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Do Cervical Cancer Screening Rates Increase in Association with an Intervention Designed to Increase Mammography Usage?

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Abstract

Objectives—To assess cervical cancer screening behaviors among underserved women participating in an intervention designed to increase mammography use.

Methods—This was a randomized trial of 897 women from three racial groups (white, African American, Native American) living in a rural county in North Carolina. Baseline and follow-up surveys were completed by 815 women; 775 women provided data to be included in these analyses. The intervention group received an educational program focused on mammography delivered by a lay health advisor, and the control group received a physician letter/brochure focusing on Pap tests.

Results—Women in both the intervention (OR 1.70; 1.31, 2.21, $p < 0.001$) and control groups (OR 1.38; 1.04, 1.82, $p = 0.025$) significantly increased cervical cancer screening rates within risk appropriate guidelines. No differences by racial group were documented. Women categorized in the high-risk group for developing cervical cancer (>2 sexual partners, age <18 years at first sexual intercourse, smoker; treated for sexually transmitted disease [STD] or partner with treated STD) significantly (OR 1.88; 1.54, 2.28, $p < 0.001$) increased Pap test completion. However, a nonsignificant increase (OR 1.25; 0.87, 1.79, $p = 0.221$) in Pap test completion was demonstrated in women categorized as low risk for cervical cancer.

Conclusions—This study suggests that women in an intensive behavioral intervention designed to increase mammography use may also increase Pap test completion, similar to a minimal intervention focused only on increasing Pap test completion. These results have implications for the design and evaluation of behavioral intervention studies.

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INTRODUCTION

Interventions to Increase Cancer Screening have generally focused on increasing the rates of a disease-specific test (e.g., mammography for breast cancer). When behavioral interventions are designed to increase the rates of one screening test, the rates of use of different site-specific cancer screening tests are usually not monitored for changes. Additionally, interventions designed to change multiple cancer screening behaviors simultaneously,[1–13] as well as interventions aimed at multiple risk factors (e.g., nutrition and physical activity, smoking and alcohol cessation),[14–22] have had varied success depending on the type of intervention or the behaviors being modified.

Acknowledging that health behaviors often cluster, the value of being able to simultaneously change multiple cancer screening behaviors with an intervention aimed at a specific cancer screening behavior has theoretical, study design, and cost implications. There is now interest in health behavior theory research that addresses multiple behaviors.[23,24] To begin exploration of this potentially practical, yet complex behavioral relationship, we assessed the change in cervical cancer screening rates in underserved women participating in a randomized intervention designed exclusively to increase mammography screening.[25,26]

MATERIALS AND METHODS

Data for this study were obtained as part of the Robeson County Outreach Screening and Education (ROSE) Project.[25,26] The ROSE Project was designed to improve breast cancer screening in medically underserved women living in North Carolina, and the design and methods have been reported previously.[25] Using a randomized design, the ROSE Project evaluated the use of an individualized health education intervention delivered by a lay health advisor to increase mammography rates. In this report of cervical cancer screening rates, we used data from the baseline and follow-up (12–14 months later) surveys of the women participating in the ROSE project. This study was approved by the Institutional Review Boards of the Wake Forest University School of Medicine and The Ohio State University.

Setting

Robeson County is a large rural county located on the southeastern coastal plain of North Carolina.[25] In 1996, when this study began, the county's poverty rate was 24.7%, and the unemployment rate was 7.5%.[27] Access to health care is limited in this county, which lacks a countywide public transportation system. As a result of these conditions, the morbidity and mortality rates in Robeson County are higher than the state average for many diseases. The population of Robeson County comprises three main racial groups: Native Americans (predominantly Lumbee Indians) (38%), African Americans (25%), and whites (33%). The remaining 4% of the county's population comprises Hispanics and Asian/Pacific Islanders.

Study population

Robeson Health Care Corporation (RHCC) is one of the major healthcare providers in the county and has four federally funded sites through a Community Health Center program. In 1996, these four centers collectively served approximately 12,778 patients; 68% were

female, approximately 63% of the users had incomes below the poverty level, one third had no health insurance, and 32% were covered by Medicaid.

In brief, women were randomly selected from a list of RHCC female patients older than 40 years, stratifying on clinic and race to ensure a balanced sample. A total of 897 women in need of a mammogram consented to participate in this project, completed the face-to-face baseline survey, and were randomized to the two groups (lay health advisor or the comparison group). The participation rate was 89%, and the process of random selection of these women has been reported previously.[25] Participants were mailed a $10.00 grocery store gift certificate after completion of the baseline survey and were given a small gift after completion of the follow-up face-to-face survey (12–14 months later) in appreciation of their time.

Intervention design

Theoretical framework—The educational intervention was designed to address the specific barriers to mammography use by rural women. Several health behavior theories provided a framework for the one-to-one interactive educational program.[28–32] The PRECEDE-PROCEED MODEL provided a framework to identify important screening barriers among participants,[28] and the Social Learning Theory[29] and the Transtheoretical Model[30] guided the educational program design and framing of the targeted messages. The Communication-Behavior Change Model and the Minority Health Communication Model focused on issues associated with delivering culturally appropriate health education for African Americans and Native Americans.[31,32]

Intervention development and implementation—The goal of the intervention was to increase awareness of the benefits of early detection of breast cancer and to encourage women of all racial groups to reduce their own risk of breast cancer mortality by identifying and reducing important barriers to obtaining mammography screening. Three lay health advisors (LHAs), two Native Americans and one African American, all women who lived in the community, were used for the project. The LHAs received training over a 1-week period by the study team members at Wake Forest University and local settings in Robeson County, with additional follow-up sessions throughout the study period. The LHA training included general project information, breast health information (breast cancer screening, diagnosis, treatment, and risk factors), administrative procedures (visits and telephone and mail contacts, study forms), practice intervention sessions, and a written examination. Problems or concerns with the interventions were addressed with the LHAs at weekly meetings, and the supervisor periodically attended home visits with each LHA to ensure protocol adherence in delivering the intervention.

The intervention was an individualized health education program that was tailored to the needs of each woman. The intervention consisted of three home visits with educational materials and follow-up phone calls and tailored mailings after each visit. The first visit (45–60 minutes) was conducted 2–4 weeks after completion of the baseline survey, and the focus of the visit was a detailed discussion about mammography, breast self-examination, breast cancer, and scheduling a mammogram. Visit two (30–45 minutes) was conducted 2–3 weeks

after the first visit and reinforced the information from the first visit and addressed the woman's barriers to completing mammography. Tailored phone calls and mailings were made during months 3–9 of the intervention to address any ongoing barriers and to encourage women to complete breast cancer screening. During the final visit (months 10–14), mammography screening was discussed along with reinforcing overall awareness of the importance of good breast health. Small gifts (calendars, coffee mugs) were given to the participants at this visit in appreciation of their time.

Participants were asked to complete a face-to-face follow-up survey that was similar to the baseline survey except that it asked about the intervention components to assess the value of the intervention and any contamination in the comparison group. Women who refused to complete the entire follow-up survey were asked to complete a shorter version of the survey. Ten percent of the women were recontacted by the assistant project manager to verify that the follow-up survey had been administered, and no problems were discovered. The control group received a mailing including a letter and a brochure focusing on cervical cancer screening from their physician 6 months after completing the baseline survey. Interviewers were blinded to intervention assignment of the women. A woman was defined as high risk for cervical cancer if she confirmed any of the following criteria on the baseline survey: (1) a history of being treated for a sexually transmitted disease (STD), (2) having present or previous sexual partners who had been treated for STDs, (3) engaging in sexual intercourse before 18 years of age, (4) having more than two sexual partners, or (5) ever smoking cigarettes on a regular basis. Risk-appropriate guidelines for cervical cancer screening are defined as a Pap test every year for women categorized as high risk, and every 3 years for women categorized as low risk for cervical cancer.[33]

Statistical analysis

There were 897 women eligible and randomized to one of the two study groups; 453 were in the intervention group, and 444 were randomized to the comparison group. The sample consisted of 295 African American women, 371 Native American women, and 226 white women, and 5 women were classified as being multiracial. The 5 multiracial women were excluded from the analyses so as to provide large cell counts and so that the study would focus on the three primary racial groups of interest. Of the 892 women, 41 moved, died, or were mentally/physically unable to complete the follow-up survey. Among the 851 (95.4%) women eligible for follow-up, 815 (95.8%) completed both baseline and follow-up surveys, which included information about Pap smear testing. Complete information for these analyses, which categorized women into high or low risk for developing cervical cancer, was available from 775 women (95%). Data for demographics, doctors' encouragement for Pap screening, and risk factors were taken from the baseline survey, and Pap screening behavior was taken from both the baseline and follow-up surveys.

Frequencies and percentages of demographics, such as race, age, education, work status, marital status, private insurance, and whether or not a doctor ever recommended a Pap smear were calculated and compared between groups using chi-square tests or *t* tests. Frequencies and percentages were also calculated and compared between groups for each cervical cancer risk factor (ever treated for STD, any partners treated for STD, sexual

intercourse before age 18, more than two sexual partners, and current or former smoker) and for women categorized as high risk for developing cervical cancer.

Risk-appropriate Pap screening rates were compared from baseline to follow-up using McNemar's test because of paired data from each woman completing both surveys. These comparisons were made across the entire sample to determine if cervical cancer screening rates were higher at follow-up overall and separately by intervention group, racial group (African American, Native American, and white), and cervical cancer risk group (high/low).

Risk-appropriate Pap screening rates were also calculated by intervention group and survey for levels of each of the demographic factors, doctor recommendation for a Pap test, and risk factors. A logistic regression analysis with repeated measures was fit for each of these factors to test for a relationship between levels of that factor and Pap smear completion after adjusting for survey and intervention group. Odds ratios (OR) and standard errors (SE) comparing levels within each factor were computed from each model.

Predictive logistic regression modeling, with purposeful forward selection, was then used to determine the set of baseline demographic and other factors most predictive of risk-appropriate Pap screening after simultaneously adjusting for the other predictors in the model. Intervention group (intervention/comparison), survey (baseline/follow-up), cervical cancer risk group (high/low), and racial group were forced into the model, and generalized estimating equations (GEE) were used to account for the correlated data within subject across time. The model also included interaction effects for survey by intervention group to test if Pap test completion increased more in the intervention group than in the comparison group, and survey by cervical cancer risk group to test if Pap test completion varied differently according to cervical cancer risk group. Other two-way interactions were considered according to their statistical significance. All statistical tests were performed at a two-sided $\alpha = 0.05$ level using the SAS System for Windows, version 9.1 (SAS Institute, Inc., Cary, NC).

RESULTS

The frequencies of demographic characteristics and doctor recommendation for a Pap smear from the baseline surveys of the 775 women are listed in Table 1. Thirty-two percent of the women were African American, 42% were Native American, and 25% were white. The average age was 54.95 years (SD = 11.1). Forty-four percent of the women never completed high school, and 43% reported working full or part time. Only 17% of the women were categorized as being High SES, which is defined by having a high school education, an income of at least $20,000, and private insurance. Nearly half (47%) of the women were married or living with partner, and 36% had private health insurance; 29% had no insurance at all. Sixty percent of the women reported that a Pap smear had not been recommended by their doctor. There were no statistically significant differences between the intervention and control groups in these variables at baseline.

Of the 815 participants completing baseline and follow-up surveys, 664 (85.7%) were categorized as being high risk for cervical cancer, 111 (14.3%) were low risk for cervical

cancer, and 40 subjects could not be categorized because of “refused” or “don’t know” survey responses. Data on participants’ responses to the baseline survey regarding the criteria of high risk for cervical cancer categorization are provided in Table 2. Over half of the women (54%) reported having more than two sexual partners in their lifetime, and 51% had sexual intercourse before age 18. A little more than half (53%) of the women reported ever having smoked on a regular basis. Ten percent were ever treated for having an STD, and 7% had partners who had been treated for an STD. There were no statistically significant differences between the intervention and control groups in these risk factors.

At the time of the baseline survey, 52.2% of all women were within risk-appropriate guidelines for a Pap smear. This rate significantly increased to 64.9% at follow-up (McNemar’s test, chi-square (1) = 38.42, $p < 0.001$) (Table 3). The percent of women within Pap smear guidelines increased in both the intervention and control groups and within each racial group. Whereas women in the high-risk group increased their Pap smear completion rate significantly (49% to 63%, McNemar’s test, chi-square (1) = 37.13, $p = <0.001$), women in the low-risk group did not significantly increase screening rates (73% to 77%, chi-square (1) = 1.33, $p = 0.248$).

Table 4 displays the frequencies and percentages of women within risk-appropriate guidelines for Pap smear by intervention group and survey for each of the baseline demographic variables, doctor recommendation for Pap smear testing, and cervical cancer risk factors. Odds ratios are displayed for each factor after adjusting for intervention group and survey. There was a significant association between age and risk-appropriate Pap smear compliance ($p < 0.001$), with women 40–49 years old more likely to be within guidelines than older women. Additionally, women were significantly more likely to be within Pap smear screening guidelines if they were high school graduates or had some college ($p < 0.001$), were working part-time or full-time ($p = 0.036$), were categorized as high SES ($p < 0.001$), or had received a doctor’s recommendation for a Pap test ($p = 0.010$).

Individual risk factors for cervical cancer were associated with being within risk-appropriate Pap screening guidelines. Women who had their first sexual intercourse before age 18 were less likely to be within guidelines ($p = 0.003$) as were women who had ever smoked cigarettes on a regular basis ($p = 0.014$) compared with nonsmokers. Women who were categorized as low risk were much more likely to be within risk-appropriate Pap guidelines ($p < 0.001$) compared with women at high risk for developing cervical cancer.

The final logistic regression model included factors for survey, intervention group, risk for cervical cancer, survey and intervention group, survey and risk for cervical cancer, and race (all forced into the model) along with age group, doctor’s recommendation for Pap test, SES, doctor’s recommendation and SES, and doctor’s recommendation and age group (selected for their predictive ability). Thirteen women had missing data for one or more covariates (assumed missing at random); thus, data from 762 women were included in the final model. The significance of each effect along with resulting ORs are displayed in Table 5. The odds of Pap smear completion within guidelines where higher at the follow-up survey than at the baseline survey for women in both the intervention group ($p < 0.001$) and the control group ($p = 0.025$), but this OR was not significantly different for women in the

intervention group than women in the control group ($p = 0.244$). The odds of being within guidelines increased from baseline to follow-up in the high risk for cervical cancer group ($p < 0.001$) significantly more than in the low risk for cervical cancer group ($p = 0.221$), as evidenced by a marginally significant interaction between cervical cancer risk group and survey ($p = 0.065$). The odds of Pap test compliance decreased with each successive age group compared to 40–49 year olds. A doctor's recommendation to have a Pap smear was associated with increased odds of Pap smear completion ($p = <0.001$), and odds were also increased for women in the high SES group compared with those in the low SES group ($p = 0.013$). The effect of the doctor's recommendation was significantly higher ($p = 0.002$) in the high SES group ($p = <0.001$) than in the low SES group ($p = 0.028$), and it had the largest effect in the group of women at least 70 years old ($p < 0.001$). Each of these ORs represent the odds after adjusting for all the other factors in the model.

DISCUSSION

There was a significant increase in the receipt of cervical cancer screening within guidelines among women who participated in the ROSE Project, originally designed to increase mammography screening rates among women in need of a mammogram. This increase in cervical cancer screening was documented in women randomly assigned to both the intervention and control groups, with no significant difference in these rates between groups at the follow-up survey. Additionally, cervical cancer screening within guidelines was increased at the follow-up survey in all three racial groups.

It is interesting to note, however, that although there was no significant increase in cervical cancer screening in women at low risk for cervical cancer (73.0% to 76.6%, $p = 00.248$), there was a significant increase among women at high risk for cervical cancer at the follow-up survey (48.7% to 62.9%, $p < 0.001$). Women categorized as high risk for cervical cancer were less likely to be screened within risk-appropriate guidelines at the baseline survey (48.7%) compared with women at low risk for cervical cancer (73.0%). Women in this study who were at high risk may not have been aware of the need to be screened annually, were less adherent to healthy behaviors, did not have the time, or might not have been able to complete the annual tests due to financial constraints.[25,33]

Predictors of the receipt of a Pap test in the present study were similar to those identified in previous studies conducted among different racial, SES, and cultural groups.[34–44] These factors include a physician's recommendation for a Pap test,[37,40] younger age,[42,44] and higher SES group.[34,40,41,42,44] Insurance status was not significantly associated with the receipt of a Pap test within guidelines, whereas previous studies have found an association.[34,35,37,39,42–44] The present study, however, did not examine the impact of beliefs and knowledge about Pap tests on Pap smear completion.

The LHA intervention tested in this study specifically focused on improving knowledge about, reducing barriers to, and providing social support for mammography.[26] The intervention did not focus specifically on Pap test completion, but as the LHA sessions are flexible, this topic may have been addressed. Additionally, the sessions may have provided the women with overall health awareness and empowerment skills. The brochure and letter

were a more traditional behavioral approach, addressing knowledge and physician recommendation for cervical cancer screening.[45–47]

Behavioral interventions designed to increase rates of one cancer screening test, especially those delivered by an LHA, provide a teachable moment to discuss being within risk-appropriate guidelines for all cancer screening tests. Previous studies testing interventions designed to increase multiple cancer screening behaviors have focused mostly on increasing breast and cervical cancer screening.[1–13] These interventions have been conducted in clinics, worksites, the community, and the participants' homes. The interventions were delivered by LHAs, especially in minority populations, but some interventions were also provided by nurses, community-based coalition members, and counselors. The research designs of these studies have varied, making the results of the different intervention strategies difficult to compare. Most interventions, however, demonstrated an increase in cancer screening completion rates.

The belief that an individual will adopt multiple health behaviors by specifically addressing only one health behavior has not been thoroughly investigated. The results of this study demonstrate that increasing awareness of different preventive health behaviors in an intervention directed at a specific behavior may prove to be worth the small additional effort. In a previous study, self-efficacy in changing one risk behavior (smoking) was significantly related to self-efficacy change in another behavior (exercise).[46] This suggests that an individual's attitude or confidence about changing one behavior may be associated either simultaneously or sequentially with another behavior. Although potentially practical, more studies specifically addressing multiple cancer screening tests must be conducted in the future before a definitive recommendation can be made about this complex behavioral and logistic relationship. Based on this study, recalcitrant women (approximately 30% of the study population who did not receive a Pap smear) may need more intensive interventions focusing on cervical cancer to increase Pap smear screening rates.

This study has several strengths. This was a randomized trial of underserved women belonging to three racial groups who lived in a rural county in North Carolina. In addition, 95% of the women who completed the baseline survey were eligible for the follow-up survey, and the response rate for the follow-up survey was 95%. A limitation of this study is that it was based on women's self-report of Pap tests, which has been shown to vary in accuracy compared with medical records.[47–50] As no intervention effect was found, however, there is no reason to believe that participants in the intervention arm biased reporting of Pap test completion at follow-up. Additionally, awareness of Pap testing may have been raised among women because of questions about Pap test completion on the baseline survey. The frequency of discussion about cervical cancer screening during the LHA visits was not documented, and this may have influenced the increased rate of Pap test completion in the intervention group. Although the increase in cervical screening may have been due to a secular trend, the Behavioral Risk Factor Surveillance System (BRFSS) data suggest that the cervical screening rates did not change during the period of the study. Pap test rates were low at both baseline (52.5%) and follow-up (65.2%) in this study compared with the 68% rate from the BRFSS for women 40+ years in the United States during that same time period[51]; thus, this group of women was in need of interventions for cervical

cancer screening. Finally, the clinic patients included in this study may not represent all women in the United States, as they were from a federally qualified health center, and all women needed a mammogram.

In conclusion, this study describes the cervical cancer screening behaviors of women participating in an intervention designed to increase mammography rates. The results of this study suggest that it might be beneficial to address multiple cancer screening tests in behavioral interventions. Although the results of this study are supportive of addressing multiple behaviors, the increased burden of changing multiple behaviors needs further exploration. Future theoretical research and intervention studies should address the behavioral and logistic ramifications of improving multiple cancer screening test rates simultaneously.

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Table 1

Demographic Characteristics of Participants at Baseline by Treatment Groups[a]

Variable	Intervention (*n* = 387)	Control (*n* = 388)	Total (*n* = 775)
Race			
African American	125 (32%)	125 (32%)	250 (32%)
Native American	163 (42%)	165 (43%)	328 (42%)
White	99 (26%)	98 (25%)	197 (25%)
Age range (years)			
40–49	175 (45%)	161 (42%)	336 (43%)
50–59	108 (28%)	105 (27%)	213 (28%)
60–69	57 (15%)	70 (18%)	127 (16%)
70+	47 (12%)	51 (13%)	98 (13%)
Mean age: Years (SD)	54.39 (10.7)	55.52 (11.4)	54.95 (11.1)
Education			
<High school	165 (43%)	176 (45%)	341 (44%)
High school	110 (28%)	128 (33%)	238 (31%)
Some college	112 (29%)	84 (22%)	196 (25%)
Work status			
Work full-time/part-time	177 (46%)	157 (40%)	334 (43%)
Retired	52 (13%)	45 (12%)	97 (13%)
Homemaker	47 (12%)	61 (16%)	108 (14%)
Unable/disability	95 (25%)	102 (26%)	197 (25%)
Unemployed/other	16 (4%)	23 (6%)	39 (5%)
SES[b]			
Lower SES	311 (82%)	328 (85%)	639 (83%)
High SES	70 (18%)	57 (15%)	127 (17%)
Marital status			
Married/living together	177 (46%)	185 (48%)	362 (47%)
Divorced/separated	88 (23%)	85 (22%)	173 (22%)
Widowed	91 (24%)	86 (22%)	177 (23%)
Never married	31 (8%)	32 (8%)	63 (8%)
Insurance			
None	101 (27%)	122 (32%)	223 (29%)
Not private	131 (35%)	132 (35%)	263 (35%)
Private	147 (39%)	126 (33%)	273 (36%)
Doctor recommendation for Pap smear			
Yes	164 (42%)	148 (38%)	312 (40%)
No	223 (58%)	240 (62%)	463 (60%)

[a] No differences between the groups were statistically significant at the $p < 0.05$ level.

[b] SES, socioeconomic status; High SES, high school graduate + annual income of at least $20,000 + private insurance.

Table 2

Positive Responses to Criteria for Classification of Being High Risk for Cervical Cancer by Treatment Group and Overall

Criterion	Intervention (*n* = 387)	Control (*n* = 388)	Total (*n* = 775)
Partner with treated STD[a]	30 (8%)	21 (6%)	51 (7%)
Treated STD	44 (11%)	31 (8%)	75 (10%)
Age <18 years at first sexual intercourse	196 (52%)	188 (50%)	384 (51%)
Current or former smoker	211 (55%)	200 (52%)	411 (53%)
>2 sexual partners	201 (57%)	177 (52%)	378 (54%)
High risk	335 (87%)	329 (85%)	664 (86%)

[a]STD, sexually transmitted disease.

Table 3

Percent of Participants by Treatment Group, Race, and Cervical Cancer Risk Characterization within Risk-Appropriate Guidelines for Pap Testing at Baseline and Follow-Up Surveys (n = 775)

	% within risk-appropriate guidelines for Pap testing		McNemar test	
	Baseline	**Follow-up**	**Chi-square (1 df)**	***p* value**
Overall treatment	52.2	64.9	38.42	<0.001
Intervention	51.6	66.6	29.00	<0.001
Control	52.9	63.2	11.94	<0.001
Race				
African American	55.0	66.7	10.65	0.001
Native American	50.6	62.9	15.09	<0.001
White	51.3	66.0	12.94	<0.001
Risk status				
Low risk	73.0	76.6	1.33	0.248
High risk	48.7	62.9	37.13	<0.001

Table 4

Odds Ratios Comparing Demographic Groups on Compliance with Risk-Appropriate Guidelines for Pap Testing by Treatment Groups (n = 775)

Variable	Control baseline	Control follow-up	Intervention baseline	Intervention follow-up	OR (95% CI)
Race					
African American	62 (50%)	80 (64%)	75 (60%)	87 (70%)	1.10 (0.81, 1.51)
Native American	91 (55%)	101 (62%)	74 (46%)	105 (64%)	0.92 (0.69, 1.24)
White[a]	51 (52%)	64 (65%)	50 (51%)	66 (67%)	1.0
					p = 0.458
Age range (years)					
40–49[a]	91 (57%)	103 (64%)	109 (62%)	129 (74%)	1.0
50–59	52 (50%)	71 (68%)	47 (44%)	74 (69%)	0.74 (0.56, 0.98)
60–69	39 (57%)	45 (65%)	28 (49%)	36 (63%)	0.79 (0.55, 1.12)
70+	22 (43%)	25 (49%)	15 (32%)	19 (40%)	0.38 (0.26, 0.57)
					p = <0.001
Education					
<High school[a]	83 (47%)	102 (58%)	72 (44%)	95 (58%)	1.0
High school	71 (55%)	85 (66%)	61 (56%)	80 (73%)	1.57 (1.19, 2.07)
Some college	50 (60%)	58 (69%)	66 (59%)	83 (74%)	1.79 (1.32, 2.42)
					p = <0.001
Work status					
Homemaker	33 (54%)	37 (62%)	25 (54%)	32 (68%)	0.96 (0.66, 1.38)
Retired	23 (52%)	23 (51%)	19 (37%)	24 (46%)	0.55 (0.37, 0.82)
Unable/disability	53 (52%)	67 (66%)	48 (51%)	65 (68%)	0.94 (0.70, 1.26)
Unemployed/other	14 (61%)	15 (65%)	12 (75%)	11 (69%)	1.33 (0.79, 2.27)
Work full-time/part-time[a]	81 (52%)	103 (66%)	95 (54%)	126 (71%)	1.0
					p = 0.036
SES[b]					
High SES	35 (61%)	45 (79%)	45 (64%)	53 (76%)	1.82 (1.29, 2.57)
Lower SES[a]	167 (51%)	199 (61%)	151 (49%)	201 (65%)	1.0
					p = <0.001

Variable	Control baseline	Control follow-up	Intervention baseline	Intervention follow-up	OR (95% CI)
Marital status					
Divorced/separated	40 (47%)	48 (56%)	51 (58%)	69 (78%)	0.98 (0.72, 1.33)
Married/living together[a]	109 (59%)	128 (70%)	88 (50%)	112 (63%)	1.0
Never married	13 (41%)	21 (66%)	18 (58%)	20 (65%)	0.87 (0.56, 1.33)
Widowed	42 (49%)	48 (56%)	42 (47%)	57 (63%)	0.75 (0.55, 1.02)
					p = 0.293
Insurance					
None[a]	61 (50%)	85 (70%)	48 (48%)	64 (63%)	1.0
Not private	63 (48%)	74 (56%)	66 (50%)	83 (63%)	0.87 (0.65, 1.17)
Private	77 (61%)	85 (67%)	81 (55%)	107 (73%)	1.31 (0.97, 1.77)
					p = 0.019
Doctor recommended					
No[a]	118 (49%)	142 (59%)	112 (50%)	141 (63%)	1.0
Yes	86 (59%)	103 (70%)	87 (53%)	117 (71%)	1.37 (1.08, 1.75)
					p = 0.010
More than 2 sexual partners					
No[a]	89 (54%)	103 (63%)	83 (54%)	102 (67%)	1.0
Yes	94 (53%)	113 (64%)	99 (50%)	138 (69%)	0.98 (0.76, 1.26)
					p = 0.854
<18 at first sexual intercourse					
No[a]	114 (61%)	123 (65%)	99 (54%)	131 (72%)	1.0
Yes	84 (45%)	115 (61%)	95 (49%)	122 (62%)	0.70 (0.55, 0.89)
					p = 0.003
Ever smoked					
No[a]	104 (56%)	123 (65%)	101 (57%)	125 (71%)	1.0
Yes	100 (50%)	122 (61%)	98 (47%)	133 (63%)	0.74 (0.58, 0.94)
					p = 0.014
Ever treated for STD					
No[a]	189 (53%)	225 (64%)	177 (52%)	230 (67%)	1.0
Yes	13 (42%)	19 (61%)	22 (50%)	28 (64%)	0.83 (0.58, 1.20)

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Variable	Control baseline	Control follow-up	Intervention baseline	Intervention follow-up	OR (95% CI)
					p = 0.328
Any partners treated for STD					
No[a]	192 (54%)	228 (64%)	182 (52%)	235 (67%)	1.0
Yes	8 (38%)	13 (62%)	13 (43%)	19 (63%)	0.74 (0.47, 1.15)
					p = 0.184
Risk					
High[a]	163 (50%)	201 (61%)	159 (48%)	217 (65%)	1.0
Low	41 (69%)	44 (75%)	40 (77%)	41 (79%)	2.41 (1.59, 3.68)
					p = <0.001

[a] Referent category.

[b] SES, socioeconomic status; High SES, high school graduate + annual income of at least $20,000 + private insurance.

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Table 5

Predictors of Pap Screening within Risk-Appropriate Guidelines and Their Significance from Final Multivariable Logistic Regression Model Along with Relevant Odds Ratios from Model (n = 762)

Effect	DF	Chi-square	Pr > ChiSq[a]	Comparison	Within group	OR (95% CI)	*p* value[b]
Race	2	1.37	0.5040	African American vs. white	—	1.16 (0.83, 1.62)	0.392
				Native American vs. white	—	0.98 (0.72, 1.34)	0.910
Survey	1	13.72	0.0002	Follow-up vs. baseline	—	1.53 (1.25, 1.88)	<0.001
Treatment	1	0.06	0.8129	Intervention vs. control	—	1.03 (0.80, 1.32)	0.813
Survey × treatment	1	1.36	0.2437	Follow-up vs. baseline	Control group	1.38 (1.04, 1.82)	0.025
					Intervention group	1.70 (1.31, 2.21)	<0.001
Risk	1	26.60	<0.0001	Low risk vs. high risk	—	3.05 (1.97, 4.74)	<0.001
Survey × risk	1	3.41	0.0648	Follow-up vs. baseline	High risk	1.88 (1.54, 2.28)	<0.001
					Low risk	1.25 (0.87, 1.79)	0.221
Doctor recommendation	1	18.37	<0.0001	Doctor recommendation: Yes vs. no.	—	2.54 (1.66, 3.87)	<0.001
SES	1	6.62	0.0101	High SES vs. low SES	—	1.63 (1.11, 2.41)	0.013
Doctor recommendation × SES	1	9.81	0.0017	Doctor recommendation: Yes vs. no.	High SES	4.64 (2.19, 9.86)	<0.001
					Low SES	1.39 (1.04, 1.86)	0.028
Age group	3	22.71	<0.0001	50–59 vs. 40–49	—	0.86 (0.64, 1.17)	0.347
				60–69 vs. 40–49	—	0.73 (0.51, 1.05)	0.094
				70+ vs. 40–49	—	0.32 (0.20, 0.49)	<0.001
Doctor recommendation × age group	3	19.06	0.0003	Doctor recommendation: Yes vs. no.	Ages 40–49	1.53 (0.98, 2.39)	0.062
					Ages 50–59	3.62 (2.07, 6.33)	<0.001
					Ages 60–69	1.18 (0.59, 2.37)	0.638
					Ages 70+	6.33 (2.75, 14.6)	<0.001

[a] Score statistics for type 3 GEE analysis.

[b] All *p* values are unadjusted for multiple hypothesis tests. The primary hypothesis is for the interaction of survey and treatment group along with the ORs for screening at follow-up vs. baseline for each treatment group, and other *p* values may be considered exploratory.