differences in mothers' behavior are largely unaffected when we control for differences in planning status across these groups. Thus, subgroup differences in behavior are not due solely to differences in women's feelings about their pregnancy. Instead, they probably reflect differences in environmental and cultural factors that affect access to knowledge and services.

Work to elucidate and ameliorate the effects of these factors should continue. These findings do, however, serve as reminders that it is inappropriate, as well as ineffective, to attribute problems of late initiation of prenatal care and lack of adherence to recommended behaviors during pregnancy solely to a woman's attitude toward her baby. Rather, effects of social and demographic characteristics indicate personal and contextual factors that play a role in women's behavior.

The amount of agreement between the findings of the two surveys is encouraging. However, it is not clear how much of the discrepancy in the findings may be due to differences in sample size, design of the survey or unmeasured characteristics of the women. The guidelines we used to select the samples for analysis were aimed at making

the data comparable, but the populations of births represented in the NMIHS and the NSFG may be quite different. In addition, slight variations between the two surveys in the measurement of the outcome variables may partially account for differences in the findings.

The most consistent social and demographic results are for mother's education: Women with more education are generally more likely to recognize pregnancy and begin prenatal care early and to follow recommendations regarding the number of visits and advice on smoking, drinking and taking vitamins. Since most babies are born healthy, the value of such behaviors for women's well-being and their baby's health may not be readily apparent. This argues for increased efforts to inform all women of the value of caring for themselves and their baby before and during pregnancy.

Given the generally negative attitudes toward adolescent childbearing, it is interesting that teenage women are actually more likely than those aged 35 or older to quit smoking during pregnancy and to stop or reduce alcohol consumption. This may reflect greater ease at changing short-term habits, greater pressure from providers concerned about other health risks for young mothers or less easy access to and social support for smoking and drinking by pregnant adolescents. In contrast, teenagers are less likely than older women to start prenatal care early and to adhere to recommendations about taking vitamins and gaining weight.

Findings for Hispanic women illustrate that social and demographic factors may have varying effects on different aspects of pregnancy behavior. Hispanic women do not vary significantly from white women in the timing of pregnancy recognition or first prenatal care visit, but they appear to be much less likely to make the recommended number of visits once care begins. At the same time, Hispanic women are more likely to adhere to advice regarding smoking, drinking and taking vitamins, although the relationships are not always significant. Questions for further investigation include whether our finding that they have a lower likelihood of making prenatal care visits indicates that Hispanic women place less trust in or value on medical providers or that they have problems of access to and acceptance from providers.

Married women are more likely than never-married women to recognize pregnancy within the first six weeks, to get early prenatal care and to make the recommended number of visits. Once in care, however, they are no more likely than never-married mothers to adhere to other recommended behaviors. This finding raises questions about whether differences by marital status reflect personal factors—such as level of sexual activity or the time taken to decide what to do about an unplanned pregnancy—or other factors, such as unmarried women's access to or discomfort with prenatal care providers.

Women who have already had a child tend to be more likely than those who have not to recognize their pregnancy early; however, when there are significant differences in prenatal behavior, parous women are less likely to follow their provider's recommendations. Women who have already had children may feel less need for concern because of their previous experience, or their providers may put less emphasis on education and counseling for them than for first-time mothers.

Higher-income women are more likely to recognize early signs of pregnancy and to

start care early than are women in poverty. However, when the effects of income are accounted for, poor women on public assistance are more likely to start care early than are similar women relying on their own resources. Their Medicaid coverage may give them access to providers that other poor women do not have, or receiving public assistance may ease their access to information and referrals into prenatal care. Once care is begun, however, the remaining study variables showed no difference across poverty or public assistance status groups.

These findings underline the health value of helping women avoid unplanned pregnancies. Reducing the high proportion of unplanned conceptions in the United States would help increase the proportion of infants that benefit from early prenatal care and decrease the proportion that are exposed to maternal smoking during gestation.

Still, unplanned pregnancy is only one of the factors that contributes to unhealthy pregnancy behaviors. Our results indicate a need for attention as well to social and demographic factors that contribute to late recognition of pregnancy, delayed entry into prenatal care and continued smoking during pregnancy.

APPENDIX

Definition of Measures

•*A negative pregnancy experience* is defined in the NMIHS analysis as a spontaneous or induced abortion, a stillbirth, a low-birth-weight infant or an infant death within two months of birth. In the NSFG models, it is defined as a spontaneous abortion, a stillbirth, a low-birth-weight infant or an infant death within two months of birth.

•*Education and poverty status* are defined as the woman's status at the time of interview in the NSFG, while they are measured in the 12 months preceding the infant's birth in the NMIHS. For the NMIHS, the poverty status variable was constructed using data on household composition and total household income, by comparing income levels for a given family size to the average of federally designated poverty levels for 1987 and 1988 (source: U.S. Bureau of the Census, Poverty in the United States, 1987, *Current Population Reports*, 1989, Series P-60, No. 163; and U.S. Bureau of the Census, Poverty in the United States, 1988 and 1989, *Current Population Reports*, 1991, Series P-60, No. 171). The average of federal poverty levels for 1987 and 1988 is used because at least half of pregnancies in the NMIHS would have begun in 1987, although which pregnancies occurred in each year could not be determined because the infant's birth date is omitted from the NMIHS public use data tape. The poverty status variable is the ratio of the respondent's total household income in the 12 months before the birth to the amount of income estimated by the federal government as the threshold of poverty, varying by the total number of related individuals in the household. Averaged over the two-year period 1987-1988, the federal poverty level was $7,551 for a family of two and $11,852 for a family of four. The poverty status variable for the NSFG is provided on the public use data tape and is calculated similarly to the NMIHS poverty status variable.

•*Public assistance* is defined as any income, in any form, from Aid to Families with Dependent Children, food stamps, housing assistance or public housing, social security or veteran's benefits.

•*The timing of pregnancy recognition* in the NMIHS was determined by the respondent's answer to the question, "How many weeks pregnant were you when you first found that you were pregnant?" It was not known whether respondents counted from their last menstrual period or from the date of conception.

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Kathryn Kost and David J. Landry are senior research associates and Jacqueline E. Darroch is senior vice president and vice president for research, The Alan Guttmacher Institute, New York. The authors would like to thank Patricia Boudreau for her research assistance during the project. The authors also thank the 10 members of the advisory panel for the study, who met twice during the course of the project and provided valuable insight and direction. The research contained in this article was conducted as part of the Planning Status of Births and Infant Health study, a project supported by the National Institute for Child Health and Human Development (NICHD) under grant HD29769. The conclusions and opinions expressed in this article do not necessarily represent the views of NICHD. A preliminary version of this article was presented at the annual meeting of the Population Association of America in Washington, DC, March 26-29, 1997.

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*Our confidence in the measurement of planning status is bolstered by a comparison of this measure with a related measure of pregnancy intention—contraceptive use prior to pregnancy. In the NSFG, the respondent was asked whether she had been using a contraceptive method at the time she became pregnant. We crosstabulated this contraceptive use variable with the planning status of the subsequent birth (planned, mistimed or unwanted). In only 6% of births—those that occurred to women who reported as planned a birth resulting from a contraceptive failure—was contraceptive status inconsistent with the planning status of the birth.

†The number of visits is based on the schedule recommended by the American College of Obstetricians and Gynecologists in 1985 and still in effect in 1988, at the time of most of the births. We followed the adjustment

procedure outlined by Kotelchuck M, An evaluation of the Kessner Adequacy of Prenatal Care Index and a proposed Adequacy of Prenatal Care Utilization Index, *American Journal of Public Health*, 1994, 84(9):1414-1420. Kotelchuck's procedure is a modification of the better-known Kessner index.

‡The lower proportion of respondents who recognized their pregnancy in the first six weeks in the NSFG than in the NMIHS may be due in part to the difference in the measurement of the timing of pregnancy recognition in the two surveys. In particular, the NSFG measurement does not allow for pregnancy recognition that occurs before a formal office or clinic test (recognition through a home pregnancy detection kit or a strong suspicion of pregnancy, for example) whereas the NMIHS does. However, there is no obvious explanation for the discrepancy in the proportions making their first prenatal care visit in the first eight weeks of pregnancy.

§There was no direct measure of the timing of pregnancy recognition in the NSFG because respondents were asked how many weeks they had been pregnant when they first visited a clinic or doctor's office for a pregnancy test. For many women, this was also their first prenatal care visit. Indeed, for the NSFG data, the pattern of findings for the odds of having recognized pregnancy in the first six weeks and for the odds of having made a prenatal visit in the first eight weeks of pregnancy were similar. We therefore do not present in this article a separate analysis of the timing of pregnancy recognition for the NSFG data.

**In the NMIHS, women who reported that they did not know they were pregnant until after their first prenatal care visit were excluded unless that visit occurred at least two weeks before they learned they were pregnant, because these women may have suspected the pregnancy but may not have received test results until as much as two weeks later.

*†The surveys differed substantially in the data available for analyses of alcohol use during pregnancy. The NSFG asked more limited questions about alcohol consumption during pregnancy; respondents were asked only if they had drunk alcohol during pregnancy and, if so, how much. A woman who answered that she had not consumed alcohol during pregnancy may have quit when she became pregnant or she may have been a nondrinker. These two types of women are indistinguishable in the NSFG data, and the inclusion of nondrinkers in the analyses would have greatly biased the interpretation of the results. Therefore, for the analyses of alcohol use during pregnancy, we examined only the NMIHS data.

*‡Ninety-seven percent of women who received prenatal care reported that they were advised to take vitamins.

*§Seventy percent of women who received prenatal care received weight-gain advice.