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The Role of Family History of Cancer on Cervical Cancer Screening Behavior in a Population-Based Survey of Women in the Southeastern United States

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Abstract

Background—The objective was to determine the association of self-reported family history of cancer (FHC) on cervical cancer screening to inform a potential link with cancer preventive behaviors in a region with persistent cancer disparities.

Methods—Self-reported FHC, Pap test behavior, and access to care were measured in a statewide population-based survey of human papillomavirus (HPV) and cervical cancer (n=918). Random-digit dial, computer-assisted telephone interviews (CATI) were used to contact eligible

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respondents [adult (18–70) women in South Carolina with landline telephones]. Logistic regression models were estimated using STATA 12.

Findings—While FHC+ was not predictive (OR=1.17, 95% CI 0.55, 2.51), private health insurance (OR=2.35, 95% CI 1.15, 4.81) and younger age (18–30 years: OR=7.76, 95% CI 1.91, 3.16) were associated with recent Pap test behavior. Family history and cervical cancer screening associations were not detected in the sample.

Conclusions—Findings suggest targeting older women with screening recommendations and providing available screening resources for underserved women.

INTRODUCTION

Cervical cancer, a largely preventable disease, impacts women's health and mortality with evidence of racial and geographic gradients associated with disparities (Newmann & Garner, 2005; Sambamoorthi & McAlpine, 2003). Compared to urban women in the United States, rural women experience higher rates of cervical cancer mortality (Singh, Williams, Siahpush, & Mulhollen, 2011). The highest cervical cancer mortality rates are reported in the South (US Cancer Statistics Working Group, 2010). In South Carolina specifically, minority and rural women are disproportionately affected by cervical cancer (Adams et al., 2009; Brandt et al., 2006). The state's cervical cancer incidence rate for African-American women is 11.5 cases per 100,000 and mortality rate is 4.9 cases per 100,000 as compared to 7.5 cases per 100,000 and 1.9 cases per 100,000, respectively, for European-American women indicating a great disparity (Savoy, Hurley, Brandt, Bolick-Aldrich, & Ehlers, 2009).

Knowledge of family history of cancer and its relationship to established mediating factors on women's cancer screening behavior has gained attention with mixed findings related to family history of cancer and cancer worry as motivators of women's cancer health-protective behaviors, such as screening (Consedine, Magai, Krivoshekova, Ryzewicz, & Neugut, 2004; Diefenbach, Miller, & Daly, 1999; Hemminki & Chen, 2006; Richardson, Owen-Smith, & Howe, 2002; Williams, Reiter, Mabiso, Maurer, & Paskett, 2009; Williams et al., 2008). Family history of cancer was positively associated with Pap test behavior in a recent national study (Williams et al., 2009).

Epidemiological data indicate appropriate screening methods greatly reduce cervical cancer risk and Pap tests are primary and secondary prevention tools with reductions in incidence and mortality, yet minority and underserved women consistently experience greater morbidity and mortality (Castellsague, 2008; Pollack, Balkin, Edouard, Cutts, & Broutet, 2007; Puig-Tintore et al., 2008). Participation in cervical cancer screening through Pap tests as a cancer-preventive behavior are mediated by multiple factors, including access to care, provider availability, race/ethnicity, education, socioeconomic status, and health insurance (Bastani et al., 2002; Consedine et al., 2004; Edwards & Jones, 2000; Mandelblatt et al., 1999). Lower participation in cancer screening has been linked to minority status, advanced age, and rural residence (Brown et al., 2006; Consedine et al., 2004; Cui et al., 2007; Henley et al.; Nash, Chan, Horowitz, & Vlahov, 2007).

Compared to other cancers, less is known about the role of knowledge of family history of cancer as an influence on cervical cancer screening, which may be primarily due to persistent human papillomavirus (HPV) infection as the primary etiologic cause of most cervical cancers, rather than genetic susceptibility or family history. However, understanding family history of cancer as a motivator or barrier to cervical cancer screening behavior, along with other factors, may elucidate sources of cervical cancer disparities in different populations. This approach of documenting the influence of cultural beliefs on cancer screening in addressing cancer disparities has been linked to higher breast cancer

screening knowledge and behavior in minority women through evidence -based breast cancer screening interventions such as the Witness Project (Bailey, Erwin, & Belin, 2000; Mayo, Scott, & Williams, 2009).

The purpose of this study was to explore knowledge of family history of cancer on cervical cancer screening behavior for African-American (Black) and European-American (White) women in a population-based telephone survey in South Carolina. Unlike previous national analyses, this investigation specifically examines family history of cancer associated with cervical cancer screening in a Southeastern state with documented cervical cancer disparities. Identification of cervical cancer screening motivators may inform interventions and prevention efforts in a state and region with disproportionately high rates of cervical cancer mortality.

METHODS

A population-based, random-digit dialed telephone survey of adult women in South Carolina was conducted in 2008. The instrument was designed to measure women's knowledge, behaviors, and attitudes related to HPV and cervical cancer, and HPV vaccine acceptability. Extensive instrument development included a systematic literature review of HPV and cervical cancer-related items, expert review, and multi-phase pretesting. Existing questionnaire items, previously used in HPV and cervical cancer studies in South Carolina, and new items identified through the development process were included (Brandt et al., 2009; McCree, Sharpe, Brandt, & Robertson, 2006; Sharpe, Brandt, & McCree, 2005). The Behavioral Model for Vulnerable Populations was used as a conceptual framework for the study (Gelberg, Andersen, & Leake, 2000). After institutional review board (IRB) approval and respondent informed consent, the survey was fielded for approximately ten weeks (March to May 2008) with 1,029 completed interviews.

The survey was administered using random-digit dialing, computer assisted telephone interviewing (CATI), from a database of landline home telephone numbers. Eligible respondents were adult women, aged 18–70, living in South Carolina with working landline telephones and the ability to hear, speak, and comprehend spoken English. Interviews were conducted by trained, female interviewers to encourage respondent willingness to answer questions about sensitive topics.

African-American women were oversampled to detect racial group differences. In South Carolina, less than 3% of residents report racial backgrounds other than African American or European American (US Census Bureau Population Division, 2010). Comparatively, less than 2% of study respondents self identified as "Other" (Asian, American Indian, Native Hawaiian / Pacific Islander, and/or multiracial) resulting on sample sizes too small for reliable comparisons. As such, only African-American and European-American women with complete interviews (n=918) were included in analyses. Interview response rates for the primary sample and African-American oversample were 36.7% and 34.0%, respectively, lower than the state BRFSS response rate of 50.5% in 2008 (Centers for Disease Control and Prevention, 2008).

Measures

The dependent variable was cervical cancer screening, measured by self-report of a Pap test within three years of interview. Pap test screening interval recommendations and age eligibility requirements differ among various organizations; however, at the time of the study, a triennial Pap test was recommended for most women older than 21 years of age by the American College of Obstetrics and Gynecology (ACOG) (Akers, Newmann, & Smith,

2007; Rathore, McGreevey, Schulman, & Atkins, 2000; Smith, Cokkinides, & Eyre, 2007; Valea, 2007).

The independent variable was dichotomous: family history of cancer (FHC+) or none (FHC −). Predisposing, resource, and enabling variables, which may influence Pap test behavior and appropriate for use with the Behavioral Model for Vulnerable Populations developed by Gelberg and colleagues (2000) included age (18–30, 31–44, 45–64, 65+), race (African American or European American), education (less than high school, high school graduate, some college, or college degree), income (less than $25,000 or greater than $25,000 annually), health insurance status (private, public, or uninsured), relationship status (single, married, or divorced/widowed/separated), and smoking status (non-smoker or smoker). Residence was defined as rural or urban using Rural-Urban Commuting Area Codes (RUCAs) that approximate rural or urban geographic location based on Census tracts and zip codes (Hart, Larson, & Lishner, 2005).

Data Analysis

Data were analyzed using the statistical package STATA 12. To reflect minority over-sampling, survey data analysis procedures were used as appropriate and survey weights were applied to ensure estimation representative of the state of South Carolina. The survey design weight variable was created using the Census 2000 population statistics for South Carolina to represent the total adult population of women in the state (US Census Bureau Population Division, 2010). Missing categorical income data were imputed based on an ordered logistic regression model of income category on race, rurality, smoking behavior, and whether covered by private insurance.

Descriptive statistics summarized sociodemographic characteristics. Descriptive bivariate comparisons between African-American and European-American respondents were made using chi-square analysis for categorical variables and *t*-tests for continuous variables. Cut-points for binning age into categories were chosen to ensure adequate and symmetric bin frequencies while income was dichotomized into those in the lowest income category versus all others.

Multivariate models were estimated to determine significant outcome covariates. Logistic regression models identified which variables (family history of cancer, age, race, health insurance, education, relationship status, and smoking) were strongly predictive of recent Pap tests (within three years of the interview). Odds ratios, 95% CI, and associated p-values were reported. Models were estimated for the total sample and racial group subsamples.

RESULTS

Sociodemographic sample characteristics are presented in Table 1. The majority of respondents (54.9%) were aged 45 to 64. Approximately a quarter of the respondents reported an annual income of less than $25,000 (29.4%) and 15.6% had less than a high school education. In the total sample, 66.9% of respondents reported being married at the time of interview and a third reported an income of less than $25,000 annually with more African-Americans respondents reporting non-marital relationship statuses and poverty ($p<.001$). The sample was largely urban (62.5%) and non-smoking (79.1%). More European-American respondents were smokers than African-American respondents. Smoking status findings held true, even after taking into account a family history of cancer. Among FHC+ respondents, 15.4% of African-American respondents were smokers compared to 20.9% of European-American respondents ($p=0.0011$). [Table 1]

A majority (90.2%) of respondents reported a recent Pap test (within three years of interview) and private insurance (54.7%). Fourteen percent of respondents who had ever had a Pap test reported at least one abnormal result (Data not in table). A tenth of respondents reported a family history of cancer, 4.1% of African American and 5.9% of European-American respondents. When stratified by family history and race, similar proportions of FHC+ respondents reported a recent Pap test (90.6% African-American vs. 89.4% of European-American). There was no evidence of minority disparities in cervical cancer screening as more African-American respondents reported a recent Pap test than European-American respondents (p=0.0134; Table 1).

Pap Test Behaviors – Total Sample

In the model determining predictors of recent Pap tests in the total sample, age, health insurance, education, relationship status, family history of cancer, smoking status, and race were included and results are presented in Table 2. Age, health insurance status and type, and smoking status were predictors of recent Pap tests ($p<0.05$). Younger age was associated with recent screening. Respondents in the youngest age group (18–30) were more likely to report a recent Pap test than respondents older than 65 years (OR=7.76, 95% CI 1.91, 3.16; Table 2). However, these differences were not significant by race (p=0.4178). Access to care was associated with cervical cancer screening; private health insurance (OR=3.85, 95% CI 1.91, 7.77) and public health insurance (OR=2.35, 95% CI 1.15, 4.81) markedly increased the odds of screening (Table 2). More African Americans were reportedly uninsured or underinsured at the time of interview with higher rates of public insurance and no insurance rates than European-American respondents ($p<0.001$; Table 1). Self-report of smoking behavior was negatively associated with recent screening compared to non-smokers (OR=0.38, 95% CI 0.23, 0.64). In the total sample, family history of cancer was not predictive of cervical cancer screening behavior (OR=1.17, 95% CI 0.55, 2.51) (Table 2).

Pap Test Behaviors – Subsamples by Race

Factors predicting cervical cancer screening behavior were analyzed separately by race to explore potential differences and racial subsample results are presented in Table 3. In contrast to the total sample, only private health insurance status, with a smaller magnitude, was predictive of a recent Pap test (OR=2.30, 95% CI 1.21, 4.37) among the African-American respondent subsample while age and family history of cancer were not (Table 3). For the European-American subsample, age and health insurance status were predictive of Pap tests, with respondents under the age of 44 (across two age categories) more likely to report screening than women aged 65 or older (Table 3). Similar to the total sample, European-American respondents in the youngest age group (18–30) had highest odds of reporting a recent Pap test (OR=27.6, 95% CI 2.83, 26.94) (Table 3). Insured European-American respondents had markedly higher odds of reporting a recent Pap test than uninsured respondents (Table 3).

Family History of Cancer and Race

The final model determined the association of both race and family history of cancer on cervical cancer screening behavior as presented in Table 4. When comparing African-American respondents with or without a family history of cancer to European-American respondents with a family history of cancer, there was no significant difference in report of recent Pap tests. In contrast, family history and race were associated with cervical cancer screening among European-American respondents. Those without a family history of cancer were less likely to report a recent Pap test than European-American respondents with a family history of cancer (OR=0.49, 95% CI 0.29, 0.82; Table 4).

DISCUSSION AND IMPLICATIONS FOR PRACTICE

The primary study objective was to determine the association of family history of cancer on recent Pap tests to elucidate contributing factors to excess cervical cancer mortality and racial disparities. Family history of cancer was previously associated with cervical cancer screening behavior in national analyses in which 74.6% of the sample reported a recent Pap test (Williams et al., 2009). In contrast to the previous national study, 90.2% of the women in the sample of women in South Carolina reported a recent Pap test. Data from the population-based survey in a region with persistent cervical cancer disparities, indicate little to no association with family history of cancer and screening. In the total sample, self-report of family history of cancer was not predictive of cervical cancer screening as measured by self-reported recent Pap tests among African-American respondents and only marginally impacted screening in European-American respondents.

Racial disparities in cervical cancer screening in the sample were not apparent in the sample as total screening proportions met Healthy People 2010 cancer and access objectives (HP 2010, 3-11b) of 90% of women aged 18 and older receiving a Pap test within 3 years (US Department of Health and Human Services, 2000). This finding reflects a larger national analysis of women's cancer screening using Behavioral Risk Factor Surveillance System data in which no racial disparities in report of Pap tests were detected (Bennett, Probst, & Bellinger, 2011). However, in the decade from 2000 to 2010, the overall trend in cervical cancer screening has declined for adult women in South Carolina and nationally (Centers for Disease & Prevention, 2012).

While family history of cancer was not predictive of screening in this sample, the study findings support intersectional approaches to cervical cancer screening. As posited by Daley and colleagues, such an approach includes health policies dictating service delivery and resource allocation, community barriers, institutional barriers, and individual beliefs, behaviors, and characteristics that impact access to cancer-preventive services (Daley et al., 2011).

The high rate of cervical cancer screening noted in a population-based sample of women in South Carolina may demonstrate the effectiveness of early detection and treatment programs, such as the National Breast and Cervical Cancer Early Detection Program (NBCCEDP). The NBCCEBP, which is known as the Best Chance Network (BCN) in South Carolina, provides access to cancer screening for low-income uninsured women aged 47–64 and received a $2M appropriation to expand services and age eligibility in the state (General Appropriations, 2008).

In addition to expanded access to screening for low-income uninsured women, the high rate of overall screening for women in the sample may indicate the effectiveness and demonstrable impact of culturally tailored cancer interventions and educational programs, such as health ministries within faith communities or the Witness Project (Austin & Harris, 2011; Bailey et al., 2000). The Witness Project, a culturally-specific community-based educational program designed to increase breast and cervical cancer screening among women of color, has been shown to increase screening among African-American and Latina women in rural and urban areas (Bailey et al., 2000; Erwin et al., 2007; Ochoa-Frongia, Thompson, Lewis-Kelly, Deans-McFarlane, & Jandorf, 2012). The Witness Project has been replicated in diverse regions with fidelity (Erwin et al., 2007).

In South Carolina, the Witness Project has been implemented to increase cervical and breast cancer screening among African-American women in rural and underserved areas of the state (Mayo et al., 2009). A critical feature of the Witness Project is the use of cultural and religious beliefs to deliver breast and cervical cancer screening messages (Erwin et al.,

2007). Trend data indicate religiosity is highest in the South (Chalfant & Heller, 1991). According to a Gallup opinion poll released in February 2013, eight of the ten most religious states in the nation are located in the South (Newport, 2013). Specific to South Carolina, 52% of adults self-identified as "very religious" and the state tied for fifth most religious in the nation (Newport, 2013). In addition to regional differences in faith beliefs, several epidemiological studies have noted high rates of African-American religious involvement, such as church attendance, prayer, and cultural identity associated with faith, with mixed effects on physical and mental health status (Levin, Chatters, & Taylor, 2005). This intersection of religion, region, and race may provide further insight into the potential impact of culturally specific faith-based programs on women's cervical cancer screening behavior in South Carolina, which may contribute to the lack of association with family history of cancer.

Rather than cancer family history, generational effects were detected in cervical cancer screening behavior, which is concerning given elevated cervical cancer risk with increasing age. Respondents who were older had markedly lower odds of recent screening with some variation in how these factors operated within racial subgroups. Younger respondents were more likely to report a recent Pap test, which may point to women in younger age groups falling into "childbearing" age with increased contact with the health care system for reproductive health care. While increased use of health services and family planning services has been associated with higher utilization of cervical cancer screening among women of childbearing years, study participants in all age categories were eligible given national screening guidelines (Frost, Frohwirth, & Purcell, 2004; Wilcox & Mosher, 1993). Age-related differences in Pap test behavior may suggest a lack of community education and provider awareness about recommended continued screening among older women remaining at risk and impaired access to age-appropriate screening. Provider recommendation and receipt of cervical cancer screening, has been documented as subpar in older Medicaid populations (DuBard, Schmid, Yow, Rogers, & Lawrence, 2008). Cervical cancer screening recommendation modifications need clear communication using health literacy-appropriate educational materials to articulate needed continued screening for women over 30, which is especially salient given HPV prevalence estimates, changing sexual health behavior trends with potential exposure to new HPV strands, and fewer hysterectomies in older women (Burchell, Winer, de Sanjose, & Franco, 2006; Lindau, Drum, Gaumer, Surawska, & Jordan, 2008; Merrill, Layman, Oderda, & Asche, 2008).

While family history of cancer was not predictive of cervical cancer screening behavior in this sample, access mediators were significant. In all models (total sample and race-stratified), access to cancer preventive services as measured by health insurance status was predictive of recent Pap tests. Privately insured women reported more recent screening and health insurance was the sole predictor of screening behavior among African-American respondents. The mediating role of health insurance, private insurance specifically, underscores the critical importance of health delivery facilitators to encouraging healthy behaviors. Publicly funded insurance programs may not offer comparable access to cervical cancer prevention and control services, possibly resulting in differential access and quality, with uninsured and Medicaid populations at higher risk for late-stage cancer diagnoses (Halpern et al., 2008). In South Carolina, African-American residents are more likely to report public insurance, which has policy and practice implications for cervical cancer screening. Despite successful models increasing episodic access, disruptions in continuity of care for quality follow-up treatment may contribute to cervical cancer mortality disparities (Kupets & Paszat, 2011; Radecki Breitkopf & Pearson, 2009).

Exact mechanisms of insurance type and cancer screening behavior is still not understood, but managed care plans differentially impact cervical cancer prevention (Haas, Phillips,

Sonneborn, McCulloch, & Liang, 2002; Phillips et al., 2004). Despite mixed evidence by race and managed care plan type, publicly insured women remain at risk for inadequate access to care for cervical cancer screening. Managed care cost control measures may serve as access barriers; however, previous policy revisions had little impact on cervical cancer screening (Baker & Chan, 2007; Haggstrom et al., 2004). As such, investigations aggregating insurance types may mask specific cervical cancer screening effects and further investigation is warranted.

Given persistent cervical cancer mortality disparities in the region and health insurance as a moderator of screening and early detection, study findings support strategies to improve cancer-preventive service access. However, public insurance program expansions as public health policy to increase access, as in the Patient Protection and Affordable Care Act, will not completely ameliorate cervical cancer disparities. The disparities in cancer-preventive behaviors noted among insured populations suggest other contributing sources of inequities than health insurance alone (Rodriguez, Ward, & Perez-Stable, 2005; Swan, Breen, Coates, Rimer, & Lee, 2003). Rather than health insurance paradigms exclusively, systems approaches to cervical cancer screening have proven effective (Bastani et al., 2002; Bennett et al., 2011).

Family history did not emerge as a predictor in this study of women living in a region with high cervical cancer disparities. The lack of effect of family history may have been confounded by a national sample that did not focus explicitly on regions with high cervical cancer disparities and was masked by access to care and health insurance factors in this sample of women in the Southeastern United States. Future studies are warranted to examine the saliency of family history as a motivator or barrier to cervical cancer screening in order to understand social, structural, and cultural factors that may be more pronounced than family history.

Study limitations include the dependent variable, Pap tests, were self-reported and subject to recall bias, rather than chart review or provider verification, and over-reporting of desirable health behaviors. While Pap test recall bias is reportedly limited in population-based surveys, over-report of cervical cancer screening and inaccuracies in time recall have been noted (Ferrante et al., 2008; Howard, Agarwal, & Lytwyn, 2009; McGovern, Lurie, Margolis, & Slater, 1998; Paskett et al., 1996). Survey response rates with random digit dial methodology and exclusively landline telephone numbers have decreased steadily increasing bias risk with differential participation and non-response, especially among younger, lower-income, and minority respondents due to their overrepresentation in phoneless and cell phone only populations (Clark, Rogers, Armstrong, Rakowski, & Kviz, 2008; Link, Mokdad, Stackhouse, & Flowers, 2006; Schneider, Clark, Rakowski, & Lapane, 2010; Voigt, Koepsell, & Daling, 2003). However, at the time of survey fielding, ethical and logistical concerns related to the inclusion of cell phone exchanges in the CATI system were unresolved. Self-report of partial and/or total hysterectomy was not included in the instrument and as such, respondents with partial and/or total hysterectomies were not excluded from the sample. However, these respondents were still able to provide information about their past screening history and influences on behavior. Finally, self-report of family history of cancer was not specific to cervical cancer, which may confound the study findings. However, the knowledge of family history of any type of has been associated with self-report of cervical cancer in a national analysis (Williams et al., 2009).

CONCLUSIONS

This study is one of the first population-based surveys of HPV and cervical cancer-related attitudes, preferences, and behaviors in the southeastern United States, with excess cervical

cancer mortality in minority and underserved populations (Brandt et al., 2009). Given such disparities, understanding decision-making processes promoting consistent and appropriate uptake of Pap tests and health policies ameliorating structural barriers can inform interventions and ultimately reduce cervical cancer incidence and mortality. Traditional markers of cancer screening, including age, socioeconomic status, and access, continue to impact women. Unlike previous national analyses, knowledge of family history of cancer did not predict cervical cancer screening behavior (Williams et al., 2009).

However, study findings highlight the critical importance of increasing access to care to facilitate women's cancer screening behavior as national trends indicate declining cervical cancer screening rates. Improved access, namely private insurance, emerged as a main factor in cervical cancer screening behavior, especially among African Americans. Study findings may inform future health behavior interventions, especially those targeting communities in the southeastern US region, and expanded access to cancer-preventive services. Further studies are needed to explore family history of cancer and perceived risk of cervical cancer on screening behavior in diverse populations to identify its association with cancer-preventive behaviors.

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Table 1

Demographic Characteristics (%) by Race and Family History Status of Population-Based HPV Survey Respondents, n=918

	African American (n=377)		European American (n=541)		
Variable	**FHC+ (n=32)**	**FHC− (n=345)**	**FHC+ (n=66)**	**FHC− (n=475)**	**Total (n=918)**
AGE					
18–30	3.1	9.9	4.5	7.8	8.2
31–44	28.1	29.3	39.4	39.4	25.3
45–64	59.4	52.2	50.0	50.0	54.9
≥65	9.4	8.7	6.1	6.1	12.0
INCOME ***					
<$25,000	25.0	46.1	25.8	18.1	29.4
≥25,000	75.0	53.9	74.2	81.9	70.6
EDUCATION ***					
< HS Diploma	15.6	10.7	19.7	6.1	9.2
HS	31.3	31.9	22.7	21.5	25.8
Diploma/G.E.D.					
< College Graduate	37.5	34.5	31.8	33.3	33.8
College Graduate	15.6	22.6	25.9	38.9	31.0
RELATIONSHIP ***					
Single	18.8	25.8	6.1	5.3	13.5
Married	43.8	49.6	80.3	79.2	66.9
Divorced/Widowed	37.5	24.6	13.6	15.6	19.6
RURALITY ***					
Urban	40.6	52.5	71.2	70.1	62.5
Rural	59.4	47.5	28.8	29.9	37.5
INSURANCE ***					
Private	43.8	43.2	51.5	64.2	54.7
Public	53.1	39.1	33.5	27.8	33.3
Uninsured	3.1	17.7	15.2	8.0	12.0

	African American (n=377)		European American (n=541)		
Variable	**FHC+ (n=32)**	**FHC− (n=345)**	**FHC+ (n=66)**	**FHC− (n=475)**	**Total (n=918)**
SMOKING**					
Smokers	18.8	15.4	37.9	22.7	20.9
Non-smokers	81.3	84.6	62.1	77.3	79.1
PAP TEST *					
Recent (< 3yrs)	90.6	93.3	89.4	88.0	90.2
Not Recent	9.4	6.7	10.6	12.0	9.8

*Statistically significant differences by race at p<0.05

**Statistically significant differences by race at p<0.01

***Statistically significant differences by race at p<0.001

[a]FHC: Family History of Cancer

Table 2

Factors Predicting Recent Pap (<3yrs) for Population-Based HPV Survey Respondents in southeastern United States, (n=918)

Variable	Odds Ratio	Std. Error	Z Statistic, P>|z|		95% Conf. Interval
Race					
AA [Ref]	---	---	---		---
EA	0.40	0.12	-3.04	0.002*	0.23, 0.72
Age					
18 – 30	7.76	5.56	2.86	0.004*	1.91, 3.16
31 – 44	7.73	7.73	3.87	0.000*	2.74, 92.18
45 – 64	1.27	1.27	0.64	0.522	0.61, 2.64
65+ [Ref]	---	---	---	---	---
Health Insurance					
Private	3.85	1.38	3.76	0.000*	1.91, 7.77
Public	2.35	0.86	2.35	0.019	1.15, 4.81
Uninsured [Ref]	---	---	---	---	---
Education					
Less than HS	0.75	0.86	-0.73	0.463	0.35, 2.99
HS Diploma/GED	1.36	0.29	0.77	0.442	0.62, 3.37
< College Grad	1.44	0.55	0.84	0.403	0.61, 3.71
College Grad [Ref]	---	---	---	---	---
Relationship Status					
Single [Ref]	---	---	---	---	---
Married	1.67	0.68	1.26	0.208	0.75, 3.71
Divorced/Wid/Sep	2.03	0.90	1.59	0.112	0.85, 4.86
Family History					
FHC+	1.17	0.46	0.42	0.672	0.55, 2.51
FHC– [Ref]	---	---	--	--	---
Health Behaviors					
Smoking	0.38	0.10	-3.72	0.000*	0.23, 0.64

Variable	Odds Ratio	Std. Error	Z Statistic, P>|z|		95% Conf. Interval
Non-smoker [Ref]	---	---	--	--	---

* Statistically significant at p<0.05

Table 3

Predictors of Recent Pap (<3yrs) Predictors by AA and EA Subsamples, (n=918)

	AA Only Model (n=377)			EA Only Model (n=541)		
Variable	**Odds Ratio, 95% CI**	**Std. Error**	**Z Statistic, P>|z|**	**Odds Ratio, 95% CI**	**Std. Error**	**Z Statistic, P>|z|**
Age						
18 – 30	1.94 (0.21, 8.32)	2.22	0.58, 0.563	27.6(2.83,26.94)	32.09	2.86, 0.004*
31 – 44	3.52(0.47,26.35)	3.62	1.23, 0.220	12.5(3.34,46.52)	8.38	3.76, 0.000*
45 – 64	0.69 (0.13, 3.56)	0.58	−0.48, 0.061	1.69 (0.69, 4.11)	0.76	1.17, 0.243
65+ Ref	---	---	--	--		--
Health Insurance						
Private	7.20 (1.95, 6.60)	4.80	2.96, 0.003*	3.57 (1.41, 8.99)	1.68	2.70, 0.007*
Public	2.22 (0.76, 6.44)	1.21	1.46, 0.144	2.97 (1.08, 8.07)	1.52	2.12, 0.034*
Uninsured Ref	---	---	---	---	---	--
Education						
< HS Diploma	0.56 (0.15, 2.03)	0.37	−0.89, 0.374	0.97 (0.35, 2.68)	0.50	−0.05, 0.957
HS Diploma/GED	1.44 (0.33, 6.23)	1.08	0.48, 0.631	1.59 (0.60, 4.39)	0.82	0.90, 0.367
<College Graduate	0.44 (0.89, 2.21)	0.36	−0.99, 0.321	2.26 (0.78, 6.54)	1.23	1.50, 0.134
College Grad Ref	---	---	---	---	---	--
Relationship St.						
Single Ref	---	---	---	---	---	--
Married	1.35 (0.47, 3.89)	0.73	0.55, 0.582	2.13 (0.56, 8.22)	1.47	1.11, 0.264
Div/Wid/Sep	2.73 (0.78, 9.59)	1.75	1.57, 0.117	2.11 (0.48, 9.19)	1.58	0.99, 0.321
Family History						
FHC+	0.53 (0.14, 2.07)	0.37	−0.91, 0.362	1.60 (0.63, 4.07)	0.76	0.98, 0.325
FHC− Ref	---	---	---	---	---	--
Health Behaviors						
Smoking	0.38 (0.14, 3.43)	0.19	−1.90, 0.058	0.34 (0.18, 1.35)	0.11	−3.45, 0.001*
Non-smoker Ref	---	---	---	---	---	--

*Statistically significant at p<0.05

Table 4

Predictors of Recent Pap Test (<3yrs) in Population-Based HPV Survey Respondents in southeastern United States by Family History and Race Interaction, (n=918)

Variable	Odds Ratio	Std. Error	Z Statistic, P>|z|		95% Conf. Interval
AA with FHC	0.67	0.43	−0.62	0.536	0.19, 2.37
EA with FHC	0.57	0.26	−1.23	0.219	0.23, 1.40
EA without FHC	0.49	0.13	−2.70	0.007	0.29, 0.82
EA with FHC [Ref]	---	---	--	--	---

*Statistically significant at p<0.05

[a]Model controls for health insurance, age, income, education, relationship status, and smoking status.

[b]AA, African American; EA, European American; FHC, Family History of Cancer; Ref, Referent Level