Assessment of Pregnancy Cigarette Smoking and Factors That Predict Denial
Beth A. Bailey, PhD; Heather N. Wright, BS

Objectives: To determine rates of pregnancy smoking concealment compared to behavioral observation and to identify factors predicting untruthful denial. Methods: Review of 843 delivery charts. Results: Based on observation during delivery hospitalization, 8% of smokers denied at hospital admission, 16% denied throughout prenatal care. Compared with those admitting smoking, false deniers had higher levels of education, incomes and adequate prenatal care utilization; and were less likely to have drug use, STDs, or hepatitis C. Observation was a valid tool for assessing smoking status. Conclusions: Typical concealers were those considered lower risk, increasing the chance they would go undetected as smokers.

Key words: pregnancy smoking, smoking denial, smoking assessment, behavioral observation, rural health

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Exposure to tobacco in utero has long been associated with many deleterious pregnancy and birth outcomes and is a significant factor in later physical and psychological development.\(^1\) In fact, smoking is recognized as the most modifiable risk factor for poor birth outcomes.\(^3\) Nationally, approximately 12% of pregnant women smoke. Rates in many states and regions approach, and in some cases exceed, 20%.\(^4\) Despite the growing body of knowledge surrounding the risks of pregnancy smoking, definite populations have been identified as still at risk for prenatal tobacco exposure; and these populations include those with low-income, fewer years of education, and residence in a rural area.\(^1,5-7\) Indeed, in rural northeast Tennessee, delivery hospitals see more than one in 3 births affected by smoking, triple that of the national average.\(^8\) Clearly, this is a critical problem that deserves continued focus and public health efforts.

Identifying women who smoke during pregnancy is essential when targeting populations for cessation efforts. The most common method of determining smoking status during pregnancy is self-report, either by oral or written questioning. Self-report data has the advantage of being inexpensive and easy to collect, with responses immediately available.\(^9\) Several population-based studies of adults have led to conclusions that self-reported smoking status is accurate.\(^10,11\) A handful of studies involving pregnant women specifically have drawn the same conclusion.\(^12,14\) Others have suggested, however, that self-report of smoking status during pregnancy is unreliable and results in significant misclassification and underestimation of prevalence rates.\(^15\) An examination of the numerous studies that have investigated the association between self-report of pregnancy smoking

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status and biochemical verification has revealed false denial, or deception rates as low as 1% and as high as 35%. A recent literature review of this literature concluded that measuring smoking status during pregnancy by self-report alone significantly underestimates smoking rates and misclassifies a significant proportion of women.

Several factors likely contribute to inaccuracies in self-report of smoking status during pregnancy, including faulty recall and intentional deception. As greater attention is given to the health effects of smoking, both in general and during pregnancy, and as efforts to regulate and reduce smoking increase, smoking becomes stigmatized and individuals are sensitized to socially desirable forms of behavior. As this occurs, it is likely that concealment of smoking during pregnancy in particular may increase. Studies that have found the highest rates of smoking denial among pregnant women who were offered or were participating in cessation interventions would appear to support these conclusions. Many studies have shown that more appropriate wording, timing, and setting of inquiries of smoking status (ie, prospective use of a structured multiple-choice format in a private, confidential and/or anonymous setting) may reduce false denial among pregnant women. Yet even these methods do not completely eliminate inaccurate reporting of smoking status. As noted by Jackson (p. 831), “self-report of smoking is a subject’s own account of an addictive behavior; we do not expect high reliability from addicts.”

Identifying those who are likely to conceal smoking when asked has become a focus of research in recent years. Characteristics of both the environment in which they live and the smokers themselves are likely associated with such deception. For example, the intensity of the antismoking environment may impact rates of false denial. In areas of central and southern Appalachia antismoking sentiment is not very strong, potentially decreasing the likelihood of smoking denial. A 1999 survey revealed that less than half of Tennesseans supported smoke-free restaurants. This placed the state with the fourth lowest percentage supporting smoke-free restaurants, behind only Kentucky, North Carolina, and West Virginia. This same report included the calculation of an index that reflected the social unacceptability of smoking. Tennessee ranked fifth lowest in unacceptability, again behind Kentucky and West Virginia, and tied with North Carolina. It was also noted that from 1996 to 1999 there was little change in social unacceptability of smoking in these states, compared with many other states where levels of unacceptability increased dramatically over this period. Research is needed, however, to examine whether, as might be expected, rates of false smoking denial are lower in regions like central and southern Appalachia where social unacceptability is minimal.

In studies involving nonpregnant participants, age has emerged as a consistent personal factor associated with untruthful smoking denial, with younger smokers more likely to deny that they are smokers. This is not surprising as for the youngest respondents, smoking is illegal, and even for older teens and younger adults, there is a strong tendency to deny negative health behaviors to authority figures. In addition, many young tobacco users have not yet defined themselves as smokers and would be unlikely to report behavior inconsistent with a self-definition. Other general population studies have linked both education levels and race/ethnicity to smoking concealment. For example, an Italian study found that individuals with some education beyond high school are more likely to deny smoking than are those with less education. In a US study, both Mexican American and African American women were more likely to falsely deny smoking than were their White counterparts.

Unfortunately, very little is known about personal characteristics associated with inaccurate smoking denial during pregnancy, and many in the field have called for research in this area. Only a handful of published studies can be found, and among these, results are conflicting. In an Estonian study, deniers, compared with those who admitted to pregnancy smoking, were more likely to be ethnic minorities, to have less education, to be unmarried, and to have multiple children. A US study found that untruthful pregnancy smoking deniers smoke less, have smoked for fewer years, are older, and have lower BMIs.
than do those who admitted smoking. Finally, a report of a Swedish study, although suggesting that false denial is associated with increased awareness of the risk of pregnancy smoking, revealed no significant differences in demographic characteristics between those who admitted and those who falsely denied pregnancy smoking. Additional research is certainly needed to identify women most at risk for pregnancy smoking concealment.

Given the questionable reliability of self-report, determination of pregnancy smoking status in both clinical and research settings has increasingly relied on biochemical assessment. Cotinine, a major metabolite of nicotine, is a commonly used biomarker of exposure to tobacco smoke, and cotinine levels in saliva, blood, and urine are often considered the best measure of nicotine consumption. Compared with self-report, cotinine levels have been shown to be more accurate indicators of smoking and to be better predictors of pregnancy outcomes. Biochemical assessment of smoking behavior is not without limitations, however, and should not be regarded as the gold standard. In addition to the factors of cost and inconvenience, the establishment of appropriately sensitive and specific cutoff points is far from universal. Varying cotinine cutoff levels have been proposed to distinguish smokers from nonsmokers and from those exposed to environmental tobacco smoke (ETS). Given varying cut-point recommendations, the use of biochemical assessment may not ever be completely accurate in distinguishing those who smoke, especially intermittently, from those who are only exposed to ETS.

Further complicating biochemical verification of smoking status with pregnant women, established cut-points have been determined with nonpregnant populations and may not be valid for pregnant women. For example, similar rates of smoking during and after pregnancy resulted in significantly lower prenatal salivary cotinine values compared with postnatal values, suggesting altered metabolism and distribution of cotinine during pregnancy. A subsequent study determined that the clearance of cotinine was significantly higher and the half life of cotinine significantly shorter during pregnancy, leading these authors to conclude that current cutoff levels used to classify nonsmokers, active smokers, and those with ETS exposure do not apply during pregnancy. Most recently, a Danish study concluded that a salivary cotinine cutoff of 13 ng/mL maximized sensitivity and specificity in distinguishing pregnant smokers from nonsmokers, a high percentage of whom were exposed to significant levels of ETS. However, studies such as these assume that the self-report of smoking status used to establish the cut-points is completely accurate, which as described above is rarely the case. The degree to which the population is exposed to secondhand smoke could also impact cut-points, and a cutoff of 13 ng/mL may apply only in populations with high levels of ETS. Further research is needed in order to definitively establish cotinine cut-points for different types of smoking exposure in pregnant women.

Behavioral observation is a method of identifying health behaviors that has been used as an alternative to both self-report and biochemical analysis. The use of direct observation to assess health behaviors can circumvent many of the problems inherent in the use of self-report including memory decay, social desirability responding, and interview bias or reactivity. In contrast to biochemical assessment, this method has the further advantage of being noninvasive. Direct observation has been used to collect data on many different health behaviors including sun protection practices, food handling behaviors, and medication adherence. Many of these studies have revealed significant discrepancies between self-report and observational data, with respondents significantly more likely to report positive health behaviors than are confirmed through behavioral observation.

In general, direct observation of a health behavior such as smoking is impractical for most research purposes. It would be highly time and resource intensive to unobtrusively and continuously observe study participants over a long enough time period for such observation to be valid (to say nothing of ethical considerations). The only way that such assessment could be successful would be if participants were confined to an easily observable location for an extended period of time. Only one such assessment of smoking behavior has been published, and it
involved observation of smoking by adolescents in a high school setting. This study found that those observed had nearly double the rate of smoking alone compared with data from self-report about solitary smoking. Unfortunately, this study did not examine smoking denial specifically in relation to direct observation. However, this investigation, and those involving assessment of other health behaviors, demonstrate the potential utility of using direct observation to reliably measure a health behavior such as smoking given optimal conditions, including the opportunity to continuously observe this behavior over an extended period of time.

The current study sought to evaluate pregnancy smoking and smoking concealment in a delivery cohort in rural southern Appalachia. As clear cut-points to separate smokers from nonsmokers and those who are exposed to secondhand smoke have not been well established for pregnant women, biological confirmation was deemed a less than ideal referent method of determining smoking status in this population with known high rates of secondary smoke exposure. Behavioral observation of smoking status, which overcomes this key limitation of biological assessment, and which was uniquely available in this sample, was consequently used to determine smoking status in the current study. We believe this is the first published report on a behavioral observation methodology to assess pregnancy smoking status. In addition, this is also one of the first known projects to examine factors associated with false pregnancy smoking denial in this rural southern Appalachian population with known high rates of pregnancy smoking. Two primary research questions were addressed. First, what is the degree of pregnancy smoking concealment in a southern Appalachian sample when compared with a gold standard of behavioral observation? Second, what individual factors predict false denial of pregnancy smoking in this population, where social unacceptability is expected to be low?

**METHODS**

**Participants**

Eligible study participants were all women who gave birth in a southern Appalachian county between January 1, 2006, and December 31, 2007. During the study period, 933 births were recorded in the target county. Incomplete medical charts or inaccuracies in the recording of medical record numbers (which precluded collection and match up of all data of interest in the study) reduced the sample size to 872. Self-report of smoking status at delivery was not obtained for 4 of these women due to admission in the final minutes of labor. Another 25 women were missing prenatal self-report of smoking data (9 received no prenatal care, whereas 16 prenatal records were not sent to the hospital prior to delivery). This resulted in a final sample of 843 women, representing over 90% of all deliveries in the county during the study period.

**Measures and Methods**

The study and all procedures were approved by the affiliated university institutional review board and the hospital system research department. Data of interest were obtained through detailed chart review. Maternal delivery charts, complete prenatal charts, and corresponding newborn hospital charts were reviewed.

Women were asked at each prenatal visit whether or not they smoked, and responses were recorded in the prenatal visit notes. Any woman with a positive response at any point during pregnancy was considered to have self-reported prenatally as a smoker. Upon admission to the hospital immediately prior to delivery, women were again asked about smoking status, and this information was recorded on standard admission forms. Finally, women who wished to smoke while hospitalized were required to sign out of the hospital before leaving the building to smoke (no smoking was allowed anywhere on the property except in private vehicles in the parking lot). Nursing staff on the units charted this activity for each patient on each shift. Additionally, women would occasionally leave or attempt to leave the unit to smoke without signing out (which was not an easy task given the layout of the unit, the visual proximity to the parking lot, and the security measures in place on the unit). In this case women were questioned upon leaving or returning, and if smoking was involved this was charted. A woman was considered positive for behavioral observation of smoking if one or more such instances of signing out to smoke or being caught going to smoke/returning from smoking.
were charted during her hospital stay. Using behavioral observation as the gold standard, variables representing accuracy of self-report of smoking both prenatally and at delivery were constructed.

Additional data were collected from the medical charts to describe the sample and identify factors associated with denial of pregnancy smoking. These included both sociodemographics and medical/lifestyle factors. Sociodemographics included maternal age, marital status, education level, participation in a government insurance program (proxy for family income), number of other children, and rurality of residence. Medical and lifestyle factors included number of previous pregnancies, previous miscarriage, adequacy of prenatal care, illicit drug use (urine drug screen for various drugs done both prenatally and at delivery), and the presence of medical risk factors including sexually transmitted disease, hepatitis C, diabetes (including gestational), and previous mental health diagnosis or treatment.

**Data Analysis**

Descriptive analyses were used to detail the accuracy of self-report of smoking, both prenatally and at delivery. Power analysis revealed adequate power (\( \sim .8 \)) to detect small to moderate effect size group differences in all variables of interest. Chi-square analyses identified sociodemographic and medical/lifestyle factors predictive of smoking denial. Relative risk was also computed. For the analyses identifying predictors, only the sample of those patients identified as smokers through behavioral observation was included, as the inclusion of nonsmokers might confound differences related to smoking behavior with denial of smoking.

**RESULTS**

Sample characteristics are presented in Table 1. The vast majority of participating women (over 95%) were white, and 3
quarters had completed at least a high school education. Half were married, with 3 quarters of women either having no medical insurance or qualifying for a government insurance program. The majority resided in semirural or rural areas. A review of medical and lifestyle characteristics revealed that many participants had pregnancy risk factors including inadequate prenatal care utilization and varying rates of several health conditions. Additionally, nearly one in 5 women had a positive urine test for an illicit substance either during pregnancy or at delivery. Finally, more than 4 in 5 women remained at the delivery hospital for 3 or more days.

Based on behavioral observations by hospital nursing staff, 42% (N=355) of participants were smokers. During pregnancy, 38% of women admitted to their prenatal care provider that they smoked. A slightly higher number, 39%, admitted to smoking at delivery. Of the women who self-reported as smokers prenatally, 28% (8.6%) were not observed to smoke during their hospitalization and were considered to have quit smoking at some point during pregnancy. Of those who self-reported as smokers at delivery, all were behaviorally observed as smokers while hospitalized. However, 29 women self-reported as nonsmokers at delivery, but were later observed smoking, for a denial rate of 8.2% in the sample of smokers. Additionally, 58 women who self-reported during prenatal care as being nonsmokers throughout pregnancy were observed smoking during their hospital stay for a denial rate among smokers of 16.2%.

To look at factors predictive of smoking denial, additional analyses included only smokers (N=355). Women who accurately self-reported their status as smokers were compared with smokers who denied smoking to their prenatal care provider (Table 2) and to hospital nursing staff at delivery (Table 3). As can be seen in Table 2, women who denied smoking during pregnancy differed significantly in many ways from those who admitted smoking. On average, compared with women who ad-

### Table 2

Factors Associated With Denial of Smoking Prenatally

<table>
<thead>
<tr>
<th></th>
<th>Admit Smoking (N=297)</th>
<th>Deny Smoking (N=58)</th>
<th>RR* (95% CI)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sociodemographics</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maternal age (% teen)</td>
<td>16.8%</td>
<td>36.2%</td>
<td>2.15 (1.14,3.29)</td>
<td>.002</td>
</tr>
<tr>
<td>Education (% more than high school)</td>
<td>6.9%</td>
<td>24.6%</td>
<td>3.54 (1.90,6.58)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Marital status (% married)</td>
<td>38.5%</td>
<td>39.7%</td>
<td>1.03 (0.73,1.46)</td>
<td>.491</td>
</tr>
<tr>
<td>Insurance (% private)</td>
<td>10.4%</td>
<td>19.0%</td>
<td>1.82 (1.10,3.40)</td>
<td>.033</td>
</tr>
<tr>
<td>Number of other children (% none)</td>
<td>32.3%</td>
<td>44.8%</td>
<td>1.39 (1.09,1.93)</td>
<td>.034</td>
</tr>
<tr>
<td><strong>Medical/Lifestyle</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Previous pregnancies (% none)</td>
<td>23.6%</td>
<td>41.4%</td>
<td>1.76 (1.22,2.54)</td>
<td>.009</td>
</tr>
<tr>
<td>Previous miscarriage</td>
<td>27.9%</td>
<td>19.0%</td>
<td>0.68 (0.39,1.09)</td>
<td>.075</td>
</tr>
<tr>
<td>Prenatal care utilization (% adequate)^b</td>
<td>41.6%</td>
<td>49.1%</td>
<td>1.18 (0.88,1.59)</td>
<td>.149</td>
</tr>
<tr>
<td>Illicit drug use (% + urine drug screen)</td>
<td>34.7%</td>
<td>20.7%</td>
<td>0.59 (0.35,0.91)</td>
<td>.024</td>
</tr>
<tr>
<td>Pregnancy-induced hypertension</td>
<td>5.4%</td>
<td>5.2%</td>
<td>0.96 (0.29,3.19)</td>
<td>.623</td>
</tr>
<tr>
<td>Diabetes (including gestational)</td>
<td>2.4%</td>
<td>1.7%</td>
<td>0.73 (0.09,5.83)</td>
<td>.614</td>
</tr>
<tr>
<td>History of sexually transmitted disease</td>
<td>8.1%</td>
<td>0.0%</td>
<td>—c</td>
<td>.012</td>
</tr>
<tr>
<td>Diagnosis of hepatitis C</td>
<td>5.7%</td>
<td>0.0%</td>
<td>—c</td>
<td>.045</td>
</tr>
<tr>
<td>History of mental health treatment/diagnosis</td>
<td>8.8%</td>
<td>5.2%</td>
<td>0.57 (0.19,1.89)</td>
<td>.181</td>
</tr>
</tbody>
</table>

**Note.**
- N =355 smokers
- a Relative risk for those who deny smoking prenatally
- b Based on Kessner Index^47
- c Unable to calculate as “Deny Smoking” group had no cases with this factor

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mitted smoking during pregnancy, those who denied to their prenatal care provider were more than 3 times as likely to have education beyond high school. They were also nearly twice as likely to have private insurance and to be experiencing their first pregnancy. They were 50% less likely to have used illicit drugs and were significantly less likely to have a history of sexually transmitted disease or hepatitis C. Additionally, teens were more than twice as likely to have had adequate prenatal care utilization.

**DISCUSSION**

In this southern Appalachian sample, more than 2 in 5 pregnant women were found to be smokers at the time of delivery. Pregnancy cessation rates were low, with fewer than 9% of women who admitted to smoking early in pregnancy quitting by delivery. In addition, of the women identified as smokers while hospitalized, 8% denied this behavior at delivery admission, whereas 16% had denied this behavior to their prenatal care provider. This study also revealed several individual factors that predict untruthful pregnancy smoking denial, including higher levels of education; higher income; nulliparity; lower rates of illicit drug use, STDs and hepatitis C; and better prenatal care utilization. Teenagers were also found to have higher rates of false pregnancy smoking denial than those of their older counterparts.

Many aspects of these results are consistent with the findings of previous studies. For example, a pregnancy smoking cessation rate of 8.6% among women not participating in an organized intervention is in line with data from other studies. In addition, a 16% rate of false smoking denial during pregnancy is consistent with the 1% to 35% rates de-

<p>| Table 3 |</p>
<table>
<thead>
<tr>
<th>Factors Associated With Denial of Smoking at Delivery</th>
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<tbody>
<tr>
<td><strong>Admit Smoking</strong> (N=326)</td>
</tr>
<tr>
<td><strong>Sociodemographics</strong></td>
</tr>
<tr>
<td>Maternal age (% teen)</td>
</tr>
<tr>
<td>Education (% more than high school)</td>
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<td>Marital status (% married)</td>
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<td>Insurance (% private)</td>
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</tr>
<tr>
<td><strong>Medical/Lifestyle</strong></td>
</tr>
<tr>
<td>Previous pregnancies (% none)</td>
</tr>
<tr>
<td>Previous miscarriage</td>
</tr>
<tr>
<td>Prenatal care utilization (% adequate)</td>
</tr>
<tr>
<td>Illicit drug use (% + urine drug screen)</td>
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Note. N =355 smokers

a Relative risk for those who deny smoking at delivery
b Based on Kessner Index

c Unable to calculate as “Deny Smoking” group had no cases with this factor

mitted smoking during pregnancy, those who denied to their prenatal care provider were more than 3 times as likely to have education beyond high school. They were also nearly twice as likely to have private insurance and to be experiencing their first pregnancy. They were 50% less likely to have used illicit drugs and were significantly less likely to have a history of sexually transmitted disease or hepatitis C. Additionally, teens were more than twice as likely to deny smoking during prenatal care than were their older counterparts. Similar trends were noted for denial of smoking at delivery (Table 3). Additionally, compared with those who admitted smoking, those who denied smoking at delivery were nearly twice as likely to have had adequate prenatal care utilization.

**DISCUSSION**

In this southern Appalachian sample, more than 2 in 5 pregnant women were found to be smokers at the time of delivery. Pregnancy cessation rates were low,
scribed earlier. This finding is intriguing, though, given the expected low levels of social unacceptability of smoking in the region in which these women live. It would suggest that despite the potential attitude within the community, the possible stronger antismoking sentiment expressed by an obstetric provider may be a more important factor in smoking disclosure during prenatal care. It may also suggest either that acceptability of smoking in the region has decreased since 1999 or that acceptability of pregnancy smoking might be very different from acceptability of smoking in general. Clearly, additional research is needed to address these issues. However, it appears that women in southern Appalachia may be just as unlikely to quit smoking during pregnancy, or to falsely deny pregnancy smoking, as are women elsewhere.

One finding of the current study that is certainly unlike many others elsewhere and merits notice is the exceptionally high rate of smoking in this population. With the national rate of pregnancy smoking currently at 11%, and the Tennessee average at 17%, this region clearly stands out with double to more than triple these rates. We have reported rates this high in this region before, using small convenience samples of higher risk women; however, this is the first report to show that even when all births over an extended period are sampled, pregnancy smoking rates are still exceptionally high in northeast Tennessee. Whether these rates are due to cultural characteristics or to minimal efforts to address the problem of pregnancy smoking remains to be seen, as public awareness and funding for research and interventions begin to increase in the region.

Some of the predictors of inaccurate pregnancy smoking denial identified in the current study are those that have emerged in other investigations and extend what we know in this area to pregnant women specifically. The finding that the youngest women were most likely to conceal smoking is certainly consistent with what has been revealed in studies of nonpregnant women. Our finding that women with higher levels of education are more likely to falsely deny pregnancy smoking than those with lower levels is consistent with some studies but not others. In the latter study, though, the population was Estonian and likely differed from the current sample in many important ways. The identification of higher income, nulliparity, lower rates of illicit drug use, lower rates of STDs and hepatitis C, and better prenatal care utilization as predictors of inaccurate pregnancy smoking denial are new to the current study. With women with more education and better prenatal care utilization more likely to conceal pregnancy smoking, it appears that increased knowledge about the potential dangers of pregnancy smoking may be a factor in a greater likelihood of unwillingness to disclose this behavior to health care providers. Unfortunately, the current study did not involve asking women what they knew about the effects of pregnancy smoking, so additional research would be needed to support such a conclusion.

Further research is also needed to confirm the current findings related to predictors of untruthful pregnancy smoking denial, as they may have important clinical implications. With the exception of younger age, the individual characteristics identified as predictors of false denial of pregnancy smoking are those generally associated with lower risk of pregnancy problems or complications. A woman with comparatively higher income, experiencing her first pregnancy, not using drugs, not having a history of STDs or hepatitis C, and keeping recommended prenatal appointments, would typically be regarded by her provider as low risk. Thus, she would likely not be suspected of being a smoker or of not disclosing important health information, leading a provider to feel less compelled to suspect smoking or to probe for this information. Consequently, those women most likely to conceal pregnancy smoking may be those least likely to be given repeated opportunities to reveal this information or to have biologic confirmation of their smoking status, and providers will be missing opportunities to provide smoking cessation assistance and referrals. Clearly, prenatal care providers need to be made aware that those pregnancy smokers who are unwilling to disclose their smoking may be those least likely to be suspected of this behavior and that attempts need to be made to find out about smoking and address this negative health behavior with all prenatal patients.

The current findings are also impor-
tant as they suggest that the use of behavioral observation to assess pregnancy smoking might be a worthwhile tool. All women in the current study who admitted to smoking were subsequently observed smoking, and a fair percentage of women who denied smoking were later observed to be smokers. This would indicate that not only does this method appear to pick up on most smokers, but it also reveals additional women who are misidentified using self-report methodology. Because biochemical verification was not used in this study, we do not know if all smokers were identified or how behavioral observation might correspond to biochemical assessment. However, the current study is an important first step in developing a behavioral observation procedure to identify pregnancy smokers. With hospital complexes across the United States going smoke free, it would certainly seem possible to put a procedure in place to document trips off of a delivery unit to smoke, such as was done in the current setting. This would go a long way toward producing more accurate prevalence rates of pregnancy smoking than are currently reported based on self-report data. However, behavioral observation as used here is limited as a tool to help with pregnancy education and interventions, as complete identification of smoking status would not occur until delivery. It remains to be seen whether something similar could be instituted in other settings with women during pregnancy. Getting accurate prevalence rates with this methodology, though, is a good first step, as is using these findings to identify women most likely to deny pregnancy smoking.

Although the current study has the potential to add to what we know about pregnancy smoking assessment and pregnancy smoking denial, it is not without limitations. The absence of biochemical assessment of smoking status, despite the drawbacks of this procedure, weakened our ability to draw conclusions about the validity of the use of behavioral observation to identify pregnant smokers. Future research using behavioral observation should include some type of biochemical assessment of smoking status. Additionally, although many potential predictors of pregnancy smoking concealment were tested, many others that might be available in the context of prenatal care were not consistently available in the current study. It remains to be seen whether other specific medical conditions or psychosocial factors are associated with pregnancy smoking denial and could be used to help identify deniers. Finally, the current sample was limited to women in rural southern Appalachia, and it is unknown whether the current findings extend beyond this population. Although this study was beneficial in that it revealed important information about pregnancy smoking and denial in a traditionally understudied population with high rates of pregnancy smoking, findings related to the utility of behavioral observation to identify pregnancy smokers and the identification of factors predicting denial clearly need to be validated in other populations.

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Pregnancy Cigarette Smoking


