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As cancer rates continue to rise, the importance of patient compliance with appropriate screening methods also increases. This study explored a realm of preventive services where few studies have gone to date. The study sample was selected from the 2004 Behavioral Risk Factor Surveillance System (BRFSS) which included 37,985 participants. The associations of reactions to race and possible confounders with cancer screening utilizations for breast, cervical, and colorectal cancers were examined. Bivariate analyses as well as univariate and multivariate logistic regression analyses were conducted to explore these associations. The results demonstrated that negative reactions to race were not associated with cancer screening utilization. However, other associations between independent variables and utilization of mammogram, Pap smear, and colonoscopy/sigmoidoscopy screening were discovered. Further in-depth exploration of reactions to race in relation to cancer screening is warranted.

REACTIONS TO RACE AND

CANCER SCREENING UTILIZATION

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INTRODUCTION

Background

Cancer is the second leading cause of death in the United States (U.S.) and causes one in four deaths.[1] Breast, cervical, and colorectal cancers all attribute to a significant percentage of cancer related deaths as well as new cases.[2] As cancer rates continue to rise, the importance of patient compliance with appropriate screening methods also increases. This study attempts to examine the association between an individual's reaction to race and cancer screening utilization. This study utilizes the 2004 Behavioral Risk Factor Surveillance System (BRFSS)[3,4] to determine how perceived reactions to race are associated with utilizing breast, cervical, and colorectal cancer screenings.

In 2005, it was estimated that over 270,000 new cases of breast cancer were diagnosed, with over 40,000 deaths.[1] Between 1987 and 2002 the incident rate of breast cancer increased by 0.3% per year. Most recent data indicates that African American women have a five year survival of 76% while Caucasian women have a 90% five year survival.[5] This drastic difference is partly due to detecting the cancer at a later stage. In addition, many studies have indicated that women with a lower socioeconomic status are more likely to be treated later in the course of the disease resulting in lower survival rates.[6] While there is no single way to prevent breast cancer, there are several ways to decrease the risk of acquiring the disease and detecting the cancer early on. Women can decrease their risk by exercising, avoiding obesity, decreasing alcohol intake, and being cautious when considering hormonal replacement therapy.[7] Most breast cancers present without symptoms, emphasizing the importance of screening tests. The American Cancer

Society recommends women between the ages of 20-39 to undergo a clinical breast exam (by a clinician) every three years and consider monthly self-breast exams. Women 40 years and older are recommended to seek annual mammograms, annual clinical breast exams, and consider monthly self exams.[7] In fact, several studies have shown that early detection of breast cancer by regular mammograms greatly increase treatment options and overall survival.[8,9]

An estimated 10,000 new cases of invasive cervical cancer were expected in 2005.[2] Mortality rates have declined steadily and 3,700 deaths were expected for the past year. Increased awareness and compliance with the Papanicolaou (Pap) screening is responsible for the decline. The prevalence of cervical cancer screening has varied greatly by race and ethnicity: Asian American, Indian American, and Hispanic/Latina all have lower rates when compared to Caucasian and African American patients. The Pap test can detect pre-invasive lesions, which have nearly a 100% survival rate.[10] However, Caucasians are more likely to have cervical cancer diagnosed at this early stage. In fact, invasive cervical cancer is diagnosed at a localized stage in 57% of Caucasian women as opposed to 49% of African American women.[2] The American Cancer Society recommends women should begin screening 3 years after engaging in one's first intercourse but no later than 21 years old.[10] Screening should be done yearly. However, after the age of 30, women with three consecutive normal Pap tests can be screened every 2-3 years.

The American Cancer Society estimated over 145,000 people would be diagnosed with colorectal cancer and over 56,000 people will die from the disease in 2005.[2]

Colorectal cancer is the third leading type of cancer and is the second leading cause of cancer death in the U.S.. The incidence and mortality of colorectal cancer is 15% and 40% higher, respectively, in African Americans than Caucasians.[11] Again, this difference is partly attributable to detecting the cancer at a later stage among African Americans. Beginning at age 50, the American Cancer Society recommends one of the five following screening options: 1) fecal occult blood test (FOBT) or fecal immunochemical test (FIT) yearly, 2) flexible sigmoidoscopy every 5 years, 3) yearly FOBT or FIT with flexible sigmoidoscopy every 5 years, 4) double contrast barium enema every 5 years or, 5) colonoscopy every 10 years.[10] Despite substantial evidence supporting the use of colorectal cancer screening, it has been estimated that less than 50% of the US population over the age of 50 have been screened.[12]

Multiple studies have examined the correlation between various demographic factors and seeking medical care.[13,14] Also, a significant amount of recent research has examined the relationship between certain demographic and socioeconomic factors and mammogram utilization.[15-28] One such study examined the differences in breast cancer screening with regards to ethnicity and socioeconomic status.[15] It was determined that ethnicity does not influence obtaining mammograms but access to health care, insurance and other health behaviors do. Another study looking at mammography utilization concluded demographic characteristics (age, ethnicity, race, education, income) all were directly associated.[16] A study by Schootman et al specifically examined disparities in socioeconomic status among women who never received a mammogram.[25] They utilized data from the 1992, 1994, and 2000 BRFSS and found a substantial reduction in the percentage of women between the ages of 50-69 that never received a mammogram. However, despite this reduction, a significant disparity among the population subgroups still existed, especially among those with no health insurance and restricted access to health care. Cokkinides et al examined colorectal cancer screening using the 1999 BRFSS database.[29] They concluded that while people with lower education and no health insurance had the highest noncompliance rate, adults across various socioeconomic backgrounds were not utilizing the recommended screening tests. The overwhelming underlining theme in all studies is that the causes of disparities related to compliance with breast, cervical, and colorectal cancer screenings are multi-factorial with education, income, employment, and health insurance all having strong associations.

Swan et al used the results from the 2000 National Health Interview Survey (NHIS) to explore disparities in cancer screening practices in the United States.[30] They specifically investigated screening among historically underserved populations with regards to cervical, breast, colorectal and prostate screening modalities. Their results demonstrated that individuals with no usual source of health care and those that were uninsured were drastically less likely to receive the above screening modalities. Women without health insurance and recent U.S. immigrants were noted to be less likely to have had both mammograms as well as Pap tests. Greatest disparities in colorectal cancer screening were seen in individuals without a usual source of health care, no insurance, lower levels of education, and decreased family income. They concluded that the greatest opportunities to increase use of mammography, Pap smears, and colorectal screenings were among patients without a usual source of care, the uninsured, and recent immigrants.[30] Another study looked at age-related disparities in cancer screening using the 2001 BRFSS.[31] The results demonstrated that after adjusting for cofounders, age-related disparities in colorectal cancer screening favored the elderly (>65 years old). However mammogram and PSA screening testing declined significantly among the elderly.

Other studies have examined how racial differences affect various aspects of current health care delivery.[32-43] One study examined the relationship between race and socioeconomic status with response to perceived discrimination among healthy women.[32] Occupation and race were both noted to be related to perceived discrimination. Another study assessed racial and ethnic disparities and satisfaction with health care providers using the 2000 BRFSS.[33] They specifically looked at the patient's view on how the health care provider listened, explained material, showed respect, time spent, and overall performance. They concluded that with the exception of listening, race/ethnicity was not directly associated with any of the other variables. Barr implemented a study examining perceived differences in health care delivery with regards to race/ethnicity.[34] The study design used a random real-time survey during the primary care office visit. They concluded that non-white patients were significantly less satisfied with the physician interaction as compared to white patients. It was hypothesized that this difference could be a result of non-white patients approaching the interaction with different attitudes and expectations or physicians actually treating non-white patients differently. Cooper and Powe reviewed recent research with regards to "race-discordants" and noted ongoing racial and ethnic disparities in health care.[43] They went on to recommend changes to improve rapport between providers and minority patients. In addition, they suggested that future research is needed to better understand how health care processes and outcomes are influenced by racial and ethnic differences. While no studies examining the relationship between reactions to race and cancer screening utilization were found, numerous studies have looked at perceived racism and other aspects of health care delivery and disease states (i.e. hypertension, diabetes, genetic testing, etc).[44-48]

The key to reducing cancer morbidity and mortality is primarily through early detection utilizing screening tests. In 2003, the National Healthcare Disparities Report noted that minorities and people with lower socioeconomic status are less likely to receive cancer screening services and have higher death rates from cancer.[49] The Report of the Trans-HHS Cancer Health Disparities Progress Review Group recommended in 2004 that new research studying the effects of cancer and their relationship with factors such as race, ethnicity, socioeconomic status, and health disparities should be conducted within the next two years.[50] Furthermore, the article entitled "The Future of Research that Promotes Cancer Screening" by Meissner et al provided several research recommendations related to future cancer screening interventions.[51] They pointed out that screening and follow-up care involves a complex interaction among individuals, their social networks, health care providers, as well as social and economic environment factors. One recommendation was to implement research using population based surveys to examine behavioral and social science variables. More specifically they noted the importance to determine what factors affect screening behavior and which measure are critical in predicting compliance. Palmer and Schneider conducted a review of literature examining social disparities and colorectal cancer prevention.[52] They concluded that very little research has been done in this area to date. More specifically, there is a need for further research exploring social inequalities and cancer screening.

Specific Aims and Hypothesis

This study examines whether a patient's perceived reaction to race is associated with screening utilization rates for breast, cervical, and colorectal cancers. Specifically, the study examines if participants have ever had a mammogram, Pap test, or sigmoidoscopy/colonoscopy screening test. Three components will be analyzed with regards to the "reactions to race": 1) Experience when seeking health care, 2) Recently being emotionally upset over how they were treated based on race, and 3) Experiencing physical symptoms as a result of how they were treated due to race. Socioeconomic factors including income, employment, and education will be accounted for in the analysis as described in the methods section. This study's following aims are:

1. Determine how reactions to race are associated with breast cancer screening (mammogram exams) utilization.
2. Determine how reactions to race are associated with cervical cancer screening (Pap smear exams) utilization.
3. Determine how reactions to race are associated with colorectal cancer screening exam (colonoscopy/sigmoidoscopy) utilization.

Current thought is that participants with negative reactions to race will have decreased utilization rates in breast, cervical, and colorectal cancers screening tests. More specifically we hypothesize:

1. Females with negative reactions to race are less likely to have had mammogram exams.
2. Females with negative reactions to race are less likely to have had Pap exams.
3. Males and females with negative reactions to race are less likely to have had colonoscopy/sigmoidoscopy exams.

METHODS

The BRFSS is a state based surveillance system conducted by the U.S. Centers for Disease Control and Prevention (CDC). The BRFSS collects data on many of the behaviors that place adults at risk for chronic disease. Trained interviewers collect the data from a random sample of adults (one per household) through a telephone interview. The questionnaire has three parts: 1) core component; 2) optional modules; and 3) state added questions. The core component is a standard set of questions asked by all states. Topics included in the core component for 2004 that will be used in this study include questions about health status, health care access, tobacco use, alcohol consumption, demographic data, women's health (including mammogram and Pap screening), and colorectal cancer screening. This core component includes entries from over 300,000 persons. The optional modules are questions on specific topics that states elect to include as part of their questionnaires. In 2004, 20 optional modules were supported by the CDC, one of which included questions pertaining to reactions to race. The reactions to race module was administered by eight states (Arkansas, Colorado, Delaware, District of Columbia, Mississippi, Rhode Island, South Carolina, and Wisconsin) and had approximately 38,000 responses.[3,4]

Dependent Variables

The outcome variables of interest in this study are responses to the women's health, and colorectal cancer screening sections of the 2004 BRFSS. Questions in the women's health section that will be examined in this study include: 1) "Have you ever had a mammogram?"; 2) "Have you ever had a Pap test?"; 3) "Have you had a hysterectomy?". Respondents are asked four questions in the colorectal cancer screening section. The question of interest that will be examined is: 1) "Sigmoidoscopy and colonoscopy are exams in which a tube is inserted in the rectum to view the colon for signs of cancer or other health problems. Have you ever had either of these exams?"

Analysis will be limited in each of the above groups based on screening criteria recommended by the American Cancer Society. Participants who were asked mammogram screening questions will be restricted to females 40 years of age or older. Participants who were asked Pap exam questions will be limited to females over the age of 18 who have not had a hysterectomy. Lastly, participants who were asked colorectal cancer screening questions will be restricted to males and females 50 years of age and older. Only individuals from the 8 states that utilized the reaction to race modules will be included in this study.

Independent Variables

The primary independent variables of interest are from the reactions to race module. This module contains six questions: 1) "How do other people usually classify your race in this country?"; 2) "How often do you think about your race?"; 3) "Within the past month at work, do you feel you were treated worse than, the same as, or better than people of other races?"; 4) "Within the past 12 months when seeking health care, do you feel you were treated worse than, the same as, or better than people of other races?"; 5) "Within the past

30 days, have you felt emotionally upset, for example angry, sad, or frustrated, as a result of how you were treated based on your race?"; 6) "Within the past 30 days, have you experienced any physical symptoms as a result of how you were treated based on your race?" The study will only use the last three questions as the primary independent variables of interest in the analysis.

Covariates

The covariate variables factor in sociodemographic characteristics, general health/health behaviors, and health care utilization. Sociodemographic variables of interest include: 1) Six categories of age (18-24, 25-34, 35-44, 54-54, 55-64, 65+); 2) Sex (male or female, only used in the colorectal cancer screening analysis); 3) Five category races (White, Black, Hispanic, Multi-racial, and Other); 4) Education level (not graduate high school, high school graduate, some college, and college graduate); 5) Employment status (employed, out of work, a homemaker, a student, retired, or unable to work); and 6) Income level (<15k, 15k-25k, 25k-50k, 50k-75k, >75k). General health/health behaviors included: 1) General health (excellent-very good, good-fair, or poor); 2) Limited to disability (yes or no); 3) Smoking status (current smoker – daily, current smoker – some days, former smoker, or never smoked); 4) At risk for heavy drinking, i.e. > 2 drinks a day for males or > 1 drink a day for females (Yes or no); 5) Body mass index (<25, 25-30, >30). Health care utilization characteristics are defined by the following three variables: 1) Do you have health insurance (Yes or no); 2) Do you have a primary care doctor (Only 1, more than 1, or no); 3) In the past 12 months have you not been able to see a doctor due to cost (Yes or no).

Analysis

Initially, descriptive statistics were calculated (i.e. means, standard deviations, distributions, etc) for the total sample population (i.e. 8 states) and for breast, cervical, and colorectal cancer screenings sub-populations. Bivariate analysis was performed to explore the differences between groups. Chi-square analysis and student t-tests were used to test for any overall statistical significance between categorical and continuous variables, respectively. Univariate logistic regressions was conducted to determine the association between the dependent and independent variables. Multivariate logistic regression analysis was conducted to control for covariates that may have confounded the association between the primary independent variables of interest (reaction to race) and the dependent variables (cancer screening utilization). Odds ratios and 95% confidence intervals were calculated at a level of significance of 0.05. All analyses were conducted using SPSS version 13.0 with the complex samples module.[53] All results were corroborated using SAS version 9.1.[54] Complex samples analytic techniques were used to account for unequal probability selection of observations, clustering, stratification, and non-response in the BRFSS database.

RESULTS

The reactions to race module contained data from 37,985 adults and represented the sample size used in the analysis. This represented 12.5% of the entire 2004 BRFSS database which contained 303,822 entries. Table 1 describes the population characteristics. A majority of respondents were over the age of 45, female, and white. Nearly 88% of respondents had some form of health insurance, over 85% had at least one personal health care provider, and roughly 13% were not able to see a doctor within the past 12 months due to cost. Just under a quarter (<25%) of all respondents were current smokers and approximately 5% were at risk for heavy drinking. The vast majority of participants were employed (59.2%) although 20.4% reported being retired. Approximately 90% reported having at least a high school education. Income was distributed across the different stratas with 38.4% having an income of $50,000 or greater. Regarding the reactions to race module: 1) 3.2% reported that within the past 12 months when seeking health care they were treated worse than people of other races while 12.2% felt they were treated better than people of other races, 2) 6.5% became emotionally upset in the past 30 days because of treatment secondary to race, and 3) 3.4% noted experiencing physical symptoms within the past 30 days secondary to experiences related to race. The above percentages are all un-weighted. Table 1 also includes the weighted percentages.

Table 2 reports the bivariate results which indicate numerous significant associations when comparing independent variables with the three cancer screening modalities. The results of the bivariate analysis utilized weighted data. The sample size for the mammography analysis was 16,052 (criteria used to select participants were women over the age of 39). Factors that showed statistically significant differences among women who had a mammogram included age, race, health insurance, personal health care providers, not seeing a doctor due to cost, smoking status, limitations due to disability, employment status, education level, income, and all three questions related to reactions to race.

The total number of respondents for the cervical cancer screening section was 15,536 (criteria used to select participants were females over the age of 18 who did not have a hysterectomy). Factors that showed statistically significant differences among women who had a Pap smear test included age, race, health insurance, personal health care providers, not seeing a doctor due to cost, smoking status, risk for heavy drinking, BMI, employment status, education level, income, and reactions to race when seeking health care in the past 12 months.

The total number of respondents for the colorectal cancer screening section was 18,389 (criteria used to select participants were men and women over the age of 49). Factors that showed statistically significant differences among men and women who had colorectal cancer screening tests included age, sex, race, health insurance, personal health care providers, not seeing a doctor due to cost, smoking status, BMI, limitations due to disability, employment status, education level, income, reactions to race when seeking health care in the past 12 months, and physical symptoms as a result of how treated based on race.

Table 3 reports the univariate logistic regression results. Odds ratios (OR) and 95% confidence intervals (CI) were obtained at a level of statistical significance of 0.05. With respect to mammography utilization women between the ages of 55-64 were 1.5 times more likely to have undergone a mammogram compared to those over 65 (OR 1.52, CI 1.22-1.91). Other age groups were significantly less likely to have had a mammogram. Blacks and Hispanics had lower odds of having a mammogram compared to whites (OR 0.78, CI 0.65-0.94; OR 0.51, CI 0.35-0.73, respectively). Respondents having health insurance and at least one personal health care provider were over three times more likely to report having a mammogram (OR 3.27, CI 2.74-3.90; OR 3.33, CI 2.77-4.00, respectively). Interestingly, respondents reporting limitations due to disability were slightly more likely to have undergone a mammogram compared to those without any disability (OR 1.35, CI 1.13-1.60). When examining employment status, retired participants were nearly two times more likely to have had a mammogram compared to those who were currently employed (OR 1.85, CI 1.54-2.22). Respondents with lower levels of education and income were less likely to have had a mammogram. For example, individuals with incomes less than $15,000 were more than 50% less likely to have had a mammogram compared to individuals with income > $75,000 (OR 0.43, CI 0.33-0.56). When compared to respondents feeling that they were treated better than people of other races, those treated worse were significantly less likely to have undergone the screening (OR 0.43, CI 0.28-0.66). Lastly, those feeling emotionally upset or experiencing physical symptoms due to how they were treated based on race were less likely to have reported mammography utilization (OR 0.60, CI 0.44-0.81; OR 0.49, CI 0.34-0.72, respectively).

The univariate logistic regression analysis results for cervical cancer screening are presented below. Women between the ages of 18-24 were less likely to have had Pap smear tests (OR 0.32, CI 0.24-0.43) while the age group of 55-64 were over 9 times more likely (OR 9.36, CI 5.59-15.73) when compared to women >65 years of age. Again, having health insurance and a health care provider increased the likelihood of having had cervical cancer screening. Interestingly, compared to individuals who had never smoked, smokers and former smokers were significantly more likely to have had a Pap smear (OR 1.68, CI 1.14-2.48; OR 3.73, CI 2.55-5.46, respectively). Also, those respondents with BMI's over 25 were more likely to have undergone cervical cancer screening (OR 1.96, CI 1.38-2.77) compared to those with BMI's less than 25. Employment, education, income all turned out to be strongly associated with screening. Those out of work were less likely to have had cervical cancer screening compared to those who were employed (OR 0.59, CI 0.36-0.96). Individuals without a high school degree were nearly 75% less likely to have had a Pap smear compared to college graduates (OR 0.20, CI 0.13-0.31). However, the reactions to race questions were not significant with regards to Pap smear utilization.

The following are the univariate logistic regression analysis results for colorectal cancer screening. Hispanic and black respondents were drastically less likely to have had colorectal cancer screening when compared to whites (OR 0.58, CI 0.44-0.74; OR 0.66, CI 0.59-0.75, respectively). Similar to the preceding analyses, having health insurance and a personal health care provider both increased the odds of having colorectal cancer screening by more than 3 fold (OR 3.26, CI 2.79-3.80; OR 3.90, CI 3.34-4.57, respectively). Respondents with poor health were more likely to have had a colonoscopy/sigmoidoscopy test compared to those who reported excellent-good health (OR 1.21, CI 1.05-1.39). Students and retired individuals were two times more likely to have undergone screening as compared to respondents who were employed (OR 2.17, CI 1.32-3.57; OR 2.2, CI 2.01-2.40, respectively). When compared to respondents who reported feeling that were treated better than people of other races, those that were treated worse were significantly less likely to have undergone the screening (OR 0.52, CI 0.39-0.68). Lastly, individuals experiencing physical symptoms due to racial treatment were less likely to have reported colonoscopy/sigmoidoscopy screening compared to those without symptoms (OR 0.68, CI 0.52-0.91).

Multivariate logistic regression results are presented in Table 4. The analysis was conducted by including all covariates to account for possible confounding effects. Odds ratios and 95% confidence intervals were obtained at a statistical significance level of 0.05. After controlling for all potential confounding factors, all three reactions to race questions (the primary aims of this study) proved to be negatively associated with the three preventive screening tests, although they did not reach statistical significance. The one exception was those reporting feeling emotionally upset because of how treated based on race and colorectal cancer screening (discussed below).

Factors significantly associated with mammogram utilization were age, having a health care provider, smoking status, and income. Respondents between 35-44 years of age were significantly less likely to have undergone mammography (OR 0.21, CI 0.15-0.29) while respondents between ages 55-64 were 1.4 times more likely to have had screening (OR 1.4, CI 1.02-1.93) when compared to women 65 and older. Persons with one or more health care providers were over two times more likely to have had mammography compared to those without one (OR 2.19, CI 1.69-2.84). Current smokers proved to be less likely to have had screening when compared to non-smokers (OR 0.77, CI 0.61-0.98). Mammogram screening was significantly less likely to occur in homemakers when compared to employed participants (OR 0.66, CI 0.50-0.89). People with lower incomes were also significantly less likely to have undergone mammography. For example, respondents with income less than $15,000 were over 50% less likely to have had a mammogram compared to respondents making over $75,000 (OR 0.31, CI 0.21-0.45).

Factors that were significantly associated with Pap smear utilization include age, smoking status, heavy drinking, and education (Table 4). Multivariate analysis of cervical cancer screening again demonstrated that when compared to respondents greater than 65 years of age, the age groups between 25-64 were all more likely to have had a Pap smear. In fact, individuals between 55-64 years of age were over 6 times more likely to have undergone screening when compared those over 65 (OR 6.47, CI 3.17-13.22). Interestingly, women between the ages of 18-24 were significantly less likely to have undergone a Pap smear when compared to those over 65 (OR 0.28, CI 0.15-0.52). While racial differences were not evident with in the univariate analysis (Table 3), the multivariate analysis found that Hispanic women were 2.7 times more likely to have had a Pap smear when compared to white participants (OR 2.67, CI 1.18-6.07). Again, surprisingly, smokers and previous smokers were much more likely to have had a Pap smear as compared to person who never smoked (OR 2.79, CI 1.19-6.56; OR 2.21, CI 1.38-3.53, respectively). Also, participants at risk for heavy drinking proved to be 2.5 times more likely to have had cervical cancer screening compared to those not at risk (OR 2.50, CI 1.10-5.68). Respondents not graduating high school were significantly less likely to have undergone cervical cancer screening when compared to college graduates (OR 0.24, CI 0.11-0.52).

Analysis of colorectal cancer screening resulted in several significant factors which included age, sex, health insurance, having a health care provider, smoking status, general health, employment, education, income and experiencing emotional symptoms as a result of racial treatment. Individuals younger than 65 were less likely to have ever had a colonoscopy or sigmoidoscopy test (OR 0.72, CI 0.63-0.83). Those with health insurance were significantly more likely to have the screening compared to those without insurance (OR 1.53, CI 1.28-1.88). Having one or more health care provider resulted in a significantly greater chance of having had colorectal cancer screening (OR 2.78, CI 2.61-3.58). Compared to persons who never smoked those that currently smoked were less likely to have undergone the screening (OR 0.75, CI 0.63-0.88). Interestingly, respondents with poor health were more likely to have had the screening when compared to those responding with excellent and very good health (OR 1.46, CI 1.16-1.83). Another unexpected result demonstrated that persons out of work, students, and retired all had colonoscopy/sigmoidoscopy tests at higher rates than those noting being employed

(OR 1.40, CI 1.07-1.83; OR 2.55, CI 1.33-4.90; OR 1.43, CI 1.24-1.64, respectively). Persons with lower levels of education and lower income all had lower colorectal cancer screening rates. The only reactions to race question that was statistically significant was those reporting to be emotionally upset due to how treated based on race. These respondents were actually more likely to have undergone screening when compared to those not becoming emotionally upset (OR 1.46, CI 1.05-2.02).

DISCUSSION

This study's overall aim was to examine whether reactions to race were associated with cancer screening utilization. To our knowledge no current studies have explored this topic. After controlling for potential confounding effects, the multivariate analysis only found significant difference between individuals experiencing emotionally symptoms and colorectal cancer screening. Overall, our study demonstrated that individual and health care services factors have a significant impact on cancer screening utilization, while reactions to racism has little to no impact on these utilization rates.

With regards to mammography, when compared to the oldest age group younger individuals had breast cancer screening exams at lower rates. Other studies have examined age related disparities and mammography exams and demonstrated similar results.[31,55] This may be explained by the fact older women have had a greater opportunity and exposure to clinical visits. Also, as women retire from careers and work, they may have more time to seek preventive and health care services. Having a primary health care provider was strongly associated with increased mammography utilization. This emphasizes the importance of having a regular primary care provider in order to establish continuity of care. Swan et al also demonstrated that the greatest disparities in mammography were associated among those who lacked a usual health care provider and health insurance.[30] Multiple studies have concluded that the socioeconomic factors, including education, employment, and income, all play an important role in mammogram utilization.[15-28] Persons with lower levels of education are more likely to be unemployed and have lower levels of income. One could deduce that these individuals would be economically disadvantaged and not have access to health care services. Previous research is divided on whether ethnic/racial differences are significantly associated with mammogram screening.[15-18] While our univariate analysis results demonstrated Hispanic and black respondents were significantly less likely to have had mammography, the multivariate regression analysis no longer found race to be significant. Education and income may have confounded this result since racial and ethnic minority groups tend to have lower education levels and incomes.[56-60]

This study determined significant disparities in Pap smear exams existed with regards to age, having a health care provider, smoking status, and education. The analysis for cervical cancer screening revealed younger individuals were more likely to have had screening. The only exception to this was for Pap smear exams in women between 18-24 who had screenings at significantly lower rates. This is especially concerning as the American Cancer Society recommends that all sexually active women and those over the age of 21 should begin having yearly Pap smears. This could be due to several factors. Possibly younger women are less aware of cervical cancer screening and more apprehensive to having a physician conduct a pelvic exam. Recent studies have also produced similar results and noted differences in age with regards to cervical cancer screening utilization.[30,55] Having at least one personal health care provider resulted in a greater likelihood of having had a Pap smear. As we discussed regarding mammogram utilization, having a usual source of care is an imperative factor to consider when assessing strategies to increase cancer screening rates.[60] Surprisingly, former and current smokers who only smoke occasionally were over twice as likely to have Pap smears. These individuals may have become health conscious or have realized their relative "higher risk" and are focused on making decisions to monitor their health. Marteau et al concluded that smokers were unaware of their increased risk for cervical cancer but it did not influence whether or not they had a Pap smear.[61] Coughlin et al also noted that smoking status was not significantly associated to Pap smear utilization.[55] Further research is needed to assess the relationship between health behaviors and the use of preventive services. Persons out of work were three times more likely to have a Pap smear as opposed to those who were employed. This may because women that are out of work have more available time, are able to maintain continuity of care with a personal health provider, and are now in a stage of their lives in which health has become a priority. No recent studies have found similar results pertaining to employment. Multiple studies have concluded that being employed directly influences income and those employed are more likely to receive cervical cancer screening.[50,62]

This study yielded interesting results regarding colorectal cancer screening. Again, age played a major role in receiving screening. Unfortunately, respondents between 55-64 were significantly less like to have ever had a colonoscopy/sigmoidoscopy as compared to those over 65 years of age. This is of major importance since all adults over the age of 50 are strongly recommended to receive colorectal cancer screening every 5-10 years depending on the type of exam. Again, this may be due to the fact as one ages there are more opportunities to be screened. The univariate regression results initially demonstrated significant differences between the racial groups. However, after controlling for potential confounders, this difference became non-significant. Both health insurance and having a personal health care provider increased the chances of having had colorectal screening tests. Since this screening is invasive and expensive, having insurance and a regular provider are important factors to ensure high rates of colorectal cancer screening.[29,63-65] A very recent study examining health insurance and colorectal cancer screening rates concluded that persons with insurance were nearly three times more likely to get the screening.[63] Also, those individuals with poor health were more likely to have undergone screening as opposed to those claiming excellent-good health. Possibly those with poor health are hospitalized at a higher rates (i.e. gastrointestinal bleeds) and receive colonoscopy testing while being treated. Also, individuals may be more conscious about their health and seek preventive services as they age. Education and income were again strongly associated with screening. Cokkinides et al recently performed an intensive analysis on colorectal cancer screening using the 1999 BRFSS.[29] They found that individuals between 50-54 and those individuals without insurance underutilized screening exams as well. It was also noted there was a decrease in screening rates across racial/ethnic groups as well as persons with irregular health maintenance visits. Several recent studies have noted that racial inequalities result in decreased screening and prevention measures.[66-67] Lastly, smokers were more likely to underutilize colorectal screening. This could be attributed to that fact that persons partaking in "unhealthy" behavior are less prone to seek medical care and comply with screening. Several recent studies have demonstrated the decrease in colonoscopies among smokers.[29,65,68]

There are several limitations to our study. While telephone surveys are easy to conduct and very cost effective, they may introduce potential biases. First, not all U.S. households can be reached by telephone. The BRFSS estimates that approximately 94% of the households in the U.S. have home phones. Those households without a home phone are more likely to be people with lower incomes, less education, living in rural areas, and in poor health. The BRFSS accounts for such variances by postratification and weighting adjustments to the data. Second, as with any self-reporting survey the data are subject to recall and other biases. Lastly, the possibility exists for incorrect interpretation of questions, variations in interview techniques, non-responses, and data coding errors. However, the BRFSS attempts to minimize such errors by using a large sample size as well as imposing quality assurance measures. In addition, this study only examined whether respondents ever had the specific screening tests. The time frame between screening tests was not assessed.

This study was able to yield several interesting factors that were associated with breast, cervical, and colorectal cancer screening utilization. Reactions to race do not appear to play an important role in cancer screening utilization. However, it would be warranted to conduct further analyses such as step-wise modeling to determine which of the independent variables plays the greatest role in determining the patient's utilization of cancer screening tests.

APPENDIX A

POPULATION CHARACTERISTICS

Table 1. Population Characteristics

Variables	Total[1] (N = 37,985) n	(%)	(%)*
Age			
18-24	2371	6.2	13.8
25-34	5876	15.5	17.9
35-44	7068	18.6	20.1
45-54	8067	21.2	18.9
55-64	6457	17.0	13.0
65+	8144	21.5	16.3
Sex			
Male	14,547	38.3	48.5
Female	23,438	61.7	51.5
Race			
White	28,519	76.0	76.3
Black	5927	15.8	13.4
Hispanic	1682	4.5	5.7
Multi-racial	444	1.2	1.4
Other	943	2.5	3.2
Health Insurance			
Yes	33,179	87.6	85.1
No	4700	12.4	14.9
Personal health care provider			
Only 1	28,798	76.0	73.3
More than 1	3451	9.1	8.4
None	5659	14.9	18.3
Not see a doctor due to cost			
Yes	4893	12.9	13.2
No	33,027	87.1	86.8
Smoking status			
Current Smoker - Daily	5974	15.8	16.7
Current Smoker - some days	2097	5.5	6.1
Former Smoker	9844	26.0	23.4
Never smoked	19,943	52.5	53.8
At risk for heavy drinking			
Yes	1,971	5.2	5.6
No	35,616	94.8	94.4
BMI			
<25	14,660	40.3	40.4
25-30	13,149	36.2	36.5
>30	8536	23.5	23.1
General Health			
Excellent - Very Good	19,993	52.8	54.7
Good - Fair	15,676	41.4	40.6
Poor	2203	5.8	4.7

Table 1. Population Characteristics (cont)

Variables	Total[1] (N = 37,985) n	(%)	(%)*
Limited due to disability			
Yes	7393	20.0	17.4
No	29,594	80.0	82.6
Employment Status			
Employed	22,412	59.2	63.0
Out of work	1945	5.1	6.0
A homemaker	2359	6.2	5.6
A student	1027	2.7	4.0
Retired	7735	20.4	15.7
Unable to work	2399	6.3	5.7
Education level			
Not graduate high school	4136	10.9	10.8
High school graduate	11,474	30.3	32.4
Some college	9363	24.7	26.1
College graduate	12,935	34.1	30.7
Income			
< $15,000	4241	10.9	10.5
$15,000 - $25,000	5686	30.3	17.9
$25,000 - $50,000	10,289	31.4	32.7
$50,000 - $75,000	5459	16.7	17.4
> $75,000	7110	21.7	21.5
During past 12 months describe experience in health care compared to other races			
Worse than other races	1083	3.2	3.0
The same as other races	24,345	71.2	73.6
Better than other races	4185	12.2	11.2
Did not seek health care	622	1.8	2.1
Do not know/not sure	3979	11.6	10.1
During past 30 days have you felt emotionally upset because of how you were treated based on your race?			
Yes	2245	6.5	6.5
No	32,197	93.5	93.5
During past 30 days have did you experience physical symptoms as a result of how you were treated based on your race?			
Yes	1176	3.4	3.2
No	33,298	96.6	96.8

[1] Numbers based on totals of states participating in the reactions to race module (Arkansas, Colorado, Delaware, District of Columbia, Mississippi, Rhode Island, South Carolina, Wisconsin)
* Weighted percentage

APPENDIX B

BIVARIATE ANALYSIS

Table 2. Bivariate Analysis for Cancer Screening

Variables	Had Mammogram[1] (n = 16,052)*			Had Pap Smear[2] (n = 15,536)*			Had sigmoidoscopy or colonoscopy[3] (n = 18,389)*		
	n	(%)	*p-value*	n	(%)	*p-value*	n	(%)	*p-value*
Age			p < 0.001			p < 0.001			p < 0.001
18-24	–	–		950	81.7		–	–	
25-34	–	–		2906	97.5		–	–	
35-44	1737	74.9		3121	98.7		–	–	
45-54	4279	91.1		3361	98.8		1450	35.8	
55-64	3618	95.3		2111	99.2		3565	54.5	
65+	4879	93.0		2489	93.3		5016	63.9	
Sex			–			–			p < 0.038
Male	–	–		–	–		3816	53.0	
Female	14,513	89.7		14,938	94.5		6215	55.1	
Race			p < 0.001			p < 0.001			p < 0.001
White	11,307	90.4		11,013	95.4		8280	43.9	
Black	2224	88.0		2593	94.0		1168	45.9	
Hispanic	421	82.6		679	96.0		213	42.3	
Multi-racial	134	87.4		175	97.1		94	51.9	
Other	237	87.5		327	89.0		144	43.0	
Health Insurance			p < 0.001			p < 0.001			p < 0.001
Yes	13,312	91.3		13,077	95.9		9575	56.4	
No	1184	76.1		1840	91.9		445	28.5	
Personal health care provider			p < 0.001			p < 0.001			p < 0.001
Only 1	12,017	90.9		11,679	95.7		8429	56.7	
More than 1	1466	93.0		1325	95.3		1149	59.7	
None	1006	75.0		1918	92.4		439	25.1	
Not see a doctor due to cost			p < 0.001			p < 0.417			p < 0.001
Yes	1689	81.6		2141	94.5		744	41.0	
No	12,797	90.9		12,782	95.2		9278	55.5	
Smoking status			p < 0.001			p < 0.001			p < 0.001
Current Smoker - Daily	1826	82.5		2186	96.2		930	38.4	
Current Smoker - some days	638	84.5		791	96.1		314	41.6	
Former Smoker	3915	92.2		3194	98.2		3951	60.3	
Never smoked	8074	90.8		8717	93.7		4796	54.5	
At risk for heavy drinking			p < 0.059			p < 0.038			p < 0.540
Yes	630	89.9		824	97.3		428	54.3	
No	13,797	86.5		14,011	95.0		9526	52.7	
BMI			p < 0.107			p < 0.001			p < 0.010
<25	5907	89.2		6831	93.8		3536	53.6	
25-30	4401	90.7		4082	96.8		3863	56.1	
>30	3340	89.2		3144	96.4		2262	52.4	
General Health			p < 0.645			p < 0.302			p < 0.005
Excellent - Very Good	6767	89.4		8530	95.0		4302	52.5	
Good - Fair	6470	89.9		5794	95.4		4749	55.2	
Poor	1224	90.4		577	93.1		949	42.9	

Table 2. Bivariate Analysis for Cancer Screening (Cont)

Variables	Had Mammogram[1] (n = 16,052)*			Had Pap Smear[2] (n = 15,536)*			Had sigmoidoscopy or colonoscopy[3] (n = 18,389)*		
	n	(%)	*p-value*	n	(%)	*p-value*	n	(%)	*p-value*
Limited due to disability			p < 0.001			p < 0.707			p < 0.001
Yes	3695	91.7		2509	95.4		2880	59.2	
No	10,616	89.2		12,216	95.1		7071	52.5	
Employment Status			p < 0.001			p < 0.001			p < 0.001
Employed	6938	88.6		8952	96.5		3599	45.6	
Out of work	645	85.8		928	94.2		301	49.9	
A homemaker	1299	87.4		1463	97.7		567	52.2	
A student	143	90.0		489	83.2		71	64.5	
Retired	4249	93.5		2277	94.2		4753	64.8	
Unable to work	1210	89.4		792	88.9		724	48.4	
Education level			p < 0.001			p < 0.001			p < 0.001
Not graduate high school	1815	86.6		1342	89.9		1164	45.2	
High school graduate	4637	87.6		4296	93.2		2992	51.7	
Some college	3663	91.5		3859	95.9		2342	54.7	
College graduate	4376	92.3		5420	97.8		3518	60.4	
Income			p < 0.001			p < 0.001			p < 0.001
< $15,000	1940	84.0		1682	91.6		1215	52.0	
$15,000 - $25,000	2212	85.9		2311	93.8		1469	50.7	
$25,000 - $50,000	3526	89.8		4049	96.7		2522	53.9	
$50,000 - $75,000	1873	92.4		2179	97.6		1244	54.4	
> $75,000	2386	92.4		2731	97.9		1799	57.5	
During past 12 months describe experience in health care compared to other races			p < 0.001			p < 0.001			p < 0.001
Worse than other races	358	84.3		395	93.9		200	45.0	
The same as other races	8946	89.3		9890	95.6		5782	53.0	
Better than other races	1812	92.6		1798	95.1		1506	61.3	
Did not seek health care	139	72.9		155	85.1		58	17.3	
Do not know/not sure	1998	92.5		1432	93.9		1645	59.2	
During past 30 days have you felt emotionally upset because of how you were treated based on your race?			p < 0.001			p < 0.560			p < 0.289
Yes	708	84.5		937	94.7		334	51.6	
No	12,673	90.2		12,821	95.3		8955	54.5	
During past 30 days have did you experience physical symptoms as a result of how you were treated based on your race?			p < 0.001			p < 0.615			p < 0.008
Yes	416	81.8		517	94.6		180	45.0	
No	12,967	90.1		13,244	95.3		9107	54.5	

[1] The percentages indicate women (40 and older) in that group previously having a mammogram.
[2] The percentages indicate women (over 18 and without hysterectomy) in that group previously having a Pap test.
[3] The percentages indicate men and women (50 and older) in that group previously having a sigmoidoscopy or colonoscopy.
* Totals in each indivdual group may not add up due to non-responses.

APPENDIX C

UNIVARIATE REGRESSION ANALYSIS

Table 3. Univariate Logistic Regression Analysis

Variables	Had Mammogram[1]			Had Pap Smear[2]			Had sigmoidoscopy or colonoscopy[3]		
	OR*	95% CI*	*p-value*	OR*	95% CI*	*p-value*	OR*	95% CI*	*p-value*
Age									
18-24	–	–	–	0.321	0.241 - 0.427	0.001	–	–	–
25-34	–	–	–	2.831	2.034 - 3.939	0.001	–	–	–
35-44	0.225	0.187 - 0.271	0.001	5.471	3.562 - 8.404	0.001	–	–	–
45-54	0.769	0.634 - 0.933	0.007	6.052	3.728 - 9.824	0.001	0.314	0.282 - 0.351	0.001
55-64	1.524	1.215 - 1.910	0.001	9.375	5.590 - 15.725	0.001	0.676	0.618 - 0.739	0.001
65+	...	...	...	...	...	...	...	...	
Sex									
Male	–	–	–	–	–	–	0.918	0.847 - 0.995	0.037
Female	–	–	–	–	–	–	...	...	...
Race									
White	...	...	...	...	...	...	...	...	...
Black	0.782	0.652 - 0.939	0.008	0.752	0.552 - 1.024	0.071	0.664	0.591 - 0.746	0.001
Hispanic	0.506	0.349 - 0.734	0.001	1.141	0.661 - 1.969	0.636	0.575	0.444 - 0.744	0.001
Multi-racial	0.735	0.395 - 1.367	0.331	1.601	0.538 - 4.761	0.400	0.847	0.569 - 1.260	0.412
Other	0.746	0.430 - 1.292	0.295	0.389	0.221 - 0.682	0.001	0.592	0.434 - 0.808	0.001
Health Insurance									
Yes	3.271	2.744 - 3.899	0.001	2.042	1.511 - 2.761	0.001	3.256	2.788 - 3.803	0.001
No	...	...	...	...	...	...	...	...	...
Personal health care provider									
Only 1	3.333	2.770 - 4.009	0.001	1.832	1.380 - 2.432	0.001	3.904	3.337 - 4.568	0.001
More than 1	4.418	3.265 - 5.978	0.001	1.632	0.990 - 2.691	0.055	4.425	3.645 - 5.371	0.001
None	...	...	...	...	...	...	...	...	...
Not see a doctor due to cost									
Yes	0.442	0.373 - 0.522	0.001	0.874	0.632 - 1.209	0.417	0.556	0.487 - 0.635	0.001
No	...	...	...	...	...	...	...	...	...
Smoking status									
Current Smoker - Daily	0.479	0.401 - 0.574	0.001	1.680	1.139 - 2.479	0.009	0.520	0.458 - 0.591	0.001
Current Smoker - some days	0.556	0.410 - 0.753	0.001	1.631	0.887 - 3.000	0.116	0.595	0.483 - 0.733	0.001
Former Smoker	1.211	1.002 - 1.464	0.048	3.728	2.546 - 5.459	0.001	1.263	1.162 - 1.386	0.001
Never smoked	...	...	...	...	...	...	...	...	...
At risk for heavy drinking									
Yes	1.388	0.987 - 1.950	0.059	0.520	0.278 - 0.974	0.041	1.069	0.867 - 1.318	0.535
No	...	...	...	...	...	...	...	...	...
BMI									
<25	...	...	...	...	...	...	...	...	...
25-30	1.185	0.999 - 1.407	0.052	1.957	1.381 - 2.774	0.001	1.106	1.008 - 1.214	0.034
>30	0.995	0.830 - 1.194	0.961	1.768	1.261 - 2.479	0.001	0.952	0.856 - 1.058	0.358
General Health									
Excellent - Very Good	...	...	...	...	...	...	...	...	...
Good - Fair	1.055	0.910 - 1.222	0.480	1.074	0.825 - 1.400	0.595	1.115	1.026 - 1.212	0.011
Poor	1.111	0.850 - 1.453	0.441	0.706	0.459 - 1.086	0.113	1.207	1.050 - 1.387	0.008

Table 3. Univariate Logistic Regression Analysis (Cont)

Variables	Had Mammogram[1]			Had Pap Smear[2]			Had sigmoidoscopy or colonoscopy[3]		
	OR*	95% CI*	*p-value*	OR*	95% CI*	*p-value*	OR*	95% CI*	*p-value*
Limited due to disability									
Yes	1.346	1.134 - 1.597	0.001	1.074	0.742 - 1.554	0.707	1.311	1.199 - 1.432	0.001
No	...	...	...	...	...	...	...	...	...
Employment Status									
Employed	...	...	...	...	...	...	...	...	...
Out of work	0.779	0.578 - 1.048	0.099	0.591	0.364 - 0.958	0.033	1.187	0.960 - 1.468	0.114
A homemaker	0.892	0.716 - 1.113	0.312	1.508	0.967 - 2.352	0.070	1.304	1.110 - 1.532	0.001
A student	1.152	0.466 - 2.849	0.760	0.179	0.120 - 0.267	0.001	2.168	1.316 - 3.572	0.002
Retired	1.853	1.543 - 2.224	0.001	0.590	0.436 - 0.799	0.001	2.195	2.008 - 2.400	0.001
Unable to work	1.090	0.852 - 1.394	0.493	0.288	0.175 - 0.475	0.001	1.122	0.972 - 1.294	0.115
Education level									
Not graduate high school	0.538	0.428 - 0.676	0.001	0.204	0.134 - 0.310	0.001	0.542	0.477 - 0.615	0.001
High school graduate	0.591	0.489 - 0.714	0.001	0.218	0.218 - 0.453	0.001	0.702	0.634 - 0.777	0.001
Some college	0.893	0.723 - 1.102	0.291	0.531	0.355 - 0.796	0.002	0.794	0.711 - 0.886	0.001
College graduate	...	...	...	...	...	...	...	...	...
Income									
< $15,000	0.433	0.334 - 0.560	0.001	0.237	0.136 - 0.413	0.001	0.682	0.589 - 0.790	0.001
$15,000 - $25,000	0.499	0.386 - 0.645	0.001	0.332	0.192 - 0.576	0.001	0.762	0.660 - 0.878	0.001
$25,000 - $50,000	0.723	0.563 - 0.929	0.011	0.631	0.358 - 1.114	0.112	0.864	0.759 - 0.984	0.027
$50,000 - $75,000	1.004	0.732 - 1.378	0.980	0.871	0.424 - 1.788	0.706	0.881	0.755 - 1.030	0.111
> $75,000	...	...	...	...	...	...	...	...	...
During past 12 months describe experience in health care compared to other races									
Worse than other races	0.427	0.277 - 0.660	0.001	0.791	0.413 - 1.516	0.480	0.516	0.389 - 0.684	0.001
The same as other races	0.664	0.509 - 0.866	0.025	1.115	0.727 - 1.710	0.617	0.712	0.627 - 0.808	0.001
Better than other races	...	...	...	...	...	...	...	...	...
Did not seek health care	0.214	0.137 - 0.336	0.001	0.291	0.125 - 0.678	0.004	0.132	0.088 - 0.197	0.001
Do not know/not sure	0.976	0.705 - 1.351	0.884	0.793	0.473 - 1.328	0.377	0.916	0.786 - 1.068	0.262
During past 30 days have you felt emotionally upset because of how you were treated based on your race?									
Yes	0.595	0.439 - 0.807	0.001	0.884	0.584 - 1.338	0.560	0.889	0.714 - 1.105	0.288
No	...	...	...	...	...	...	...	...	...
During past 30 days have did you experience physical symptoms as a result of how you were treated based on your race?									
Yes	0.494	0.339 - 0.720	0.001	0.874	0.517 - 1.478	0.616	0.684	0.517 - 0.906	0.008
No	...	...	...	...	...	...	...	...	...

[1] Women (40 and older) in that group previously having a mammogram.
[2] Women (over 18 and without hysterectomy) in that group previously having a Pap test.
[3] Men and women (50 and older) in that group previously having a sigmoidoscopy or colonoscopy.
* OR - Odds Ratio, CI - Confidence Ratio, ... - reference group

APPENDIX D

MULTIVARIATE LOGISTIC REGRESSION ANALYSIS

Table 4. Multi-variate Logistic Regression Analysis

Variables	Had Mammogram[1]			Had Pap Smear[2]			Had sigmoidoscopy or colonoscopy[3]		
	OR*	95% CI*	*p-value*	OR*	95% CI*	*p-value*	OR*	95% CI*	*p-value*
Age									
18-24	–	–	–	0.283	0.154 - 0.522	0.001	–	–	–
25-34	–	–	–	1.980	1.064 - 3.684	0.031	–	–	–
35-44	0.211	0.152 - 0.293	0.001	3.351	1.660 - 6.767	0.001	–	–	–
45-54	0.772	0.553 - 1.079	0.130	4.067	2.042 - 8.102	0.001	0.360	0.304 - 0.427	0.001
55-64	1.400	1.016 - 1.928	0.040	6.472	3.169 - 13.217	0.001	0.724	0.632 - 0.831	0.001
65+	...	...	...	...	...	...	...	...	
Sex									
Male	–	–	–	–	–	–	0.854	0.847 - 0.995	0.005
Female	–	–	–	–	–	–	...	...	...
Race									
White	...	...	...	...	...	...	...	...	...
Black	1.247	0.966 - 1.610	0.090	1.174	0.764 - 1.805	0.465	0.913	0.781 - 1.068	0.256
Hispanic	0.758	0.492 - 1.169	0.210	2.674	1.179 - 6.065	0.019	0.871	0.635 - 1.196	0.394
Multi-racial	0.920	0.395 - 2.140	0.846	1.912	0.459 - 7.963	0.374	1.006	0.630 - 1.609	0.979
Other	1.523	0.737 - 3.146	0.256	0.678	0.239 - 1.925	0.466	0.690	0.445 - 1.068	0.059
Health Insurance									
Yes	1.137	0.856 - 1.510	0.377	1.549	0.945 - 2.538	0.083	1.525	1.238 - 1.878	0.001
No	...	...	...	...	...	...	...	...	...
Personal health care provider									
Only 1	2.187	1.685 - 2.838	0.001	1.560	1.025 - 2.372	0.038	2.479	2.029 - 3.029	0.001
More than 1	2.633	1.778 - 3.898	0.001	0.946	0.493 - 1.815	0.868	2.783	2.161 - 3.584	0.001
None	...	...	...	...	...	...	...	...	...
Not see a doctor due to cost									
Yes	0.442	0.373 - 0.522	0.150	0.879	0.530 - 1.459	0.619	0.944	0.784 - 1.137	0.545
No	...	...	...	...	...	...	...	...	...
Smoking status									
Current Smoker - Daily	0.774	0.610 - 0.982	0.035	1.245	0.757 - 2.049	0.388	0.747	0.634 - 0.879	0.001
Current Smoker - some days	0.757	0.520 - 1.102	0.147	2.792	1.189 - 6.558	0.019	0.745	0.571 - 0.972	0.030
Former Smoker	1.045	0.824 - 1.327	0.716	2.208	1.380 - 3.531	0.001	1.163	1.038 - 1.302	0.009
Never smoked	...	...	...	...	...	...	...	...	...
At risk for heavy drinking									
Yes	1.229	0.818 - 1.847	0.321	2.500	1.100 - 5.679	0.029	0.880	0.674 - 1.151	0.351
No	...	...	...	...	...	...	...	...	...
BMI									
<25	...	...	...	...	...	...	...	...	...
25-30	1.162	0.940 - 1.436	0.165	1.568	1.015 - 2.421	0.043	1.131	1.007 - 1.271	0.380
>30	1.038	0.824 - 1.308	0.753	1.176	0.769 - 1.800	0.455	0.972	0.847 - 1.115	0.685
General Health									
Excellent - Very Good	...	...	...	...	...	...	...	...	...
Good - Fair	1.304	1.066 - 1.596	0.009	1.278	0.860 - 1.899	0.226	1.148	1.023 - 1.288	0.019
Poor	1.226	0.827 - 1.817	0.310	0.698	0.285 - 1.710	0.433	1.457	1.163 - 1.825	0.001

Table 4. Multi-variate Logistic Regression Analysis (Cont)

Variables	**Had Mammogram[1]**			**Had Pap Smear[2]**			**Had sigmoidoscopy or**		
	OR*	95% CI*	*p-value*	OR*	95% CI*	*p-value*	OR*	95% CI*	*p-value*
Limited due to disability									
Yes	1.209	0.948 - 1.542	0.126	0.958	0.523 - 1.755	0.890	1.122	0.985 - 1.278	0.084
No	...	...	...	...	...	...	...	...	...
Employment Status									
Employed	...	...	...	...	...	...	...	...	...
Out of work	0.826	0.547 - 1.247	0.363	1.042	0.533 - 2.039	0.903	1.400	1.072 - 1.829	0.013
A homemaker	0.664	0.497 - 0.887	0.005	3.313	1.602 - 6.851	0.001	0.873	0.694 - 1.098	0.246
A student	0.913	0.364 - 2.293	0.847	0.622	0.353 - 1.096.	0.101	2.553	1.331 - 4.899	0.005
Retired	1.003	0.729 - 1.379	0.987	0.584	0.327 - 1.041	0.069	1.426	1.238 - 1.643	0.001
Unable to work	1.035	0.694 - 1.541	0.868	0.601	0.274 - 1.319	0.205	1.187	0.943 - 1.495	0.144
Education level									
Not graduate high school	0.858	0.609 - 1.209	0.381	0.241	0.112 - 0.515	0.001	0.552	0.454 - 0.670	0.001
High school graduate	0.738	0.569 - 0.957	0.022	0.420	0.236 - 0.749	0.003	0.754	0.654 - 0.869	0.001
Some college	1.044	0.801 - 1.360	0.752	1.231	0.664 - 2.285	0.510	0.900	0.781 - 1.036	0.143
College graduate	...	...	...	...	...	...	...	...	...
Income									
< $15,000	0.309	0.212 - 0.449	0.001	1.368	0.659 - 2.840	0.401	0.871	0.456 - 0.714	0.001
$15,000 - $25,000	0.499	0.329 - 0.641	0.001	1.465	0.726 - 2.956	0.287	0.624	0.512 - 0.760	0.001
$25,000 - $50,000	0.723	0.489 - 0.881	0.005	1.517	0.790 - 2.912	0.211	0.721	0.614 - 0.846	0.001
$50,000 - $75,000	1.004	0.746 - 1.492	0.764	1.858	0.837 - 4.125	0.129	0.829	0.696 - 0.987	0.035
> $75,000	...	...	...	...	...	...	...	...	...
During past 12 months describe experience in health care compared to other races									
Worse than other races	0.797	0.476 - 1.335	0.389	0.930	0.398 - 2.173	0.866	0.843	0.575 - 1.235	0.380
The same as other races	0.777	0.572 - 1.057	0.108	1.181	0.704 - 1.984	0.529	0.880	0.754 - 1.028	0.108
Better than other races	...	...	...	...	...	...	...	...	...
Did not seek health care	0.462	0.254 - 0.841	0.012	0.393	0.138 - 1.114	0.079	0.318	0.199 - 0.508	0.001
Do not know/not sure	1.246	0.837 - 1.856	0.279	1.401	0.642 - 3.059	0.398	0.916	0.757 - 1.108	0.365
During past 30 days have you felt emotionally upset because of how you were treated based on your race?									
Yes	0.914	0.611 - 1.370	0.665	1.129	0.615 - 2.071	0.696	1.457	1.053 - 2.017	0.023
No	...	...	...	...	...	...	...	...	...
During past 30 days have did you experience physical symptoms as a result of how you were treated based on your race?									
Yes	0.846	0.516 - 1.387	0.507	0.855	0.406 - 1.797	0.679	0.885	0.583 - 1.344	0.567
No	...	...	...	...	...	...	...	...	...

[1] Women (40 and older) in that group previously having a mammogram.

[2] Women (over 18 and without hysterectomy) in that group previously having a Pap test.

[3] Men and women (50 and older) in that group previously having a sigmoidoscopy or colonoscopy.

* OR - Odds Ratio, CI - Confidence Ratio, ... - reference group

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