Cervical Cancer Risk as a Predictor of Pap Smear Use in Rural North Carolina

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ABSTRACT: *Risk for invasive cervical cancer is reported to be higher in rural areas than urban ones, and cervical cancer-related mortality is higher in rural women due to poorer utilization of preventive services and subsequent presentation at late stages of the disease. This cross-sectional study examined the relationship between prevalence of risk factors for cervical cancer and the degree of compliance with risk-appropriate screening guidelines for cervical cancer. Secondary data were analyzed for 614 women from Robeson County, NC, aged 40 and older, and of mainly rural and low socioeconomic status. High-risk status was determined by the presence of any of the following five risk factors: a history of more than two sexual partners, age at first sexual intercourse under 18 years, history of sexually transmitted disease, history of sexually transmitted disease in sexual partner(s), and smoking. Low-risk status was the absence of all factors. A high-risk participant was considered compliant if she had had at least three Pap smears in the 3 years prior to the interview, while a low-risk participant was considered compliant if she had had at least one Pap smear within the previous 3 years. Overall, 82% of the participants were at high risk for cervical cancer. However, only 41% of all participants were compliant with the risk-appropriate screening guidelines. Low-risk status was significantly associated with compliance with cervical cancer screening guidelines (adjusted OR = 6.7; 95% CI = 3.7 to 11.1, p = .0001). Findings in this study population suggest rural women at high risk for cervical cancer are less likely to be compliant with appropriate Pap smear screening guidelines, indicating the need to target educational programs.*

The incidence of cervical cancer and the associated mortality rate have declined considerably in the United States in recent decades (Coleman et al., 1993). The widespread use of the Pap smear has been an important factor in this decline (Taylor et al., 1989). An estimated 12,900 women were expected to be diagnosed with cervical cancer and 4,400 deaths were expected in the United States in 2001 (Greenlee, Hill-Harmon, Murray, & Thun, 2001).

However, certain subgroups of the population bear much of the burden of the disease's morbidity and mortality. Friedell et al. (1992) reported a disproportionate rate of invasive cervical cancer among rural Appalachian women (14.9 per 100,000) in comparison with women in the Surveillance, Epidemiology, and

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End Results Program (7.8 per 100,000). Earlier reports indicated that the incidence of nonlocalized cervical cancer was slightly lower in rural women compared with urban women and a significant proportion of the tumors were unstaged for both white (13% rural vs. 10% urban) and African American women (23% vs. 16%) (Liff, Chow, & Green, 1991). A more recent report (Schootman & Fuortes, 1999) indicates the reverse. The incidence rate of in situ carcinoma of the cervix was lower among rural women than urban women, while the incidence of invasive cervical cancer was higher among rural women than urban women. This suggests a limitation in utilization of preventive and follow-up services for cervical cancer in rural areas (Liff et al., 1991; Mandelblatt et al., 1983; Schootman & Fuortes, 1999). Part of the reason for this is that rural populations generally have lower incomes, less education, and a larger proportion of elderly individuals than urban populations (Liff et al., 1991; Miller, Yunger, & Clifford, 1987; Summer, 1991). In addition, rural populations have poorer access to health care services and fewer cancer prevention activities, and they are also less likely to take advantage of health resources (Liff et al., 1991). For example, Smith, Desch, Simonson, and Kane (1991) observed that, in Virginia, while cancer services were clustered in metropolitan areas, cancer cases were distributed throughout the state and the mortality trends over time were worse in the rural areas. With regard to mortality, high mortality rates of 6.8 per 100,000 women years have been reported in Appalachia and the Midwestern United States, reflecting a tendency for a higher risk of death from cervical cancer among rural women in low socioeconomic classes (Schiffman, Brinton, Devesa, & Fraumeni, 1996). In 1994, 150 deaths were due to cervical cancer in North Carolina. Women over 40 years of age accounted for 86% of the deaths, and mortality rates were highest in the eastern part of North Carolina (where this study was conducted) and lowest in the south central and western areas. The observed regional variation was purportedly due to differences in availability and timeliness of screening and care, particularly for women in the higher risk categories (Harris & Herman, 1995). The implication is that high-risk women in these rural areas were neglected by preventive efforts.

The major risk factors for cervical cancer include an increased number of sexual partners, young age at first sexual intercourse, history of sexually transmitted diseases (STD), especially human papilloma virus (HPV), sexual partners' history of STD, and former and current smoking status. Weaker and inconsistent risk factors include an increased number of live births, the use of exogenous estrogens, low socioeconomic status, and dietary deficiencies (Bornstein, Rahat, & Abramovici, 1995; Daling et al., 1996; Harris et al., 1980; Stone et al., 1995). There are no clear indications of higher prevalence of sexually related risk factors for cervical cancer among rural women compared with urban women in the United States; in fact, the opposite has been indicated (Sung, Blumenthal, Alema-Mensah, & McGrady, 1997). However, a higher prevalence of risk factors associated with poor utilization, such as never having had a Pap smear, high prevalence of abnormal Pap smear, and low frequency of Pap smear use, has been reported among rural women (Miller, Yunger, Single, & Kunz, 1996; Oleszkowicz, Kresch, & Painter, 1994).

Despite the reported substantial increases in the use of cervical cancer screening in the United States, women of low socioeconomic status, rural dwellers, elderly women, and single women remain much less likely to undergo the recommended screening tests (Harlan, Bernstein, & Kessler, 1991; Liff et al., 1991; Nathoo, 1988; Woolhandler & Himmelstein, 1988). The national objectives for recent cervical cancer screening for women 18 years and older in special populations for the year 2010 are that 78% of low-income women, 93% of rural women, 83% of African American women, 72% of American Indian or Alaskan Natives, 74% of Hispanic women, and 69% of women with less than a high school education will have had a Pap smear in the preceding 3 years (Healthy People 2010, 2001).

The primary hypothesis tested in this study was that women who were at higher risk for cervical cancer would be less likely to comply with guidelines for cervical cancer screening. The participants were women aged 40 and older in Robeson County, NC, a rural county with an urban influence code of 5 (nonmetro/adjacent to small metro with a city of 10,000 or more) (Economic Research Service, 2001). The county, with a population of whites, African Americans, and Native Americans, has consistently ranked among the poorest in North Carolina. Educational attainment is low, with less than half of the adults being high school graduates, and a lack of public transportation further limits access to health care. Morbidity and mortality rates for several diseases, including cancer, are higher than the state average in this county (Department of Health and Human Services, 1996).

Extensive research has been done to identify the risk factors for cervical cancer, the predictors of participation in cervical cancer screening programs, and effective measures that can improve screening utiliza-

tion. However, previous studies have not examined whether the risk status of individual women determines compliance with cervical cancer screening guidelines. The present study is unique in that it examined personal risk status as a predictor of compliance with risk-appropriate Pap smear-screening guidelines.

Methods

Study Sample. This was an ancillary study of the larger Robeson County Outreach, Screening, and Education (ROSE) Project, a National Cancer Institute (NCI)-funded study currently under way in Robeson County. This study utilized the baseline cross-sectional survey data of the ROSE project for secondary data analysis.

Women were randomly sampled from three clinics in the county (the Pembroke, Maxton, and Lumberton communities). Eligibility was restricted to women aged 40 and older who had not undergone hysterectomy and were patients of the Robeson Health Care Corporation (RHCC) during 1995–1997. Upon enrollment, each woman signed an informed consent form and completed the baseline survey. The response rate was 78%, with the ultimate sample for the study consisting of 614 women (159 white, 218 African American, and 237 Native American).

Variables and Measurement. Data were collected during structured face-to-face interviews conducted in respondents' homes. The survey included questions on demographics such as marital status, educational attainment, race/ethnicity, age, employment status, and annual household income. Also collected were data on sexual partner characteristics, sexual behavior, and smoking habits. Other information collected was the frequency of Pap smears during the 3 years preceding the date of the interview, a history of physician recommendation of Pap smear, and the date of the most recent Pap smear.

Definition of Risk. Risk categories were defined on the basis of the prevalence of five epidemiologic risk factors for cervical cancer: increased lifetime number of sexual partners (three or more), early age of onset of sexual intercourse (less than 18 years), history of STD, partners' history of STD, and past or present smoking history (at least 100 cigarettes ever smoked). The defining criteria for each dichotomous variable were drawn from subcategories frequently used in other publications. For example, previous studies have shown that having three or more sexual partners significantly increases risk of cervical cancer (Bornstein et al., 1995; Daling et al, 1996). In addition, the cervix is particularly vulnerable to carcinogenic insults during menarche (usually during early adolescence) when there is rapid cell growth at the transition zone (Hatch and Hacker, 1999). Women were considered at high risk for cervical cancer if they had one or more of the risk factors (American College of Obstetricians and Gynecologists [ACOG], 1995). The low-risk group included women who did not have any of the risk factors. Using these criteria, 82% (n = 506) of the 614 participants were classified as high risk and 18% (n = 108) were classified as low risk.

Definition of Compliance. Compliance was defined as adherence to the guidelines for cervical cancer screening according to the participant's risk category. A high-risk participant in this study was considered compliant if she had had at least three Pap smears in 3 years prior to the interview date. Those at low risk were considered compliant if they had at least one Pap smear within the same period. These definitions of compliance with risk-appropriate screening guidelines were drawn from the consensus recommendation of the National Institute of Health, with additional guidelines provided by ACOG and the current knowledge of risk factors for cervical cancer (ACOG, 1995; Daling et al., 1996; NIH, 1980; NIH, 1996). In the consensus recommendation, all women who are or have been sexually active or who have reached age 18 should have annual Pap smears. After three or more consecutive normal smears, subsequent screening should be done at the discretion of their physicians in consultation with the patient. ACOG's guidelines determine Pap smear screening frequency on the basis of personal risk factors. ACOG recommends that patients with one or more risk factors for cervical cancer (e.g., HIV or HPV infection, a history of low-grade squamous intraepithelial lesion, and high-risk behavior, including the five epidemiologic risk factors used in this study) be screened annually (ACOG, 1995; NIH, 1996).

Statistical Analysis. Demographic predictors of compliance that were examined included marital status, educational attainment, annual household income, and employment status. Marital status was dichotomized into currently married and currently single groups. Educational attainment was categorized into less than high school, high school, and college.

Table 1. Frequency Distribution of Selected Characteristics of the Study Population.

Characteristics	Number	Percentage
Sociodemographic factors		
Age (years)		
40–49	240	39.0
50–59	166	27.0
>60	208	33.9
Marital status		
Married	286	46.6
Single	328	53.4
Employment status		
Employed	260	42.3
Unemployed	273	44.5
Retired	81	13.2
Annual household income		
≤$20K	427	69.5
>$20K	166	25.0
Unknown	21	3.4
Educational attainment		
<High school	271	44.1
High school	232	37.8
College	107	17.1
Unknown	4	0.7
Race/ethnicity		
Caucasian	159	25.9
African American	218	35.5
Native American	237	38.6
Epidemiologic risk factors		
Age at first sexual intercourse (years)		
≥18	287	46.7
<18	327	53.3
Number of sexual partners		
<3	254	41.0
≥3	274	45.0
Unknown	86	14.0
History of STD[1]		
Negative	544	85.0
Positive	55	9.0
Unknown	15	2.0
History of STD in partner(s)		
Negative	558	91.0
Positive	38	6.0
Unknown	18	3.0
Smoking status		
Never	318	51.8
Ever	296	48.2
Risk[2]		
Low risk	108	17.6
High risk	506	82.4

1. STD = sexually transmitted disease.
2. Components of risk are age at first sexual intercourse, lifetime number of sexual partners, history of STDs, partners' history of STDs, and history of smoking. High risk was defined as having at least one component.

Annual household income was defined as high (more than $20,000) and low (less than $20,000) for univariate and multivariate analyses. Employment status was categorized as employed, unemployed, and retired.

The primary hypothesis was that women deemed at high risk for cervical cancer are less compliant with risk-appropriate screening guidelines for cervical cancer than their low-risk counterparts. All analyses were conducted using SAS software version 6.12 for Windows (SAS Institute, Cary, NC). The initial analysis consisted of a descriptive statistical analysis to summarize selected characteristics of the sample population, including the prevalence of risk factors for cervical cancer.

Unadjusted chi-square tests of the significance of the association between compliance with screening guidelines for cervical cancer and independent variables were performed. After this, multiple logistic regression analysis was performed to assess the association between risk status and compliance while controlling for potential confounders. The binary outcome was compliance or noncompliance with cervical cancer risk-appropriate screening guidelines (0, not compliant; 1, compliant). Covariates also identified as associated with compliance were the total annual household income, marital status, educational attainment, employment status, age, and race/ethnicity. These were therefore included in the model.

A series of logistic regression analyses were then carried out to determine the association between each component of the risk variable and compliance with cervical cancer screening guidelines and to thereby further elucidate the relationship between risk and

compliance with cervical cancer screening guidelines. The model was fitted with compliance as the response variable, and the independent variables were the number of sexual partners, age at first sexual intercourse, history of STD, smoking status, and a history of STD in sexual partners.

To further examine the relationship between the risk of cervical cancer and Pap smear use, risk status was cross-tabulated with the number of Pap smears without taking into consideration the definition of risk-appropriate compliance.

Results

Table 1 summarizes the frequency distribution of the sociodemographic characteristics of the study sample. The participants were mainly of low socioeconomic status with a high unemployment rate (44.5%), annual household income of $20,000 or less (69.5%), and low educational attainment (proportion with a high school education or less, 81.9%). The prevalence of epidemiologic risk factors for cervical cancer in the study population was high, with 82.4% of the sample at high risk. There was a high prevalence of onset of sexual intercourse at less than 18 years of age (53.3%), more than two sexual partners (45.0%), and history of smoking (48.2%). However, only 41.4% of all participants were compliant with risk-appropriate screening guidelines.

Data in Table 2 show that the high-risk status was associated with a significant tendency to not comply with risk-appropriate cervical cancer screening guidelines (34.3% vs. 73.4% for high vs. low risk, $p = .001$), and the odds of compliance were significantly higher among low-risk participants than among high-risk participants (OR = 5.5; 95% CI 3.3 to 8.3). Unadjusted chi-square tests showed that each of the five risk variables (age at first sexual intercourse, a history of more than two sexual partners, ever smoked, history of STD, and history of STD in sexual partner) was associated with relative lack of compliance with risk-appropriate screening guidelines.

Table 3 shows the results of both the adjusted and unadjusted logistic regression analyses of sociodemographic predictors of compliance. There was a significant association between age and compliance. Women 50 to 59 years old were less likely to be compliant than women aged 40 to 49 (OR = 0.5; 95% CI = 0.3 to 0.8). Educational level was also significantly associated with compliance. Specifically, having a high school education was significantly predictive of compliance with screening guidelines (OR = 1.81; 95% CI = 1.1 to 2.9). The recommendation of a physician to have a Pap smear was significantly predictive of compliance (OR = 1.6; 95% CI = 1.0 to 2.3). There was no significant association between marital status, employment status, or annual household income and compliance with risk-appropriate screening guidelines. Multivariate analyses showed that a low risk for cervical cancer was still strongly associated with compliance with cervical cancer risk-appropriate screening guidelines (OR = 6.7; 95% CI = 3.7 to 11.1). Multivariate

Table 2. Summary of Results of Epidemiologic Risk Factors by Compliance With Risk-appropriate Guidelines for Pap Smear Screening (%).[1]

Characteristics	Number of Compliant Patients (%)	Number of Noncompliant Patients (%)	Odds Ratio (OR)	95% Confidence Interval (CI)
Total	254 (41.4)	360 (58.6)		
Age at first sexual intercourse				
≥18 years	147 (51.6)	138 (48.4)	2.2	1.6 to 3.1
<18 years	106 (32.4)	220 (67.6)		
Number of sexual partners				
<3	126 (50.0)	126 (50.0)	2.2	1.6 to 3.1
≥3	85 (31.0)	189 (69.0)		
History of STDs[2]				
Negative	237 (42.9)	315 (57.1)	2.2	1.2 to 4.2
Positive	14 (25.5)	41 (74.6)		
History of STDs in partner(s)				
Negative	238 (42.7)	320 (57.4)	2.1	1.0 to 4.4
Positive	10 (26.3)	28 (73.7)		
Smoking status				
Never	152 (48.0)	165 (52.1)	1.8	1.3 to 2.4
Ever	101 (34.2)	194 (65.8)		
Risk category				
Low risk	80 (73.4)	28 (26.6)	5.5	3.3 to 8.3
High risk	174 (34.3)	332 (65.7)		

1. Missing values were excluded from the analyses.
2. STDs = sexually transmitted diseases.

Table 3. Results of Multivariate Analyses of Sociodemographic Correlates of Compliance With Risk-appropriate Screening Guidelines for Cervical Cancer.

Characteristics	Univariate Analysis OR (95% CI)	Multivariate Analysis OR (95% CI)[1]
Age (years)		
40–49	1.0	1.0
50–59	0.6 (0.4 to 0.9)	0.5 (0.3 to 0.8)
≥60	0.7 (0.5 to 1.0)	0.6 (0.3 to 1.0)
Overall		$p = .01$[2]
Marital status		
Married	1.0	1.0
Single	0.7 (0.5 to 1.0)	0.7 (0.5 to 1.1)
Employment status		
Employed	1.0	1.0
Unemployed	0.9 (0.6 to 1.2)	1.3 (0.8 to 2.2)
Retired	1.0 (0.6 to 1.6)	1.2 (0.6 to 2.7)
Overall		$p = .40$[2]
Annual household income		
High	1.0	1.0
Low	0.6 (0.4 to 1.2)	1.0 (0.5 to 2.2)
Educational attainment		
<High school	1.0	1.0
High school	2.1 (1.5 to 3.0)	1.8 (1.1 to 2.9)
College	2.5 (1.6 to 3.9)	1.7 (0.9 to 3.2)
Overall		$p = .05$[2]
Race/ethnicity		
Caucasian	1.0	1.0
African American	1.0 (0.7 to 1.5)	1.3 (0.8 to 2.3)
Native American	0.9 (0.6 to 1.4)	1.1 (0.6 to 1.8)
Overall		$p = .50$[2]
Physician recommendation of Pap smear test		
No	1.0	1.0
Yes	1.5 (1.1 to 2.1)	1.6 (1.0 to 2.3)
Risk category		
High	1.0	1.0
Low	5.5 (3.3 to 8.3)	6.7 (3.7 to 11.1)

1. Adjusted for all other factors in the model.
2. Overall significance of factors with three or more categories.

Table 4. Results of Multivariate Analyses of Association Between Epidemiologic Risk and Compliance With Risk-appropriate Screening Guidelines for Cervical Cancer.

Characteristics	Univariate Analysis OR (95% CI)	Multivariate Analysis OR (95% CI)[1]
Age at first sexual intercourse		
<18 years	1.0	1.0
≥18 years	2.2 (1.6 to 3.1)	1.9 (1.3 to 2.8)
Number of sexual partners		
≥3	1.0	1.0
<3	2.2 (1.6 to 3.1)	1.9 (1.3 to 2.8)
History of STDs[2]		
Positive	1.0	1.0
Negative	2.2 (1.2 to 4.2)	1.6 (0.6 to 4.8)
History of STDs of partner(s)		
Positive	1.0	1.0
Negative	2.1 (1.0 to 4.4)	0.9 (0.3 to 3.0)
Smoking status		
Ever	1.0	1.0
Never	1.8 (1.3 to 2.4)	1.6 (1.1 to 2.3)

1. Adjusted for all other factors in the model.
2. STDs = sexually transmitted diseases.

analyses also confirmed that marital status, annual household income, and employment status as well as race/ethnicity did not significantly predict risk-appropriate compliance.

Table 4 shows the results of the analysis of the risk variables. The multivariate analysis indicated that early onset of sexual intercourse (OR = 1.9; 95% CI = 1.3 to 2.8), more than two sexual partners (OR = 1.9; 95% CI = 1.3 to 2.8), and ever-smoking status (OR = 1.6; 95% CI = 1.1 to 2.3) were significantly associated with not complying with screening guidelines. However, history of STD and history of STD in sexual partners did not prove to be significant predictors of compliance after multivariate adjustments.

To determine Pap smear use regardless of risk-appropriate compliance, we analyzed the distribution of Pap smear use in the two risk groups over the period of study. Eighty-one percent of patients in the high-risk category and 74.2% in the low-risk category had

had at least one Pap smear in the previous 3 years. In addition, a large proportion in both risk groups (low-risk group, 47.2%; high-risk group, 54.6%) had two or more Pap smears in the previous 3 years. Overall, the association between the risk category and Pap smear use was not statistically significant (chi-square test, 3.4; $p = .3$).

Discussion

Cervical cancer remains a major cause of death in women worldwide. Even though screening with Pap smears can reduce the mortality from this cancer, women most at risk for cervical cancer may not be getting screened as frequently as necessary. As a result, preneoplastic changes go undetected and untreated and cervical cancer develops.

This study found that compliance with risk-appropriate screening guidelines for cervical cancer was significantly poorer among high-risk women than among low-risk. This relationship persisted after multivariate adjustment for potential confounders. This strong association between high-risk status and low compliance is consistent with the findings from a study by Woolhandler and Himmelstein (1988), in which high-risk members of the study population were found to be poor users of preventive services.

A recommendation for a Pap smear by a primary care physician and a high school education were significantly associated with a tendency to comply with risk-appropriate cervical cancer screening guidelines. This suggests that adequate access to health services and education about the importance of health services use, which are known to be limited in rural communities, enhances compliance. The association of increasing age with a decrease in compliance may be partly due to the reported reduction in medically related visits, such as for obstetrics services, as well as to limitations in mobility and social support (Hayward, Shapiro, Freeman, & Corey, 1988; Wilcox & Mosher, 1993). These findings agree with those reported elsewhere (Ferrante, Gonzalez, Roetzheim, Pal, & Woodard, 2000; Harlan et al., 1990; Nathoo, 1988; Woolhandler et al., 1988). Race/ethnicity, marital status, employment status, and low annual household income did not, however, significantly predict compliance with risk-appropriate cervical cancer screening guidelines. This is in contrast with study findings reported by other groups (Berman, Bastani, Nisenbaum, Henneman, & Marcus, 1994; Katz & Hofer, 1994; National Cancer Institute Cancer Screening Consortium for Underserved Women, 1995). Our observation may be explained in part by the homogeneous socioeconomic composition of our population (being mainly rural and of low socioeconomic status) and the availability of relevant screening services to all eligible women irrespective of their health insurance status.

Among our participants, a history of multiple sexual partners, early onset of sexual intercourse, and smoking were strongly predictive of noncompliance. The association between these epidemiologic risk factors for cervical cancer and compliance may be partly explained by the fact that causes and mediators of high-risk sexual behavior—such as an external locus of control regarding health issues (i.e., a tendency to credit life events to the presence of external causes or the lack of it), limited knowledge and awareness of high-risk behavior, poverty and lack of opportunity, and alcohol and drug use—are associated with poor utilization of health services (Becker, Rankin, & Rickel, 1998).

An important question to consider was whether the poor compliance in the high-risk group could be explained by this group's need for more frequent Pap smears. We believe this is unlikely. While there was statistically no difference in the screening frequency between the high- and low-risk groups (3.4; $p = .34$), this may be explained by the limited sample size used for the subset analyses of the association between risk status and Pap smear use. In addition, a large proportion of those in the low-risk group (47.2%) reported having two or more Pap smears in the 3 years under review. This may indicate a tendency toward overscreening in this risk group. Furthermore, the association of high-risk behavior and poor compliance with Pap smear screening has been observed by others in this and other age groups. For example, it has been reported that the rate of Pap smear use in women aged 42 to 75 was lower in those who smoked one pack or less of cigarettes per day than in those who had never smoked (Clark, Rakowski, & Ehrich, 2000; Rakowski, Clark, & Ehrich, 1999). A similar association has been reported between smoking and alcohol use, high risk behavior, ignorance of the health implications of smoking, and limited internal locus of control on health issues, among other factors, although this was seen in a lower age group (Griffin, Botvin, Doyle, Diaz, & Epstein, 1999; Martenelli, 1999; Memon, 1999). The inverse relationship that exists between a limited knowledge of health-related issues, poverty, and lack of opportuni-

ty and the utilization of preventive services is well documented (Brinton et al., 1989; Harlan et al., 1991; Mamon et al., 1990).

This study is limited in its ability to generalize beyond the population of low-income rural women that was examined. The probability that the results found within the study population could be due to chance is unlikely in view of the strength of the association between risk and compliance even after controlling for confounding variables. Furthermore, the significant composites of the risk variable, namely number of sexual partners, age at first sexual intercourse, and smoking status, were independently consistent in their prediction of compliance. Histories of STD and STD in sexual partners were not significantly associated with compliance, but this was probably due to the small number of participants who reported these risk factors. Although the status of HPV infection in our participants was not determined, the selected variables are known to be independently associated with the risk of developing cervical cancer. The possibility of a misclassification bias inherent in self-reported prevalence of Pap smear use and risk factors for cervical cancer cannot be absolutely ruled out, and this remains a limitation of the study (Bowman, Sanson-Fisher, & Redman, 1997). The association of a high-risk status with poor compliance and the overall low rate of compliance with risk-appropriate screening guidelines for cervical cancer (41%) are consistent with the current knowledge that underserved, rural women of low socioeconomic status at high risk for cervical cancer do not use Pap smear screening adequately (Berman et al., 1994; Katz & Hofer, 1994; Woolhandler et al., 1988).

We have suggested possible explanations for the association between a high-risk status for cervical cancer and poor use of Pap smear. It appears that these behavioral mediators of high-risk status may be working in concert with factors already asserted such as rurality, poverty, limited education, and access to bring about the characteristic poor use of preventive services in these rural women. The consequence is that, although rural women do not have a higher risk in comparison with urban women, they account for a higher proportion of mortality due to cervical cancer. Thus, the burden falls on physicians and other health care providers in rural communities to (1) identify high-risk women, (2) recommend appropriate screening for women at higher risk, and (3) educate women about the risk factors for cervical cancer and their individual risk profiles. Many studies, including the present study, have documented that a physician's recommendation to engage in health maintenance behavior (e.g., smoking cessation and mammograms) is a strong predictor of adherence. Thus, providers in rural settings should be educated regarding cervical cancer risk factors to ensure that they can make proper screening recommendations. This view is further supported by Lantz, Weigers, and House (1997), who surveyed 2,346 rural Wisconsin women aged 40 and older and found that the strongest barriers to breast and cervical cancer screening were nonfinancial impediments to access. They suggested that policies and interventions should also be focused on addressing attitudinal and health-care access barriers if the goal of increased screening is to be achieved.

In conclusion, we found that appropriate Pap smear use was not commensurate with risk status in this rural population. We therefore recommend that risk status should be determined and counseling given on cervical cancer screening frequency in this and other similar populations. Furthermore, interventions for high-risk sexual behavior modification should include emphasis not just on safe sexual practices but also on adequate screening behavior for sexually transmissible diseases like cervical cancer. Finally, an educational intervention project should be developed that promotes cervical cancer screening in high-risk women in these rural areas.

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