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Cancer Screening Patterns by Weight Group and Gender for Urban African-American Church Members

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Abstract

Background—Obese white women have lower rates of cancer screening compared to non-obese women. This study will determine if a relationship exists between weight and adherence to cancer screening guidelines among African Americans.

Methods—We used multivariate logistic regression to examine the relationship between being up-to-date with cancer screening (colorectal, breast, cervical, and prostate) and weight group (normal, overweight, obese I, obese II+) using data from older (age 50+) members (N=955) of 20 African American churches in Michigan and North Carolina. CRC testing rates were examined using multiple definitions to account for differences in screening rates vs. polyp surveillance rates.

Results—After adjusting for confounders, we found relationships between weight group and up-to-date CRC (p=0.04) and PSA (p=0.004) testing for men and mammography (p=0.03) for women. Compared to normal-weight men, obese I men were more likely to be up-to-date with CRC (OR 2.35, 95%CI 1.02–5.40) and PSA (OR 4.24 95%CI 1.77–10.17) testing. CRC screening rates were lower when individuals with polyps were excluded from the analysis; however, patterns by weight remained the same.

Conclusions—Contrary to previous research, we did not find lower rates of cancer screening among obese African Americans. Instead, we found that normal-weight African American men had lower screening rates than any other group. As we did not consistently find lower screening

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rates among obese African Americans, targeting this group for increased screening promotion may not be the most effective way to reduce weight-related cancer disparities.

Keywords

Screening& Early Detection; Polyp Surveillance; Obesity; Disparities; African American

Background

Obesity increases risk for several cancers, including colorectal, breast, and prostate cancer. Obese individuals are estimated to be up to 62% more likely to die from cancer than normal weight individuals (1). Obesity rates in the United States remain high, especially among minority groups such as African Americans (2). African Americans also have higher cancer mortality rates than any other racial/ethnic group (3). Improving rates of cancer prevention behaviors (e.g., physical activity, fruit and vegetable intake, and screening) among higher risk sub-groups such as obese individuals and African Americans may help reduce disparities in cancer incidence and mortality.

Previous studies indicate that obese individuals may have lower rates of cancer prevention behaviors, including physical activity (4) and cancer screening (5). It is unclear, however, whether weight-related disparities in cancer screening behavior exist among African Americans. Understanding the relationship between weight and cancer screening among African Americans will help to better target future cancer prevention interventions to the most vulnerable sub-groups.

Review studies found that an association between obesity and lower rates of breast and cervical cancer screening existed for white women, but not for men or other races (5–7). A recent race-stratified analysis found that obese white women had lower rates of colorectal (CRC) screening, particularly colonoscopy, than non-obese white women (OR 0.66, 95%CI 0.50–0.85) (8). No relationship between weight and CRC screening was found for African American women (OR 1.30, 95%CI 0.83–2.96). This contradicts earlier research in rural African American churches which found that obese women were less likely to report a past-year screening (4). This research was conducted at a time when stool card testing was more prevalent than colonoscopy. Furthermore, none of the above studies differentiate between screening and polyp surveillance. This may be important, given that obese individuals may have a higher risk of polyps (9); it is possible that including tests which were completed for diagnostic or surveillance purposes may obscure differences in usage of preventive screening.

The main goal of the present study was to add to the literature on weight and cancer screening among African Americans. First, we examined differences in CRC screening rates among normal weight, overweight, obese I and obese II+ African American men and women. Specifically, we wanted to determine whether the previously observed negative relationship between CRC screening and weight seen among African American church members (4) persists now that colonoscopy is the preferred screening modality. Next, we examined whether results differed based on the definition of CRC screening used. Finally, we looked at screening patterns by weight for breast, cervical, and prostate cancer, as the relationship between weight and screening is under-studied among African Americans.

Methods

Study Participants

Data for this analysis were collected from the baseline survey of the ACTS of Wellness Study, a CRC prevention trial conducted in urban African American churches in North Carolina and Michigan. Eligible individuals were African American church members, age 50 or older, who participated in the baseline survey. Churches were recruited from urban areas in two states: Flint, Michigan, and Wake, Durham, and Guilford counties in North Carolina. Churches were eligible to participate in the project if they had at least 50 members who were age 50 or older and had a coordinator who was willing to help recruit members. A total of 19 churches were enrolled in the study: 12 churches in North Carolina and 7 in Michigan. Prior to randomization to the intervention, participants completed a self-administered 100-item paper and pencil survey which included information on demographics, fruit and vegetable intake, cancer screening, physical activity, and health status.

Measures

Weight Group. Body Mass Index (BMI) was calculated using self-reported height and weight. Individuals were then categorized into weight groups based on their BMI: normal weight (BMI 18.5–24.94), overweight (BMI 24.95–29.94), obese I (BMI 29.95–34.94) and obese II+(34.95+).

Colorectal Cancer Screening behavior was ascertained using measures proposed and validated by Vernon et al. (10, 11). From this were created a variable indicating whether individuals had met average-risk guidelines for “Any CRC Screening” including stool blood test in the past year, colonoscopy in the past 10 years, flexible sigmoidoscopy in the past 5 years, double contrast barium enema in the past 5 years or virtual colonoscopy in the past 5 years (12). We also looked separately at use of colonoscopy (within the past 10 years) and stool blood test (within the past year).

Other screenings. We measured other cancer screening behaviors for men (PSA and DRE) and women (mammogram and pap smear) using two questions for each test. Test descriptions and questions were taken verbatim from the Healthy Information National Trends Survey (13). A woman was considered up-to-date for a given screening if she had a mammogram within the past year or a pap smear within the past two years. We considered a man with a PSA test or DRE within the past year to be up-to-date for those tests.

Other covariates. Continuous variables included age, co-morbidities, and self-reported fruit and vegetable intake (servings/day). The co-morbidities variable was created by summing all positive responses to the question “Have you been diagnosed with any of the following illnesses: high blood pressure, heart disease, diabetes, arthritis, or cancer?” Fruit and vegetable (F&V) intake was assessed with two validated measures. The first was a 10-item food frequency questionnaire assessing frequency over the last month, adapted from a 35-item measure for US Southern African Americans (14). We excluded the item on French fries/fried potatoes, leaving nine items for analysis. We also used a two-item measure to assess usual F&V intake (separate items for total fruits and total vegetables consumed “each day”) (14). Categorical variables included state (North Carolina or Michigan), gender, marital status (married or living with a partner, never married, divorced/separated, or widowed), education (11th grade or less, high school graduate/GED, trade/beauty/some college, college graduate, more than college), health insurance (yes/no), had polyps removed (yes/no), family history of colon cancer (yes/no), health status (excellent, very good, pretty good, fair/poor), income (<20,000, 20,000–49,999, 50,000–99,999, 100,000+, missing). Physical activity minutes per week were calculated based on seven activities (run/jog, bike, active sports, dance, swim, walk/hike, and aerobics or other moderate/vigorous activity). For each activity, participants indicated frequency (rarely or never, 1–3 times per month, 1–2 times per week, 3–4 times per week or 5 or more times per week) and duration of activity (less than 20 minutes or 20 minutes or more); these numbers were multiplied for each activity and the resulting minutes per week were summed across activities to create a final physical activity score (15). Participants were then dichotomized based on whether they were meeting the physical activity recommendation of 150 minutes per week of moderate or vigorous activity (16).

Primary Analyses

All analyses were completed using SAS version 9.2 survey procedures to account for randomization by church. We used chi-square and t-tests to assess relationships between weight group and both categorical and continuous variable, respectively. All tests were adjusted for clustering at church level. To justify stratifying the adjusted analyses by gender, we tested whether gender moderated the relationship between each CRC screening variable and weight. We created multivariate logistic regression models for each CRC screening outcome that included BMI group, gender, an interaction term (BMI group*gender) and selected covariates. For each model, we initially included any covariate which was associated with BMI group or screening ($p<0.1$). The final model retained covariates which were associated with the outcome ($p>0.1$) and did not change the estimate of the interaction term by 10% or more. If the interaction term remained significantly ($p<0.05$) associated with a given screening outcome in the final model, we conducted gender-stratified multivariate logistic regression analyses to assess relations between weight group and screening measures separately for men and women. If the interaction term was not significant, the interaction term was removed and the relationship between screening and weight groups was examined for men and women together.

Analyses Using Alternative Screening Definitions

In addition to the primary analyses using previously-defined definitions of colorectal cancer screening, we conducted analyses using alternative definitions of “up-to-date CRC testing.” These analyses accounted for the fact that more frequent screening is recommended for certain high-risk groups, such as those who previously had polyps. First we stratified the sample by polyp status: individuals who responded ‘yes’ to the question “have you ever had polyps or growths removed from your colon?” versus those who answered ‘no’ or ‘don’t know.’ For those without polyps, we created an up-to-date screening variable indicating whether or not they were meeting guidelines for average-risk individuals (as discussed above). For those with polyps, we created an up-to-date surveillance variable using self-reported data on when their doctor told them to return for follow-up. Possible answer choices were: every year, every two years, every five years, every 10 years, other, (s)he didn’t tell me when to return, and don’t know. Individuals were considered up-to-date for surveillance if they reported having a colonoscopy within the time-frame that the physician had indicated. If a person answered ‘other’, ‘(s)he didn’t tell me when to return’, or ‘don’t know’ they were considered up-to-date if they had a colonoscopy within the past 5 years. Lastly, we created a combined variable (up-to-date screening or surveillance) that included all individuals and indicated whether they were meeting the guidelines which applied to them: people without previous polyps were considered up-to-date if they were meeting screening guidelines while people with previous polyps were considered up-to-date if they were meeting surveillance guidelines. We repeated all adjusted and unadjusted analyses using the new variables.

Results

Weight Group Characteristics

Characteristics for the sample and for each weight group are shown in Table 1. There were statistically significant (p<0.05) differences by weight for gender, age, co-morbidities, health status, and physical activity. Obese individuals were younger, more likely to be female, had more co-morbidities, and were more likely to rate their health as poor/fair. We also found a relationship between weight group and physical activity (p=0.001). Only 25.3% of obese individuals reported engaging in at least 150 minutes of moderate or vigorous recreational physical activity, compared with 40.0% of normal-weight participants.

Cancer Screening

<u>CRC Screening</u> rates for the entire sample and by weight group are shown in table 1 (men and women combined), table 2 (men only) and table 3 (women only). Overall, women had slightly higher rates of CRC screening than men, but with one exception, these differences were not statistically significant. Among individuals with polyps, women were more likely to be meeting surveillance guidelines than men (p<0.03). Gender moderated the relationship between weight group and being up-to-date with any CRC screening (p=0.04); therefore, analyses were stratified for this variable. Bivariate analyses found no significant relationships between weight group and being up-to-date for CRC screening for men (Table 4) or women (Table 5). After adjusting for potential confounders, we found a significant association between weight and CRC screening for men (p=0.04). Men in the obese I group were significantly more likely to be up-to-date with screening (OR 2..40, 95%CI: 1..05–5.48) than normal-weight men. There were no significant differences in screening for women, but we saw a pattern in which obese women (I and II+) were less likely to be up-to-date with CRC screening than non-obese (normal or overweight) women. Gender did not moderate the relationship between weight group and CRC screening for the other variables (colonoscopy only, stool test only), nor was there a relationship between weight group and those variables.

<u>Prostate cancer screening</u> (PSA and DRE) rates are shown in Table 2, and odds ratios are shown in Table 4. We found a statistically significant relationship between PSA screening and weight group (p=0.05): men in the obese I group were more likely to report an up-to-date PSA test than normal-weight men (75.0% vs. 54.3%). This relationship persisted after adjusting for confounders (p=0.01); men in the obese I group were more likely to be up-to-date with prostate cancer screening than normal weight men (OR 4.25, 95%CI 1.63–11.12). After adjusting for confounders, we found a relationship between DRE screening and weight group (p=0.05); overweight and obese I men had higher rates of up-to-date DRE than normal-weight men.

<u>Mammogram and Pap Smear</u> rates for women are shown in Table 3, and odds ratios are shown in Table 5. After adjusting for confounders, we saw a statistically significant relationship between weight group and up-to-date mammogram (p=0.03). Overweight women were more likely than normal-weight to be up-to-date with mammogram recommendations (OR 1.47, 95%CI 1.00–2.88). A similar pattern was seen for pap smear, but that relationship was not statistically significant.

Alternative CRC Screening Definitions

In order to differentiate between preventive CRC screening and polyp surveillance, we looked separately at individuals who reported ever having had polyps removed from their colon. Bivariate analyses did not find any statistically significant differences by weight group for compliance with physician recommendation for polyp surveillance or CRC

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screening among men (Table 2) or women (Table 3). Also, there was no statistically significant relationship between weight group and the combined "up-to-date screening or surveillance" variable for men and/or women. While the pattern by weight was similar as was seen for the "any CRC screening variable," screening rates were lower across the board when individuals with polyps were held to a higher standard. Gender did not moderate the relationship between weight group and the alternative variables; thus we did not conduct gender-stratified adjusted models for these variables. Adjusted analyses with men and women together revealed no statistically significant association between any of the alternative screening variables and weight.

Discussion

We found a statistically significant relationship for men between weight group and having an up-to-date CRC screening test. Men in the obese I and overweight groups had higher screening rates than men in the normal-weight or obese II groups. When other definitions of CRC screening were used, the pattern remained, but the relationship was no longer significant. Contrary to our previous research in African American churches (4), we did not find a statistically significant association between weight and CRC screening among women.

Our findings for breast and cervical cancer screening are similar to previous research indicating that African American women categorized as overweight or obese I have higher screening rates than those of normal weight (6, 7); while not statistically significant, our pattern showed higher screening rates among overweight and obese II+ women (but not among obese I women). For prostate cancer screening, previous research in mixed-race samples has found that rates were highest among obese men compared to normal-weight or overweight men (17, 18). We found significantly higher rates of screening among obese I men compared to other weight groups; unlike other studies, obese II+ men had the lowest screening rates. While our results may be different because we only included African American men, it is also possible that the small sample size leads to distorted estimates when it is further divided by weight group.

In addition to the small number of men surveyed, this study has other limitations. Churches and participants within churches were based on a convenience sample of those willing to participate in a CRC prevention intervention. These self-selected participants may be healthier than their peers, which may limit generalizability. This sample also has higher average screening rates, education, and income than is seen among African Americans in national samples (8). It is unclear whether healthier, more educated individuals have higher or lower screening rates. It is possible that less healthy individuals with more co-morbidities have more frequent visits to a physician and thus are more likely to receive a recommendation for screening. While this may partially explain higher screening rates seen among overweight and obese individuals, this pattern persisted after adjusting for co-morbidities and other potential confounders.

A strength of this study is our examination of multiple definitions of up-to-date colorectal cancer testing. In our previous work, we hypothesized that obese individuals may have inflated screening rates because they are undergoing more diagnostic or surveillance procedures. Reported rates of previous polyps were higher among obese individuals, but when individuals with previous polyps were removed from the sample, we still saw similar screening patterns across weight groups. However, CRC screening rates were more than ten percentage points lower when we removed individuals with polyps or held them to more rigid screening guidelines. This highlights the importance of differentiating between

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screening and surveillance; using average risk screening rates for everyone in a mixed-risk population may lead to an inflated estimate of screening.

In conclusion, we did not find a relationship between cancer screening and weight group for African American women, but we did find differences by weight for men. Across the board, normal-weight men have lower cancer screening rates than any other weight group. This may be because normal-weight men are (or presume themselves to be) healthier than their heavier counterparts, and therefore are less likely to see a physician on a regular basis. Fewer visits mean fewer opportunities for the physician to make screening recommendations. While physicians play an important role in delivering the screening message, they cannot make recommendations unless a patient comes to them. Community-based interventions, such as the church-based study from which these data were collected, could potentially play an important role in reaching individuals who do not regularly see a physician.

As we did not find lower cancer screening rates among obese African Americans, targeting screening behavior may not be the best way to reduce weight-related cancer disparities. Of the cancer-prevention behaviors measured in this study, physical activity was the only one which was consistently lower among obese individuals. Behavioral interventions focused on improving physical activity rates among obese men and women may be more effective at reducing the cancer disparities seen between obese and non-obese African Americans.

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Table 1

Characteristics of ACTS of Wellness Project Participants by BMI Group

Variable	Entire sample (n=955)	Normal-weight (BMI 18.5–24.9) n=125	Over-weight (BMI 25–29.9) n=356	Obese I (BMI 30–34.9) n=260	Obese II/III (BMI 35–39.9) n=191	*P**
State						0.62
North Carolina	64.5	62.4	64.9	61.8	67.7	
Michigan	35.5	37.6	35.1	38.2	32.3	
Gender, %						<0.0001
Male	29.8	29.6	39.9	25.4	18.2	
Female	70.2	70.4	60.1	74.6	81.7	
Age, *Mean (SE)*	62.6 (0.73)	64.9 (1.13)	63.2 (0.94)	62.3 (0.94)	60.5 (0.59)	<0.0001
Marital status, %						0.05
Married/living with partner	53.6	53.2	56.4	54.4	49.0	
Never married	7.2	8.1	6.2	4.3	11.2	
Divorced/separated	21.1	17.7	21.0	20.9	24.0	
Widowed	18.1	21.0	16.4	20.5	15.8	
Education, %						0.96
11th grade or less	7.3	10.4	8.0	6.2	5.6	
High school graduate/GED	19.9	20.0	20.2	20.6	18.3	
Trade/beauty/some college	33.3	33.6	31.6	35.0	34.0	
College graduate	18.9	17.6	19.1	17.5	21.3	
More than college	20.7	18.4	21.1	20.6	20.8	
Income, %						0.09
<20,000	18.1	26.6	16.3	17.6	16.7	
20,000–49,999	34.9	30.4	33.4	32.4	42.4	
50,000–99,999	27.1	23.2	27.8	18.3	27.8	
100,000+	10.1	7.2	11.8	11.8	6.6	
Income missing	9.8	13.6	10.1	9.9	6.6	
Health insurance	97.8	97.6	98.3	97.7	97.5	0.88
Co-morbidities, *mean (SE)*	1.6 (0.05)	1.5 (0.07)	1.5 (0.07)	1.5 (0.08)	2.0 (0.09)	<0.0001
Had polyps removed from colon, %	32.5	30.4	28.5	35.1	38.6	0.07
Family history of colon cancer, %	11.5	8.8	10.7	11.5	15.2	0.32

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Variable	**Entire sample (n=955)**	**Normal-weight (BMI 18.5–24.9) n=125**	**Over-weight (BMI 25–29.9) n=356**	**Obese I (BMI 30–34.9) n=260**	**Obese II/III (BMI 35–39.9) n=191**	***p****
Health status, %	5.0	10.5	5.9	3.5	1.6	<0.0001
Excellent	33.5	39.5	37.6	31.0	26.8	
Very good	48.7	40.3	47.7	52.7	51.0	
Pretty good	12.8	9.7	8.8	12.8	20.6	
Fair/poor						
CRC screening, %	74.5	71.2	76.7	73.3	73.2	0.58
Any test	67.0	62.4	66.6	67.6	69.7	0.59
Colonoscopy only	12.3	16.0	12.4	9.2	13.1	0.25
Stool test only						
Moderate and vigorous recreational physical activity *≥150 min/week, %*	32.9	40.0	38.8	28.2	25.3	0.0002
Fruit and vegetable servings/day, *Mean* (*SE*)	4.2 (0.10)	4.4 (0.30)	4.2 (0.18)	4.1 (0.24)	4.1 (0.18)	0.33

* P-value for chi-square test of association between weight group and characteristics/behaviors

Table 2

Screening Behaviors of ACTS of Wellness Project Participants by BMI Group: Men Only

Variable	Entire sample n=284	Normal-weight (BMI 18.5–24.9) n= 37	Overweight (BMI 25–29.9) n=142	Obese I (BMI 30–34.9) n=66	Obese II+ (BMI 35–39.9) n=36
CRC screening, % Any test Colonoscopy only Stool test only	72.9 64.4 12.7	62.2 59.5 10.8	74.7 64.8 14.1	77.2 68.2 9.1	66.6 61.2 16.7
Up-to-date CRC testing, % Screening† Polyp surveillance‡ Screening or surveillance	60.7 68.2 63.0	46.2 72.7 54.1	62.6 69.8 64.8	63.6 72.7 66.7	58.3 50.0 55.6
Up-to-date prostate cancer screening, % Digital rectal exam PSA test	 57.6 64.7	 46.0 54.3	 61.4 64.4	 60.9 75.0	 47.1 57.1

†Only includes individuals who did not report previously having polyps removed from their colon (n=195).

‡Only includes individuals who reported previously having polyps removed from their colon (n=88).

Table 3

Screening Behaviors of ACTS of Wellness Project Participants by BMI Group: Women Only

Variable	**Entire sample n=668**	**Normal weight (BMI 18.5–24.9) n=88**	**Overweight (BMI 25–29.9) n=214**	**Obese I (BMI 30–34.9) n=194**	**Obese II+ (BMI 35–39.9) n=161**
CRC screening, % Any test Colonoscopy only Stool test only	75.4 68.4 12.7	75.0 63.6 18.2	78.0 67.8 11.2	72.7 68.0 9.3	75.1 72.1 12.4
Up-to-date CRC testing, % Screening† Polyp surveillance‡ Screening or surveillance	64.2 82.8 70.4	62.3 77.8 67.0	67.9 89.7 73.8	61.6 78.3 67.5	61.9 85.9 71.4
Up-to-date mammogram, %	76.1	72.9	79.5	72.9	78.5
Up-to-date Pap smear, %	75.2	74.6	81.0	71.1	74.5

†Only includes individuals who did not report previously having polyps removed from their colon (n=446).

‡Only includes individuals who reported previously having polyps removed from their colon (n=221).

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Table 4

Odds of Getting Screened by Weight Group: Men

Outcome	Normal-weight (BMI 18.5–24.9) n=37	Overweight (BMI 25–29.9) n=142	Obese I (BMI 30–34.9) n=66	Obese II+ (BMI 35–39.9) n=36	*P*
Any CRC screening					
Unadjusted*	1.00	1.79 (0.84–3.83)	2.07 (1.00–4.29)	1.22 (0.54–2.74)	0.19
Adjusted[1]	1.00	2.01 (0.72–5.56)	2.35 (1.02–5.40)	0.73 (0.23–2.28)	0.04
Up-to-date PSA, %					
Unadjusted*	1.00	1.53 (0.66–3.52)	2.53 (1.02–6.26)	1.12 (0.26–4.77)	0.05
Adjusted[2]	1.00	1.70 (0.96–4.17)	4.25 (1.63–11.12)	1.34 (0.25–7.21)	0.01
Up-to-date DRE, %					
Unadjusted*	1.00	1.87 (0.87–4.04)	1.84 (0.79–4.25)	1.05 (0.43–2.53)	0.09
Adjusted[3]	1.00	1.88 (0.89–3.88)	1.77 (0.74–4.23)	0.83 (0.28–2.47)	0.05

* Adjusted for church

1 Adjusted for co-morbidities, age, marital status, income, health status, education, history of polyps, family history of CRC, insurance and church

2 Adjusted for co-morbidities, age, marital status, income, health status, physical activity, insurance, and church

3 Adjusted for co-morbidities, marital status, income, education, and church

Table 5

Odds of Getting Screened by Weight Group: Women

Outcome	Normal-weight (BMI 18.5–24.9) n=88	Overweight (BMI 25–29.9) n=214	Obese I (BMI 30–34.9) n=194	Obese II+ (BMI 35–39.9) n=161	*P*
Any CRC screening, %					
Unadjusted*	1.00	1.18 (0.70–2.01)	0.89 (0.48–1.64)	1.01 (0.61–1.67)	0.81
Adjusted[1]	1.00	1.09 (0.66–1.79)	0.64 (0.38–1.10)	0.61 (0.34–1.11)	0.09
Up-to-date mammogram, %					
Unadjusted*	1.00	1.44 (0.82–2.54)	1.00 (0.63–1.59)	1.35 (0.87–2.11)	0.10
Adjusted[2]	1.00	1.47 (1.00–2.88)	1.05 (0.36–1.78)	1.61 (0.70–2.34)	0.03
Up-to-date Pap smear, %					
Unadjusted*	1.00	1.45 (0.68–3.11)	0.84 (0.47–1.50)	0.99 (0.51–1.95)	0.08
Adjusted[3]	1.00	1.44 (0.64–3.22)	0.86 (0.43–1.72)	1.17 (0.53–2.55)	0.39

*Adjusted for church

[1] Adjusted for co-morbidities, age, marital status, income, health status, education, history of polyps, family history of CRC, insurance, and church

[2] Adjusted for co-morbidities, age, income, marital status, health status, physical activity, and church

[3] Adjusted for co-morbidities, age, marital status, health status, physical activity, and church