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Adherence to Recommendations for Follow-up to Abnormal Pap Tests

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OBJECTIVE: To evaluate whether timely adherence rates differ by race among women with abnormal Pap tests participating in a cost-free or reduced-cost program.

METHODS: Eligible subjects included women aged 47–64 years who received a referral for follow-up care after an abnormal Pap test from 1999 to 2002 in South Carolina (n=330). Adherence was measured as days to receipt of follow-up care after an abnormal Pap test. Cox proportional hazards modeling was used to estimate risk factors associated with time to adherence within 60 and 365 days by race.

RESULTS: African-American and non-Hispanic white women had similar adherence to follow-up. Among white women, those with high-grade lesions were less likely to adhere in a timely manner relative to those with low-grade lesions (hazard ratio 0.6, 95% confidence interval [CI] 0.4–1.0). For African-American women, rural residence (hazard ratio: 0.5, 95% CI 0.2–0.9) and history of abnormal Pap tests (hazard ratio 0.6, 95% CI 0.3–1.0) were associated with decreased adherence, whereas less education (hazard ratio 2.3, 95% CI 1.3–3.9) was associated with increased adherence.

CONCLUSION: Adherence rates do not differ by race. However, risk factors for adherence within race are variable. Interventions tailored to the differential needs of racial and ethnic groups may prove effective toward increasing timely adherence rates.

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Cervical cancer mortality rates range from 1.3 to 6.1 deaths per 100,000 women across the United States.[1] Mortality resulting from cervical cancer can be attributed to three main factors: lack of consistent Pap testing,[2–5] failure of the Pap test to detect an abnormality,[6,7] and lack of adherence to recommended follow-up after an abnormal Pap test result.[6,7] High rates of Pap test usage in the United States are encouraging, but approximately 7% of Pap tests are abnormal and require medical follow-up.[8] Women with less access to routine screening, including low-income and minority women, are therefore at increased risk of dying from this disease.

Although several studies have assessed barriers to and predictors of cervical cancer screening, few have focused on predictors of receiving follow-up care for abnormal Pap test results. Among women who are regularly screened, those with abnormal Pap tests who are referred for follow-up care are those most at risk for developing cervical cancer. Follow-up after an abnormal Pap test has become increasingly expensive and out of range for many low-income women without insurance.[9–12] Other factors shown to be associated with lack of adherence to follow-up recommendations include age,[10,12–17] race,[10,13,14,16,18–22] severity of Pap test result,[10,11,13,15,16,18,20–24] knowledge,[10,14,16,21,25–30] patient provider communication,[9,17,24] social support,[25] and psychological factors.[14,26–29]

African Americans have a higher incidence of cervical cancer and have a higher cervical cancer mortality rate than white women.[31] This disparity may be due to differences in follow-up rates after an abnormal Pap test. Seven[10,14,16,19–22] of 15 studies [10,13,14,16,17,19–24,27–29,32] to address race/ethnicity and adherence found that African-American women were less likely to schedule follow-up visits, to keep appointments, or to receive follow-up care. Because of this mixed literature regarding race and adherence, additional research is needed to determine if and why African-American women with an abnormal Pap test are less likely than non-Hispanic white women to

adhere to physician recommendations for abnormal Pap test follow-up.

The Centers for Disease Control and Prevention's National Breast and Cervical Cancer Early Detection Program (NBCCEDP) provide breast and cervical cancer screening and follow-up care to uninsured, low-income women aged 47–64 years in the United States.[33] The NBCCEDP has an active program in South Carolina, a southern state with high percentages of minority and low-income residents. In 2005, the mortality rate due to cervical cancer in South Carolina was 3.1 per 100,000 women, exceeding the national average of 2.7 per 100,000 women.[1] Although it ranks 26th in population size, South Carolina ranks seventh in the nation for estimated deaths from cervical cancer.[1] African-American and other nonwhite women were 60% more likely to be diagnosed with cervical cancer than white women in South Carolina.[34]

The Centers for Disease Control (CDC) funded the current project for the purpose of investigating why some women with abnormal Pap tests do not adhere to recommendations for receipt of care in a timely manner. The purpose of this analysis is to evaluate whether timely adherence rates differ by race among women with abnormal Pap tests. Differences in adherence rates may be due to lesion severity, socioeconomic status, rural residence, education, smoking, marital status, and previous abnormal Pap tests.

MATERIALS AND METHODS

Potential study participants were identified by the South Carolina BCCEDP. The current study was approved by institutional review boards at all participating institutions. Eligible subjects included women aged 47–64 years who received a referral for follow-up care after an abnormal Pap test from 1999 to 2002 (n=330).

The primary outcome for this analysis was adherence to follow-up recommendations. Compliance is defined by the BCCEDP as completion of follow-up care within 60 days of the initial abnormal Pap test.[22] The impact of the exposures relative to adherence to follow-up recommendations may vary over time; therefore, we created an additional measure of adherence, defined as time to first follow-up within 365 days.

Participation in the current study included completion of a phone interview regarding a woman's abnormal Pap test experience. Detailed methodology for this research study has been published elsewhere.[35] Concepts to be addressed in this analysis as correlates of adherence include race, age, education, marital status, socioeconomic status, rural residence, smoking, previous abnormal Pap tests, and lesion severity. Data from both medical records (demographics, lesion severity, and timely adherence to follow-up) and the questionnaire (race, education, marital status, smoking status, and previous abnormal Pap tests) contributed to the current data analysis. Thus, information obtained from medical records was available for all women enrolled in the South Carolina BCCEDP (n=330), whereas information obtained from the questionnaire was available only for interviewed women (n=149).

A composite variable for community level socioeconomic status was created using U.S. Census 2000 ZIP code level data for median income, poverty, education, and employment.[36] Community level socioeconomic status is an important aspect of a woman's environment, reflecting various community resources influencing access to care. Rural residence was also defined using the ZIP code level data available from the U.S. Census. Socioeconomic status and rural residence were then categorized into tertiles based on the distribution of the data among all women.

All data were analyzed with Intercooled Stata 8.0 (Stata Corporation, College Station, TX). Two models were developed corresponding to the availability of exposure variables for women who were interviewed compared with those who did not complete the interview. Model 1 consisted of variables obtained from medical records, from the U.S. Census, or from both. Exposure data for variables obtained from the U.S. census were available for 99% (n=326) of all women in the primary data set (n=330). Unavailability corresponds to women with ZIP codes corresponding to a post office box; data for these ZIP codes are not reported in the U.S. Census. The second model consisted of variables that were obtained through participation in the questionnaire (education, smoking status, marital status, previous abnormal Pap tests) (n=149). Cox proportional hazards modeling was used to estimate relative hazard ratios for adherence to follow-up recommendations for the two time periods and for the two samples. The χ^2 and t test were used to evaluate statistically significant differences between variables across the racial/ethnic groups. Further, the χ^2 test for trend[37] was used to test linear trends across socioeconomic status and rural residence. Women who did not adhere to follow-up within 60 or 365 days were censored in respective models.

Age and lesion severity were both assessed as

confounders, but only lesion severity met the operational definition of confounding and was included in the model as a confounder. Race was included as the primary exposure to determine whether race was associated with time to adherence at 60 and 365 days in models including lesion severity, education, rural residence, history of a past abnormal Pap, and smoking. Finally, we explored whether risk factors for adherence differed by race. The Breslow-Day test for homogeneity[38] was used to determine whether race modified the association between identified risk factors associated with adherence.

RESULTS

Of 183 African-American women and 147 white women identified by BCCEDP as referred for follow-up care from 1999 to 2002 in South Carolina, 83 African Americans and 66 white women completed phone interviews. Table 1 presents the demographic characteristics of women by race and study sample. The mean age of women in the full sample was 53.5±4.7 years. The majority (48.2%) of women were diagnosed with a cervical lesion defined as atypical squamous cells of undetermined significance (ASCUS). Most women were nonsmokers (73.2%), had at least a high school education (62.4%), and had no previous abnormal Pap tests (54.7%). Approximately 47% of all women were married at the time of the abnormal Pap test. The demographic profiles of African-American and white women interviewed in this study were similar, with the exception that more white women were current smokers and were more likely to have had a history of an abnormal Pap. No differences were observed across the demographic profile between women who participated in the interview and the total sample.

Adherence status and time to adherence for all women receiving care through the BCCEDP are presented in Table 2 by race. Most women adhered to follow-up recommendations within 60 days (62.8% of African Americans and 69.4% of white Americans), and almost all adhered within 365 days (95.9% of African Americans and 95.6% of white Americans). On average, African-American women received follow-up care 7.6 days (±3.9) later than white American women, but this difference was not statistically significant and is unlikely to be of clinical significance.

Tables 3 and 4 present predictors of adherence to follow-up recommendations within 60 and 365 days after an abnormal Pap test. When adherence was defined based on BCCEDP records, presence of a higher- rather than a lower-grade lesion was associated with nonadherence at both 60 and 365 days after an abnormal Pap test. Those women living in areas of intermediate socioeconomic status were more likely to receive follow-up care within 60 days than women living in areas of higher socioeconomic status. Women with less than a high school education were also more likely to receive follow-up care in a timely manner (within 60 days) than those with at least a high school diploma.

Tables 5 and 6 present correlates of adherence at 60 and 365 days by race. No factor investigated was consistently associated with both racial groups.

Among white women, lesion severity (high versus low grade) was the only variable associated with adherence within 60 days (hazard ratio 0.6, 95% confidence interval [CI] 0.4–1.0) and 365 days (hazard ratio 0.6, 95% CI 0.4–0.9). African-American women living in very rural areas were less likely to adhere to follow-up recommendations in a timely manner (hazard ratio 0.5, 95% CI 0.2–0.9 for adherence within 60 days) than those living in urban areas; the trend of rural residence and adherence was also significant (P=.02). Additionally, those living in areas of intermediate socioeconomic status compared with those living in areas of high levels of socioeconomic status were more likely to be adherent within 60 days. However, no trend toward increasing socioeconomic status being associated with greater adherence was noted (P=.21). African-American women with less than a high school education were significantly more likely to adhere to follow-up recommendations at both 60 (hazard ratio 2.3, 95% CI 1.3–3.9) and 365 days (hazard ratio 2.0, 95% CI 1.2–3.3) than those attaining at least a high school education. Finally, although having a history of an abnormal Pap test was associated with a reduced likelihood of adherence at 60 days (hazard ratio 0.6, 95% CI 0.3–1.0), this association was not significant for follow-up at 365 days.

DISCUSSION

Timely adherence to treatment and follow-up care for an abnormal Pap test greatly reduces the risk of progression to invasive cervical cancer. Although racial disparities exist for incidence of and mortality due to cervical cancer, this study found no difference between African-American and white women in days to follow-up care or overall adherence status at 60 or 365 days after an abnormal Pap test. This finding is consistent with some previous research[13,17,23,24,27–29,32] that concluded that African-American race was not an independent predictor of adherence to follow-up recommendations. However, this finding contrasts with others[10,13,14,16,18–22] who note that African-American

Table 1. Characteristics of Women Referred for Follow-up Care After Abnormal Pap Test in South Carolina, 1999–2002

	Full Sample		Interviewed Sample	
Characteristics	African American (n=183)	White American (n=147)	African American (n=83)	White American (n=66)
Age (y, mean±SD)	53.7±4.7	53.1±4.7	53.6±5.0	53.4±4.9
P (*t* test)*	.27		.80	
Lesion type				
ASCUS	91 (51.4)	65 (44.2)	40 (48.2)	31 (47.0)
LSIL/HPV	54 (27.9)	41 (27.9)	26 (31.3)	19 (28.8)
HSIL/AGUS/SCC	38 (20.7)	41 (27.9)	17 (20.5)	16 (24.2)
P (χ^2)†	.27		.85	
Rural residence	(n=182)	(n=144)	(n=83)	(n=66)
Very rural	62 (34.1)	49 (34.1)	29 (35.0)	20 (30.3)
Rural	61 (33.5)	47 (33.5)	27 (32.5)	22 (33.3)
Urban	59 (32.4)	48 (32.4)	27 (32.5)	24 (36.4)
P (χ^2)†	.98		.82	
Socioeconomic status	(n=182)	(n=144)	(n=83)	(n=66)
Low SES	58 (31.9)	30 (20.8)	27 (32.5)	15 (22.7)
Middle SES	60 (33.0)	55 (38.2)	29 (35.0)	28 (42.4)
High SES	64 (35.1)	59 (41.0)	27 (32.5)	23 (34.9)
P (χ^2)†	.08		.40	
Education	–	–	(n=83)	(n=66)
High school diploma or greater	–	–	52 (62.1)	41 (62.7)
Less than high school diploma	–	–	31 (37.9)	25 (37.3)
P (χ^2)†	–		.95	
Marital status	–	–	(n=83)	(n=66)
Married	–	–	39 (47.0)	31 (47.0)
Divorced/separated	–	–	22 (26.5)	19 (28.8)
Single	–	–	6 (7.2)	1 (1.5)
Widowed	–	–	16 (19.3)	15 (22.7)
P (χ^2)†	–		.42	
Smoking status‡	–	–	(n=83)	(n=66)
No	–	–	68 (81.9)	41 (62.1)
Yes	–	–	15 (18.1)	25 (37.9)
P (χ^2)†	–		.01	
Any other abnormal Pap test	–	–	(n=76)	(n=61)
No	–	–	48 (63.2)	27 (44.3)
Yes	–	–	28 (36.8)	34 (55.7)
P (χ^2)†	–		.03	

SD, standard deviation; ASCUS, atypical squamous cells of undetermined significance; LSIL, low-grade squamous intraepithelial lesion; HPV, human papillomavirus; HSIL, high-grade squamous intraepithelial lesion; AGUS, atypical glandular cells of undetermined significance; SCC, squamous cell carcinoma; SES, socioeconomic status.

Data are expressed as n (%) except where otherwise indicated.

* *t* test *P* value tests racial difference across age.

† Chi-square *P* value tests racial differences across adherence status.

‡ Smoking status defined as being a smoker in year of abnormal Pap.

women were less likely to schedule follow-up visits, keep appointments, or receive follow-up care.

Several factors associated with adherence disproportionately affected women in each racial group including lesion severity, rural residence, education, and history of abnormal Pap test. The majority of studies report that women with more severe lesions are more likely to adhere to follow-up recommendations than those with less severe lesions.[10,11,13,15,16,18,20–24] However, results from this study indicate that, among white Americans, women with more severe lesions were less likely to adhere to follow-up. This association remained regardless of the time frame for adherence (60 or 365 days). Reasons for this association are not clear but may involve fatalistic attitudes of being diagnosed with a high-grade lesion, as well as competing life priorities

Table 2. Adherence to Follow-up Recommendation After an Abnormal Pap Test by Race in South Carolina, 1999–2002

	Full Sample		Interviewed Sample	
	African American (n=183)	White American (n=147)	African American (n=83)	White American (n=66)
Adherence to follow-up				
Adhered in 60 days	115 (62.8)	102 (69.4)	54 (65.1)	48 (72.7)
$P(\chi^2)$*	.21		.32	
Adhered in 60 days: self-report	NE	NE	52 (62.6)	47 (71.2)
$P(\chi^2)$*	NE		.27	
Adhered in 365 days	141 (95.9)	175 (95.6)	64 (97.0)	78 (94.0)
$P(\chi^2)$*	.90		.39	
Mean days to follow-up (mean±SE)	74.9±6.1	67.3±6.5	77.7±10.1	65.9±9.7
P (t test)†	.40		.41	

NE, not estimable (subject not interviewed); SE, standard error.
Data are expressed as n (%) except where otherwise indicated.
* Chi square P value tests racial differences across indicated variable.
† t test P value tests racial difference across indicated variable.

such as work or child care. Two studies investigating fatalism and adherence found that those with higher fatalism scores were less likely to be adherent.[26,29] Additional research is needed to better understand the influence of women's psychosocial response to an abnormal Pap test and their ability to cope effectively with this news and receive needed care in a timely manner.

To address the possibility that white women with high-grade lesions were treated by other health care providers, we conducted a separate analysis among interviewed women to address the association between lesion severity and self-reported adherence. It was assumed that self-reported adherence included both treatment received within the BCCEDP as well as through other health care providers. The resulting hazard ratio was not significant (hazard ratio 0.6, 95% CI 0.3–1.1), but it indicated an effect of similar direction and magnitude when compared with the original results using adherence based solely on BCCEDP records (Table 5, hazard ratio 0.6, 95% CI 0.4–0.9). Therefore, we do not believe this difference is due to treatment outside the BCCEDP.

Our finding of no association between socioeconomic status trend and adherence is consistent with the majority of studies reporting adherence was not associated with higher income, insurance, or cost of treatment.[13,14,16,17,23,29,32,39] This contrasts with four studies that found that women with higher income or private insurance were more likely to adhere to recommended treatment.[9–12] Because the majority of women in the current study were low income, we had little variance in the socioeconomic status distribution and potentially limited ability to detect a modest effect of socioeconomic status on adherence.

In the only study to address residential status as a predictor of adherence, Fox et al[20] concluded that women in urban settings of California were more likely to receive follow-up care. This finding concurs with our observation that, among African-American women, those living in very rural areas are less likely to receive follow-up care within 60 days of an abnormal Pap result than were those living in urban areas. Presumably, rural residence may affect adherence by creating a barrier to care through either greater distance to care or limited transportation. We note that rural residence disproportionately affects adherence for African-American women in need of follow-up care.

Women with lower education levels may be less likely to adhere to follow-up recommendations due in part to ineffective communication between the provider and the patient. We do not have data from providers on communication methods or follow-up instructions. However, our current data shows no differences across education levels in a woman's recall of either the notification or lesion severity of her Pap test results.

Educational interventions, including counseling to better explain to women their condition and need for treatment, have been shown to increase compliance among poorly educated patients.[10,14,16,21,26–28,30] Our finding that women with less than a high school education are more likely to adhere to follow-up recommendations than are women with at least a high

Table 3. Predictors of Adherence Within 60 and 365 Days After an Abnormal Pap Test in South Carolina, 1999–2002 (Full Sample, n=330)

	Time to Adherence (60 days)		Time to Adherence (365 days)	
	Person Days (14,055)		Person Days (23,601)	
	Event Rate* (No. Adhered)	Hazard Ratio (95% CI)	Event Rate* (No. Adhered)	Hazard Ratio (95% CI)
Race				
African Americans	0.014 (115)	0.9 (0.7–1.1)	0.013 (175)	0.9 (0.7–1.1)
P		.20		.32
White Americans	0.017 (102)	1.0 Ref	0.014 (141)	1.0 Ref
Lesion severity†				
High-grade lesion	0.012 (44)	0.7 (0.5–1.0)	0.011 (75)	0.8 (0.6–1.0)
P		.04		.06
Low-grade lesion	0.017 (173)	1.0 Ref	0.014 (241)	1.0 Ref
Rural residence‡				
Very rural	0.013 (66)	0.7 (0.4–1.1)	0.013 (107)	0.9 (0.6–1.3)
P		.16		.53
Rural	0.018 (75)	0.9 (0.6–1.4)	0.015 (104)	1.0 (0.8–1.5)
P		.73		.80
Urban	0.016 (74)	1.0 Ref	0.013 (101)	1.0 Ref
P (χ^2 for trend)§		.14		.48
Socioeconomic status‖				
Low SES	0.013 (52)	1.1 (0.7–1.7)	0.012 (84)	1.0 (0.7–1.5)
P		.81		.95
Middle SES	0.019 (84)	1.5 (1.0–2.2)	0.015 (111)	1.2 (0.9–1.7)
P		.04		.21
High SES	0.015 (79)	1.0 Ref	0.013 (117)	1.0 Ref
P (χ^2 for trend)¶		.80		.91

CI, confidence interval; Ref, reference; SES, socioeconomic status.

* Event rate = number adhered/person days.

† *Low-grade lesion* is defined as low-grade squamous intraepithelial lesion/human papillomavirus, atypical squamous cells of undetermined significance; *high-grade lesion* is defined as atypical glandular cells of undetermined significance, high-grade squamous intraepithelial lesion, carcinoma.

‡ Model includes adjustment for socioeconomic status.

§ Trend test evaluates association between increasing rural residence and adherence.

‖ Model includes adjustment for rural residence; composite socioeconomic status includes zip code level variables for median income, poverty, education, and employment.

¶ Trend test evaluates association between increasing socioeconomic status and adherence.

school diploma may reflect providers' awareness of the greater needs of less educated women to have the consequences of an abnormal Pap test clearly and carefully described in simple language. Health care providers who are part of the BCCEDP program may be particularly attuned to the needs of their less educated patients; they may provide simple explanations and facilitate referrals for women with less education. A qualitative study of BCCEDP providers in South Carolina, the majority of whom are not physicians, showed that nurse practitioners and midwives were more likely than physicians to recognize cognition problems in their patients and to use nonmedical, simple communication, as well as visual diagrams when discussing abnormal results.[40]

An alternative theory is that less educated women may have a heightened anxiety for the possibility of cervical cancer, whereas more educated women may view an abnormal Pap as not at all worrisome. However, our questionnaire included a question on how concerned the woman was when she was contacted about her abnormal Pap test. Responses were not significantly different by education status, and thus anxiety does not likely explain this finding.

Having a history of an abnormal Pap test was associated with lower levels of adherence at 60 days in this sample. An explanation for this observation may be found in a qualitative study of BCCEDP clients who reported that women who had repeated abnormal Pap tests were frustrated to be called back repeatedly for retesting and reported that "since nothing had happened yet due to abnormal Pap tests, they

Table 4. Predictors of Adherence Within 60 and 365 Days After an Abnormal Pap Test in South Carolina, 1999–2002 (Interviewed Sample, n=149)

	Time to Adherence (60 days)		Time to Adherence (365 days)	
	Person Days (6,114)		Person Days (10,798)	
	Event Rate (No. Adhered)	Hazard Ratio (95% CI)	Event Rate (No. Adhered)	Hazard Ratio (95% CI)
Race				
African Americans	0.016 (54)	0.9 (0.6–1.3)	0.012 (78)	0.9 (0.6–1.2)
P		.43		.37
White Americans	0.018 (48)	1.0 Ref	0.015 (64)	1.0 Ref
Education†				
Less than high school diploma	0.020 (43)	1.5 (1.0–2.2)	0.015 (53)	1.3 (0.9–1.9)
P		.06		.12
High school diploma or greater	0.015 (59)	1.0 Ref	0.012 (89)	1.0 Ref
Smoking status				
Smoker	0.015 (27)	0.9 (0.6–1.4)	0.012 (38)	0.9 (0.6–1.3)
P		.57		.66
Nonsmoker	0.017 (75)	1.0 Ref	0.014 (104)	1.0 Ref
Marital status				
Unmarried	0.017 (55)	1.1 (0.7–1.6)	0.014 (76)	1.1 (0.8–1.5)
P		.76		.74
Married	0.016 (47)	1.0 Ref	0.013 (66)	1.0 Ref
Previous abnormal Pap test				
Yes	0.015 (41)	0.8 (0.6–1.3)	0.013 (59)	0.9 (0.7–1.3)
P		.40		.70
No	0.018 (53)	1.0 Ref	0.013 (72)	1.0 Ref

CI, confidence interval; Ref, reference.
* Event rate = number adhered/person days.
† Model includes adjustment for lesion severity.

just quit returning." (Luchok K, Modayil M, Abbott JM, Brandt HM, Prabhu Das I, Coker AL. Congruence between clinician and client perspectives on factors affecting follow-up of abnormal Pap test results. Presented at: 132nd Annual Meeting of the American Public Health Association, November 6–10, 2004; Washington, DC.)

This study is not without limitations. Response rates for participation, while acceptable, were lower than desired (67% for white and 60% for African-American women). These response rates contributed to small sample size and limited power to detect modest differences within racial groupings. However, because response rates did not differ significantly by race and women did not know their adherence status by time, this potential selection bias is unlikely to explain study findings. Selection bias may play a role in any study that includes voluntary participation. It is likely that those who participated in our interview are more motivated to address health issues than those who do not, thus making them more likely to adhere to treatment recommendations. However, we believe this bias is unlikely due to similar adherence rates. We reduced the potential for misclassification by using both medical record and interview data to validate both adherence status and race among interviewed women. Unfortunately, we were not able to obtain medical records of women who received care outside BCCEDP practices, yet it appears few women opt to pay for care when care is provided free within the BCCEDP network.

Another limitation to this study is the use of aggregate data (U.S. Census data) as indicators for individual socioeconomic status and rural residence. Defining rural residence by ZIP code is not likely to result in significant misclassification because residential conditions do not vary greatly for individuals within a ZIP code. This may not be the case for ZIP-code-level socioeconomic status. Variances in individual income, education, and employment are likely to occur for individuals across ZIP codes, resulting in potential misclassification of socioeco-

Table 5. Predictors of Adherence in the Full Sample Within 60 and 365 Days After an Abnormal Pap Test, by Race in South Carolina, 1999–2002

	Full Sample (n=330) Hazard Ratios (95% CI)			
	African American		White American	
Time to adherence (d)	60	365	60	365
Total person days	6,084	13,708	7,971	9,893
Lesion severity*				
High versus low grade	0.8 (0.5–1.3)	1.0 (0.7–1.4)	0.6 (0.4–1.0)	0.6 (0.4–0.9)
P	.31	.99	.03	.01
Rural residence†				
Very rural versus urban	0.5 (0.2–0.9)	0.6 (0.4–1.1)	1.2 (0.6–2.4)	1.4 (0.7–2.5)
P	.02	.09	.65	.34
Rural versus urban	0.7 (0.4–1.2)	0.8 (0.5–1.3)	1.2 (0.7–2.1)	1.3 (0.8–2.1)
P	.22	.38	.45	.23
P (χ^2 for trend)‡	.02	.08	.64	.31
Socioeconomic status§				
Low versus high SES	1.6 (0.8–3.1)	1.3 (0.8–2.2)	0.7 (0.3–1.5)	0.7 (0.4–1.3)
P	.19	.32	.35	.26
Middle versus high SES	2.0 (1.2–3.5)	1.5 (0.9–2.3)	1.0 (0.6–1.8)	1.0 (0.6–1.5)
P	.01	.09	.94	.86
P (χ^2 for trend)	.21	.40	.37	.27

CI, confidence interval; SES, socioeconomic status.
* *Low-grade lesion* is defined as low-grade squamous intraepithelial lesion/human papillomavirus, atypical squamous cells of undetermined significance; *high-grade lesion* is defined as atypical glandular cells of undetermined significance, high-grade squamous intraepithelial lesion, carcinoma.
† Model includes adjustment for socioeconomic status.
‡ Trend test evaluates association between increasing rural residence and adherence.
§ Model includes adjustment for rural residence; composite socioeconomic status including zip code level variables for median income, poverty, education, and employment.

Table 6. Predictors of Adherence in the Interviewed Sample Within 60 and 365 Days After an Abnormal Pap Test, by Race in South Carolina, 1999–2002

	Interviewed Sample (n=149) Hazard Ratios (95% CI)			
	African American		White American	
Time to adherence (d)	60	365	60	365
Person days	3,450	6,451	2,664	3,450
Education*				
Less than high school diploma versus high school diploma or greater	2.3 (1.3–3.9)	2.0 (1.2–3.3)	0.8 (0.5–1.5)	0.7 (0.4–1.2)
P	.01	.01	.50	.24
Previous abnormal Pap test				
Yes versus no	0.6 (0.3–1.0)	0.7 (0.5–1.2)	1.3 (0.7–2.3)	1.3 (0.8–2.1)
P	.06	.21	.42	.38

CI, confidence interval.
* Model includes adjustment for lesion severity.

nomic status. However, the constructed ZIP-code-level socioeconomic status composite variable is a reasonable proxy for individual socioeconomic status, given that all women included in the sample are low income and either uninsured or underinsured. An effect of misclassification would be nondifferential and would bias the resulting association between socioeconomic status and adherence toward the null, indicating that the true association would be stronger than reported.

Adherence to treatment and follow-up care for an abnormal Pap test greatly reduces the risk of progression to invasive cervical cancer. Although racial disparities exist for incidence of and mortality due to cervical cancer, this study found no racial differences in adherence to follow-up care for an abnormal Pap test. However, several factors associated with adherence disproportionately affected women in each racial group. Interventions to address timely adherence to follow-up care recommendations after an abnormal

Pap test may be most effective if they are culturally competent and tailored to the differential needs of racial and ethnic groups.

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