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Perceived Susceptibility to Cervical Cancer Among African-American Women in the Mississippi Delta: Does Adherence to Screening Matter?

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Abstract

Background: Although preventive measures have greatly reduced the national burden of cervical cancer, racial/ethnic and geographic disparities remain, including the disproportionate incidence and mortality among African-American women in the Mississippi Delta. Along with structural barriers, health perceptions and cultural beliefs influence participation in cervical screening. This study examined perceived susceptibility to cervical cancer among African-American women in the Delta across three groups: (1) women attending screening appointments (Screened) (2) women attending colposcopy clinic following an abnormal Pap test (Colposcopy), and (3) women with no screening in ≥3 years (Un/under-screened).

Methods: Data were collected during a study assessing the feasibility/acceptability of self-collected sampling for human papillomavirus (HPV) testing as a cervical screening modality. A questionnaire assessed demographics, health care access, and cervical cancer knowledge and beliefs (including perceived susceptibility). Participants were asked, “Do you think you are at risk for cervical cancer”, and responses included “Yes, “No”, and “I don’t know”. Multinomial logistic regression models compared variables associated with answers among each group.

Findings: Out of 524 participants, one-half did not know if they were at risk of cervical cancer (50%) or HPV exposure (53%). Between the Un/under-screened (n=160), Screened (n=198), and

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Colposcopy (n=166) groups, age (p<.001), education (p=.02), and perceived risk of HPV exposure (p<.01) differed. Older age and younger age at first intercourse (Un/under-screened); family history and screening recommendations (Screened); and family history and perceived risk of HPV exposure (Colposcopy) were associated with perceived susceptibility to cervical cancer.

Conclusions: Differences in perceived susceptibility to cervical cancer exist between African-American women in the Delta. Understanding these variations can help in developing strategies to promote screening among this population with a high burden of disease.

Introduction

From 1973 to 2015, following the introduction of primary screening with Papanicolaou (Pap) testing and, more recently, human papillomavirus (HPV) testing in the United States, the overall cervical cancer incidence rate has dropped from 17.2 to 7.6 (per 100,000), and the mortality rate has decreased from 5.6 to 2.3 (per 100,000) (Siegel, Miller, & Jemal, 2017, 2018; Singh, 2012). Although screening has substantially reduced the burden of cervical cancer nationwide, racial/ethnic and geographic disparities in cervical cancer incidence and mortality remain (Akers, Newmann, & Smith, 2007; Sheppard, El-Zein, Ramanakumar, Ferenczy, & Franco, 2016). Such disparities include the disproportionate cervical cancer burden among African-American women in the Mississippi Delta, a high-poverty region of the state between the Mississippi and Yazoo rivers (Neaves, Feierabend, Butts, & Weiskopf, 2008; Zahnd, Jenkins, & Mueller-Luckey, 2017).

African-American women and women living in the Southern United States remain at higher risk of being diagnosed with and dying from cervical cancer compared to Non-Hispanic White women and women in other regions of the country (Yoo et al., 2017). Furthermore, African-American women in the Mississippi Delta have higher cervical cancer incidence and mortality rates than African-American women living in neighboring counties and states (“Mississippi Cancer Registry,” 2018). From 2010–2015, the cervical cancer incidence among African-American women living in the Mississippi Delta was higher than that of both Non-Hispanic White women in the Mississippi Delta and African-American women in non-Delta Mississippi counties (14.6 vs. 9.8 vs. 10.7 per 100,000, respectively) (“Mississippi Cancer Registry,” 2018). The excess mortality associated with cervical cancer between African-American women in the Mississippi Delta and African-American women nationwide from 2011 to 2015 was 2.8 per 100,000 (6.6 vs. 3.8, respectively) (“Mississippi Cancer Registry,” 2018; Siegel et al., 2018). As cervical cancer mortality in the United States is higher among medically underserved populations, this increase in mortality suggests disparities in screening and access to care exist among African-American women in the Mississippi Delta (Freeman HP, 2005).

In 2015, 81–82% of women in the United States reported receiving a Pap test in the previous three years, according to analyses of the National Health Interview Survey (NHIS) data (Hall et al., 2018; Smith et al., 2017). Although screening rates were higher among African-American women (85%), they remained low among women with no health insurance (61%) and fewer years of education (70%), factors previously associated with reduced adherence to screening (Hall et al., 2018; Leyden et al., 2005; Smith et al., 2017). Structural barriers to

cervical cancer screening are well documented and include factors such as provider availability, transportation to care, and insurance status (Chen, Kessler, Mori, & Chauhan, 2012; Leyden et al., 2005). Studies have also shown the relevance of behavioral barriers, including fatalistic beliefs, lack of perceived risk to cervical cancer, and fear of receiving a cancer diagnosis (Garces-Palacio & Scarinci, 2012; Lai et al., 2017; Scarinci et al., 2010).

Perceived susceptibility, or perceived risk, is an important behavioral construct to consider when attempting to understand cancer screening participation. Perceived susceptibility refers to an individual's "beliefs about the likelihood of getting a disease or condition" (Glanz, 2008). Within the Health Belief Model (HBM), participation in a preventive behavior is likely to occur if an individual (1) perceives himself/herself susceptible to the condition, (2) perceives consequences of the condition to be serious, and (3) believes there is an obtainable action, with greater benefits than barriers to reduce the risk of developing the condition (Glanz, 2008). Understanding perceived susceptibility and associated factors can be crucial in developing strategies to promote screening within populations experiencing a high burden of disease. Perceived susceptibility to cervical cancer has been associated with various factors including family history of cancer, knowledge of risk factors, and prior abnormal screenings (Asiedu, Breitkopf, & Breitkopf, 2014; Johnson, Mues, Mayne, & Kiblawi, 2008). This study aimed to examine factors associated with perceived susceptibility to cervical cancer among three groups of African-American women living in the Mississippi Delta: women waiting for their Pap test appointment (Screened), women waiting for their colposcopy appointment (Colposcopy), and women recruited in the community who indicated the absence of cervical cancer screening within the past three years (Un/under-screened).

Material and Methods

Recruitment and Participants

Data were collected as part of a larger study assessing the feasibility of self-collection for HPV testing among African-American women in the Mississippi Delta. Detailed methods were previously described (Gage et al., 2011; Litton, Castle, Partridge, & Scarinci, 2013). Recruitment of African-American women between 26 to 65 years of age in Tallahatchie, Leflore, Sunflower, and Washington counties occurred from 2007 to 2009 for three groups: (1) Women in the public health department clinic waiting room for Pap appointments (Screened); (2) Women in the public health department clinic waiting room for colposcopy appointments following an abnormal Pap result (Colposcopy); and (3) Un/under-screened women in the community who had not undergone cervical cancer screening in the past three years or longer (Un/underscreened). Women recruited in the community were directed to visit a local health department to participate in the study. Once women arrived at the clinic, the approach was the same for all participants. A woman was eligible to participate if (a) she was 26 to 65 years old; (b) she identified herself as African-American; (c) she had access to a telephone; (d) she denied any previous history of cervical cancer; (e) she had no self-reported history of a hysterectomy; and (f) she was not pregnant.

Measures and Procedure

Once consented, women were asked to participate in an interviewer-administered baseline questionnaire, have their cervical sample collected by a health care provider, and selfcollect a specimen for HPV testing. Participants received $20 as compensation for their time. Twenty-six questions in the baseline questionnaire assessed knowledge, beliefs, and attitudes pertaining to cervical cancer, screening history, and demographics. Questions were derived from previous qualitative research assessing the acceptability and usability of self-collection sampling for HPV testing among African-American women in the Mississippi Delta and our previous work with other populations (Garces-Palacio & Scarinci, 2012; Scarinci, Litton, Garces-Palacio, Partridge, & Castle, 2013). Prior to asking questions about cervical cancer, the interviewer provided a simple description of cervical cancer and its location. Similarly, before questions about Pap test were asked, a simple definition of a Pap test was provided to participants.

Perceived susceptibility to cervical cancer was assessed through the following question: “Do you think you are at risk of cervical cancer?”. Response options included “Yes”, “No”, and “I don’t know” (DK). A follow-up question provided an opportunity for open-ended responses to “Why?”. Perceived severity was assessed by asking “How serious is cervical cancer?” and response options ranged from “Not at all serious” to “Extremely serious”. Perceived past exposure to HPV infection was assessed through the following question, “Do you think you may have been exposed to HPV infection in the past?”. Response options included “Yes”, “No”, and “DK”. Preventive healthcare utilization (i.e. checkup frequency) was measured by asking “How often do you go to the doctor for check-ups (when you are NOT sick, just to see if everything is fine)?”. Response options ranged from “Never” to “Every 5 years or more”, and the results were grouped into three categories: “Never”, “Yearly”, and “Every 2+ years”. Curative healthcare utilization was assessed by asking “How often do you visit the doctor when sick?”. Response options ranged from “never sick” and “never” to “always”. Recent receipt of a provider’s recommendation for screening was assessed by asking “During the last year, has a doctor/health care professional recommended that you have a Pap smear?”. Response options included “Yes”, “No” and “DK”.

Analysis

Descriptive statistics outlined demographics and variables of the three study groups: Un/under-screened, Screened, and Colposcopy. Women were further separated into groups based on perceived susceptibility, defined by the responses Yes, No, and DK to “Do you think you are at risk of cervical cancer?”. Bivariate analyses were performed using ANOVA for continuous variables and Pearson χ^2 or Exact P-values for categorical variables. The significance level was set at 0.05 and all statistical analyses were conducted using STATA version 12 analytic software (StataCorp LP, College Station, TX). A multinomial logistic regression was performed to explore the relationship between socio-demographic and knowledge characteristics, and perceived susceptibility to cervical cancer (Yes, No, and DK) in each study group. Variables with P values less than 0.10 in the bivariate analyses were included in the unadjusted logistic regression models. Variables with P values less than 0.10 in unadjusted models were entered into the adjusted model using backwards elimination. Significance for variables in adjusted models was set at $P < 0.05$. The estimates derived from

the multinomial logistic regression analyses used those who answered yes to “Do you think you are at risk of cervical cancer?” as the reference group. Variables included in the unadjusted model were: age, marital status, age at first intercourse, number of lifetime sexual partners, frequency of visiting doctor when sick, whether a doctor had recommended a Pap in the past year, family member who has died of cancer, and perceived past HPV exposure.

All aspects of this study were reviewed and approved by the National Cancer Institute, Mississippi State Board of Health, and The University of Alabama at Birmingham Institutional Review Boards for human subject research.

Results

Characteristics of all participants

The final sample consisted of 524 participants: 160 Un/under-screened, 198 Screened, and 166 Colposcopy. Characteristics and descriptive statistics of all participants and participants by study group are outlined in Table 1. Overall, participants’ mean age was 35.4 (± 8.5) years, mean education was 12.4 (± 2.3) years, and mean age at first sexual intercourse was 16.4 (± 3.0) years. Mean number of lifetime sexual partners was 8.4 (± 9.2) and average monthly income was 1267 US $ (± 1307). When asked “How often do you visit the doctor when sick?”, “Sometimes” was the most common response (55%). 63% of women reported a yearly checkup, and 22% received a provider’s recommendation to receive a Pap test in the past year. Many women answered DK to perceived risk of cervical cancer (50%) and previous HPV exposure (53%). Only 69 participants (13%) believed they may have been exposed to HPV in the past. Most (70%) believed cervical cancer was extremely serious.

On comparison of the three study groups (Table 1), there were demographic differences in mean age ($p<.001$), years of education ($p=.02$), and monthly income ($p=.03$). There were also differences in the reported frequency of preventive ($p<.01$) and curative ($p<.01$) healthcare utilization. Only 4% of the Un/under-screened group believed they may have been exposed to HPV, compared to 12% in the Screened, and 24% in the Colposcopy groups. Recent receipt of a provider recommendation to have a Pap test ($p=.13$), family history of a cancer-related death ($p=.24$), and perceived seriousness of cervical cancer ($p=.12$) were similar across all three groups. Perceived susceptibility to cervical cancer differed by study group ($p=.03$), with 40% of participants in the colposcopy group perceiving themselves at risk compared to 28% in the screened group and 26% in the un/under-screened group.

Characteristics by perceived susceptibility to cervical cancer

Characteristics of women by perceived susceptibility to cervical cancer (Yes, No, and DK), stratified by study group, are summarized in Table 2.Variables among women in each group (Un/under-screened, Screened, and Colposcopy) who answered “No” or “DK” to “Do you think you are risk of cervical cancer?” are compared to women in the same group who answered “Yes” in Table 3 (unadjusted and adjusted models). The results will be described in a section below for each group (Un/under-screened, Screened, and Colposcopy).

Un/under-screened women

Most un/under-screened women did not know if they were at risk of cervical cancer (56%). When characteristics of un/under-screened women were compared by perceived susceptibility to cervical cancer (Table 2), there were significant differences in current age (p=.02), age at first intercourse (p=.02), and perceived risk of HPV exposure (p<.01). There was a marginal difference in lifetime number of sexual partners (p=.06), with the highest mean number reported for un/under-screened women who perceived themselves at risk of cervical cancer.

Between un/under-screened women who answered “No” and “Yes” in the unadjusted model (Table 3), there were significant differences with regard to age at first intercourse and number of lifetime sexual partners. In the adjusted model, there were no significant differences.

Between un/under-screened women who answered “DK” and “Yes” in the unadjusted model, there were significant differences with regard to age, age at first intercourse, and number of lifetime sexual partners. In the adjusted model age and age at first intercourse remained significant. That is, un/under-screened women who did not know if they perceived themselves at risk of cervical cancer were significantly more likely to be older and report an older age at first intercourse than un/under-screened women who perceived themselves at risk.

Screened women

Most screened women did not know if they were at risk of cervical cancer (53%). When characteristics of screened women were compared by perceived susceptibility to cervical cancer (Table 2), statistically significant differences were seen in recent receipt of a Pap recommendation from a provider (p=.04), family history of a cancer-related death (p<.01), and perceived risk of prior HPV exposure (p<.01).

Between screened women who answered “No” and “Yes”, in both the unadjusted and adjusted models (Table 3), there were significant differences with regard to having a family member who died of cancer. That is, women who had a family history of a cancer-related death were significantly more likely to perceive themselves susceptible to cervical cancer than the ones who did not.

Between screened women who answered, “DK” and “Yes”, there were significant differences in both the unadjusted and adjusted models (Table 3) with regard to having a family member who died of cancer and receiving a recommendation to get screened by a health care provider within the past year. That is, women who had a family member who died of cancer or received a recommendation for screening from a provider within the past year were significantly more likely to perceive themselves susceptible to cervical cancer than women who did not.

Women at a colposcopy appointment

“DK” (40.4%) and “Yes” (39.8%) responses made up most of the group. When women in the colposcopy group were compared by perceived susceptibility to cervical cancer (Table

2), there were statistically significant differences in visits to a doctor when sick (p=.04), family history of a cancer-related death (p<.01), and perceived risk of prior exposure to HPV (p<.01) Age of first intercourse was lowest among women who perceived themselves at risk of cervical cancer and there was a marginal difference by perceived risk of cervical cancer (p=.06).

Between women in the colposcopy group who answered “No” and “Yes”, in the unadjusted model (Table 3), there were significant differences regarding visits to a doctor when sick, family history of a cancer-related death, and answering “Yes” or “DK” when asked, “Do you think you may have been exposed to HPV infection in the past?”. In the adjusted model, the differences in family history and perceived risk of HPV exposure remained significant. That is, women who had a family history of a cancer-related death and women who either perceived themselves at risk or did not know if they perceived themselves at risk of prior HPV exposure were significantly more likely to perceive themselves susceptible to cervical cancer.

Among women in the colposcopy group who answered “DK” and “Yes” in the unadjusted model (Table 3), there were significant differences regarding age at first intercourse and family history of cancer-related death. The difference in family history remained significant in the adjusted model. That is, women who had a family history of a cancer-related death were more likely to perceive themselves susceptible to cervical cancer than women who did not.

Reasons provided for perceived susceptibility to cervical cancer

The three most common themes identified among responses provided by participants when asked “Why?” following “Do you think you are at risk of cervical cancer?” varied by screening status. Among women who perceived themselves at risk of cervical cancer and provided a response (n=184), family history, being a woman, and prior abnormal Pap results were the most common reasons provided across all screening groups.

Reasons provided by women who did not perceive themselves at risk for cervical cancer (n=93) varied by study group. Among un/under-screened women (n=29), no reason (“I just don’t/I don’t know”) (38%), lack of family history (24%), and fatalism or “not claiming it” (24%) were the most common. Among screened women (n=33), no reason (40%), no history of an abnormal pap (27%), and no family history (15%) were the most common. In the colposcopy group (n=31), fatalism (55%), no reason (26%), and no family history (13%) were the most common.

Reasons provided by women who did not know if they perceived themselves at risk of cervical cancer (n=200) most frequently included “I don’t know” and lack of information across all three screening groups. To describe why women did not know if they were at risk of cervical cancer, un/under-screened women (n=78) acknowledged the absence of recent screening (17%); screened women (n=75) reported the absence of health problems (9%); and women in the colposcopy group (n=47) endorsed fatalistic beliefs (13%).

Discussion

Among African-American women living in the Mississippi Delta, similarities and differences in factors associated with perceived susceptibility to cervical cancer were seen according to screening status. Differences in age, education, and healthcare utilization were observed based on screening status, and such differences may influence screening behavior and risk beliefs among women. Across all study groups, most women did not know if they perceived themselves at risk for cervical cancer. Perceived susceptibility to cervical cancer was associated with younger current age and younger age at first intercourse among un/under-screened women; recent receipt of a provider's recommendation to complete a Pap test among screened women; and perceived prior exposure to HPV among the colposcopy group. Additionally, women undergoing screening or colposcopy were more likely to perceive themselves susceptible to cervical cancer if they had a family history of a cancer-related death.

Regardless of screening/follow-up group, a significant number of participants did not know if they perceived themselves at risk for cervical cancer or prior HPV exposure. Cancer risk perception has been shown to be a precursor of engagement in behaviors that prevent disease as posited by a number of behavior change theories, including the HBM (Glanz, 2008). Interestingly, our findings indicate that even women who were engaged in screening (Screened) and follow-up after an abnormal Pap test result (Colposcopy) did not know if they were at risk for cervical cancer. Waters et al. have focused their work on better understanding respondents who answer "don't know" regarding perceived cancer risk, and they report these individuals are less likely to engage in cancer prevention behaviors than individuals who endorse "valid" responses (yes or no). They also describe that "don't know" responses were "higher among sociodemographic groups that are disproportionately more likely to have limited formal education (e.g., African Americans, individuals with low incomes)" (Hay, Orom, Kiviniemi, & Waters, 2015; Orom et al., 2017; Waters, Hay, Orom, Kiviniemi, & Drake, 2013; Waters, Kiviniemi, Orom, & Hay, 2016).

What would motivate a 30-year-old African-American woman to get a Pap, a test that is unpleasant, time-consuming, and potentially costly for a low-income individual, if she is uncertain whether she is truly at risk? Taber and Klein (2016) propose the concept of "risk perception conviction", which refers to "the subjective sense that one knows what one's risk belief is (risk correctness), as well as confidence that this risk belief is accurate (risk clarity)"(Taber & Klein, 2016). That is, it may not be only about the perception of risk, but also the certainty or uncertainty associated with the belief. They suggest that a few antecedents should be in place for individuals to form their risk conviction: "direct experience with disease, consistency of underlying information, relevance of underlying information, completeness of underlying information, and perceived ambiguity of information"(Taber & Klein, 2016). Although most of these antecedents are related to health knowledge (e.g., context, content, messaging, messenger), we must first understand how and why the "don't know" responses occur, which, in turn, will inform the development of appropriate cancer risk communication strategies.

Although we did not directly measure health literacy in our study, limited knowledge of cervical cancer and HPV may have contributed to the high proportion of women who did not know if they perceived themselves at risk (Kim & Han, 2016; Kiviniemi, Orom, Waters, McKillip, & Hay, 2018; Morris et al., 2013). Health literacy has been associated with increased knowledge of cancer and screening participation (Kim & Han, 2016; Lindau et al., 2002), but the relationship between perceived susceptibility and health literacy is not as clear (Kim & Han, 2016; Morris et al., 2013; Peterson, Dwyer, Mulvaney, Dietrich, & Rothman, 2007). Some studies have paradoxically identified an association between improved cervical health literacy and reductions in perceived risk of cervical cancer (Nadarzynski, Waller, Robb, & Marlow, 2012; Ramaswamy et al., 2017). More broadly, Schapira et al. found that general health numeracy was not correlated with perceived risk of cervical cancer (Schapira et al., 2011). Research on cervical health literacy has not focused on those who do not know if they perceive themselves at risk, but “don’t know” responses have been associated with low specific and generalized health knowledge among other study populations (Hay et al., 2015). Although public health initiatives have aimed to improve cervical cancer and HPV knowledge, barriers to access and comprehension may continue to limit knowledge among individuals with low health literacy (Khan et al., 2008; Kiviniemi et al., 2018). Kiviniemi et al. recently called for efforts to address disparities in “don’t know” answers to perceived risk by examining communication strategies among specific sub-populations (Kiviniemi et al., 2018). Thus, future educational strategies should aim to identify and address population-specific barriers to accessing and understanding cervical cancer and HPV knowledge.

Similar to previous findings of decreased screening participation among older women, un/under-screened women in our study were older than women waiting to attend a Pap or colposcopy appointment (Akers et al., 2007; Chen et al., 2012; Cuzick et al., 2014; Leyden et al., 2005). The disparity in screening between Non-Hispanic White women and African-American women in the United States is largely a consequence of decreased screening participation among African-American women, particularly older women (Akers et al., 2007; Akinlotan et al., 2017). Barriers to screening among older women include fewer preventive provider visits, more frequent comorbidities, and decreased perception of risk with age (Guo, Hirth, & Berenson, 2015; Sherman, Castanon, Moss, & Redman, 2015). Among older women, particularly those living in rural areas with low education levels, inadequate health literacy could represent another potential barrier to care, as literacy scores decrease with age and fewer years of education (Kutner et al.,2006). In fact, our results show that un/under-screened women had lower average monthly incomes and fewer years of education than women attending Pap or colposcopy appointments, two factors previously associated with decreased screening uptake (Freeman HP, 2005; Leyden et al., 2005).

Across all three groups of women, there were significant differences in both preventive and curative healthcare visits. Access to healthcare services generally promotes preventive measures such as participation in Pap tests (Chen et al., 2012). As such, it has been shown that screening rates are higher among women with healthcare coverage and women living in more urban communities (Akinlotan et al., 2017). In the present study, the proportion of women who reported never attending a checkup and never going to the doctor when sick was highest among the Un/under-screened group. Similar to previous studies of un/under-screened women with limited engagement in healthcare services and burdensome financial

constraints, the existence of free access to screening services may not be enough (Leyden et al., 2005; Nonzee et al., 2015; Scarinci et al., 2010). Successful engagement of participation could require additional efforts to improve knowledge of how the services are covered, health literacy, and/or trust in the provider.

In the present study, women attending screening or colposcopy with a family history of a cancer-related death had higher odds of perceiving themselves at risk of cervical cancer. Although there is no evidence that family history affects the risk of developing cervical cancer, family history has been shown to influence an individual's perceived susceptibility to cancer in general, including cervical cancer, and it is possible that family history provided increased awareness of cervical cancer risk and prevention options among participants (Garces-Palacio & Scarinci, 2012; Vornanen et al., 2016). In fact, the presence or absence of family history were two of the most common reasons women used to describe why they did or did not find themselves susceptible to cervical cancer. However, women who did not know if they were susceptible to cervical cancer rarely cited family history. Although family history of cancer may motivate certain women to participate in screening, other women could avoid screening due to the absence of family history and ignore important behavioral risk factors associated with cervical cancer, such as tobacco use.

Women in the Un/under-screened group who did not find themselves susceptible to cervical cancer and those in the Colposcopy group who did not or did not know if they perceived themselves susceptible to cervical cancer commonly provided reasons associated with fatalism or faith to describe their perceived risk of cervical cancer. Fatalism, a common barrier among populations with high burdens of cervical cancer in the United States, is strongly influenced by an individual's religious and spiritual beliefs (Peek, Sayad, & Markwardt, 2008; Scarinci et al., 2010). In the present study, a common reason provided by women to support their beliefs concerning susceptibility was, "I'm not claiming it". This phrase, used to describe the power of confession, likely stems from religious beliefs tracing to the Christian Word of Faith movement (Harrison, 2005; MacGregor, 2007). This "name it and claim it" movement focuses on the power of faith and spoken word to determine reality (Harrison, 2005). For example, to attain health, believers are encouraged to recognize and vocalize positive health characteristics (Harrison, 2005). Similarly, acknowledgement of illness and negative circumstances is discouraged because doing so suggests a lack of faith and makes negative outcomes more likely (Harrison, 2005; MacGregor, 2007). Although we did not assess beliefs among participants, previous studies describe the importance of faith among African-American women, and some success has been seen with the inclusion of church communities in screening efforts (Dessio et al., 2004; Scarinci et al., 2010). Beliefs in positive confession and similar practices may increase perseverance and positive thinking, but they could also reduce the recognition of risk factors and participation in preventive measures. Thus, fatalistic and religious barriers to perceived susceptibility may require more focused methods to educate women about the importance of cervical cancer screening as a routine part of preventive health care and not as the result of a risk factor.

One similarity across groups was the relatively low proportion of women who believed they may have been exposed to HPV, especially among those in the Screened and Un/underscreened groups. Overall, only 13% of participants believed they were susceptible to

prior HPV exposure, and only one un/under-screened woman referenced HPV as a reason for being susceptible to cervical cancer. The number of women who believed they may have been exposed to HPV remained relatively low among women attending colposcopy (24%) appointments, suggesting a lack of understanding about the risk factors associated with cervical cancer and the indications for a colposcopy. Correspondingly low knowledge of HPV was observed in a previous study examining the feasibility of self-collected sampling for HPV testing among African-American women in the Mississippi Delta (Scarinci et al., 2013). The present study was performed shortly after the Advisory Committee on Immunization Practices first recommended the HPV vaccine, and various national initiatives have aimed to increase HPV awareness and vaccination uptake since then (Beavis & Levinson, 2016).

Although studies have shown an increase in general awareness of HPV and its link to cervical cancer, racial and geographic disparities in knowledge and vaccination uptake exist (Beavis & Levinson, 2016; Strohl et al., 2015). A recent analysis of the National Cancer Institute's 2013 and 2014 Health Interview National Trend Survey (HINTS) found African-American women were less likely to report knowledge of HPV or identify the relationship between HPV and cervical cancer compared to Non-Hispanic White women (Ojeaga, AlemaMensah, Rivers, Azonobi, & Rivers, 2017). The majority of HINTS participants were welleducated non-Hispanic whites with health insurance and a regular healthcare provider (Ojeaga et al., 2017); thus, the sample may not represent knowledge and/or perceived risk among subpopulations across the United States. Even though research reports most women are aware of HPV, low perceived risk of HPV remains a barrier to vaccination uptake among parents (Galbraith et al., 2016). Such findings highlight the difference between general awareness and perceived risk, suggesting a lack of understanding that most individuals will be infected with HPV in a lifetime (Satterwhite et al., 2013). Although the overall perception of previous exposure to HPV was low in our study, women in the colposcopy group who believed they were at risk of prior HPV exposure had higher odds of perceiving themselves susceptible to cervical cancer. Therefore, to increase the perceived risk of cervical cancer and impact future screening behaviors, future efforts should focus on educating women about the prevalence and risk of HPV and its connection to cervical cancer.

The limitations of this study deserve consideration. First, this is a cross-sectional study, and an individual's perceived susceptibility to cervical cancer and screening behavior could change over time. However, our previous qualitative work with this population indicated similar findings, which led to the quantitative assessment of this phenomenon (Scarinci et al., 2013). Second, women who agreed to participate in a study to determine the feasibility of self-collection sampling for HPV testing as a cervical cancer screening approach may have different beliefs than the women who refused to participate or were not asked to participate. Additionally, we did not measure health literacy or perceived risk to other malignancies in our study, two factors that could affect knowledge, beliefs, and attitudes regarding cervical cancer.

Implications for Practice and/or Policy

This study makes a unique contribution to the literature by examining perceived susceptibility to cervical cancer and associated factors among un/under-screened women, women waiting for a Pap test, and women who were likely to be HPV positive as they were in the waiting room for colposcopy appointments. As most cervical cancer in the United States occurs in high risk sub-populations of women, it is important to understand perceived susceptibility among such populations in order to successfully address disparities in disease recognition and management. Along with the development of strategies to address barriers to perceived cervical cancer susceptibility and, consequently, screening among un/under-screened women, it is critical to identify and reinforce facilitators to screening among screened women. One facilitator identified in the present study includes the importance of education concerning HPV exposure and cervical cancer as a way to heighten perceived susceptibility. As such, we have developed culturally relevant strategies to promote cervical cancer screening among African-American women in the Mississippi Delta, and their efficacy is currently being examined through a group randomized trial (Castle et al., 2011). We are also conducting additional research to better understand how vulnerable populations conceptualize “cancer risk”, and, consequently, inform interventions to promote cancer screening, particularly with regard to preventable/early detected cancers such as breast, colorectal, cervical, and skin cancer.

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Table 1.

Characteristics of participants, by cervical cancer screening/follow-up group

	All N=524	Un/under-screened N=160	Screened N=198	Colposcopy N=166	P[a]
Age (y)[b]	35.4 (8.5)	40.1 (9.1)	34.7 (4.6)	31.9 (6.8)	<.001
Education (y)[b]	12.4 (2.3)	12.0 (2.1)	12.7 (2.4)	12.4 (2.3)	.02
Married/cohabitate[c]	155 (29.6)	47 (29.4)	63 (32.0)	45 (27.1)	.60
Sexual initiation (y)[b]	16.4 (3.0)	16.3 (3.3)	16.4 (3.0)	16.6 (2.8)	.65
Lifetime partners (#)[b]	8.4 (9.2)	8.8 (8.6)	8.5 (7.7)	9.0 (11.1)	.84
Income/month (US $)[b]	1267 (1307)	1056 (606)	1442 (1908)	1268 (832)	.03
How often do you visit the doctor when sick[c]					
Always	153 (29.2)	39 (24.4)	56 (28.3)	58 (34.9)	<.01
Sometimes	288 (55.0)	83 (51.9)	121 (61.1)	84 (50.6)	
Never	37 (7.1)	21 (13.1)	7 (3.5)	9 (5.4)	
Not sick	46 (8.8)	17 (10.6)	14 (7.1)	15 (9.0)	
Checkup frequency[c]					
Yearly	329 (62.8)	50 (31.3)	159 (80.3)	120 (72.3)	<.01
Every 2+ years	80 (15.3)	54 (33.8)	16 (8.1)	10 (6.0)	
Never	115 (22.0)	56 (35.0)	23 (11.6)	36 (21.7)	
Recent Pap Recommendation[c]	117 (22.3)	36 (22.5)	36 (18.2)	45 (27.1)	.13
Family history[c]	301 (57.4)	90 (56.3)	107 (54.0)	104 (62.7)	.24
Perceived seriousness of cervical cancer[c]					
Slight/moderate	15 (2.9)	7 (4.4)	2 (1.0)	6 (3.6)	.12
Serious	126 (24.0)	42 (26.2)	41 (20.7)	43 (25.9)	
Extreme	365 (69.7)	108 (67.5)	144 (72.7)	113 (68.1)	
Don't know	18 (3.4)	3 (1.9)	11(5.6)	4 (2.4)	
At risk for cervical cancer[c]					
Yes	164 (31.3)	42 (26.3)	56 (28.3)	66 (39.8)	.03
No	98 (18.7)	28 (17.5)	37 (18.7)	33 (19.9)	
Don't know	262 (50.0)	90 (56.3)	105 (50.0)	67 (40.4)	
Perceived past HPV exposure[c]					
Yes	69 (13.2)	6 (3.8)	24 (12.1)	39 (23.5)	<.01
No	176 (33.6)	60 (37.5)	74 (37.4)	42 (25.3)	
Don't know	279 (53.2)	94 (58.8)	100 (50.5)	85 (51.2)	

[a] ANOVA for continuous variables, Pearson χ^2 for categorical variables and Exact *P*-value for categorical variables with cell size ≤ 5

[b] Mean (standard deviation)

[c] *n* (%) Abbreviations: Sexual

Initiation, Age at first intercourse; Lifetime partners, Lifetime sexual partners; Family History, 5 history of cancer-related death; HPV, Human Papillomavirus

Table 2.

Characteristics, by study group, of perceived susceptibility to cervical cancer

	Un/under-screened				Screened				Colposcopy			
	Yes n=42	No n=28	DK n=90	*P* [a]	Yes n=56	No n=37	DK n=105	*P* [a]	Yes n=66	No n=33	DK n=67	*P* [a]
Age [b]	37.1 (8.0)	39.1 (8.8)	41.7 (9.4)	.02	35.2 (8.3)	34.7 (7.5)	34.4 (7.3)	.80	31.4 (6.5)	34.2 (8.0)	31.3 (6.3)	.09
Education (y) [b]	12.0 (2.4)	12.7 (2.1)	11.8 (1.9)	.13	12.5 (2.3)	12.2 (2.5)	12.9 (2.4)	.20	12.6 (2.2)	12.5 (2.0)	12.2 (2.6)	.64
Married/cohabitate [c]	13 (31.0)	4 (14.3)	30 (33.3)	.15	22 (39.3)	15 (40.5)	26 (25.0)	.08	21 (31.8)	7 (21.2)	17 (25.4)	.49
Sexual initiation (y) [b]	15.1 (2.5)	16.4 (2.7)	16.8 (3.7)	.02	15.7 (2.7)	16.8 (4.0)	16.6 (2.6)	.13	15.9 (3.0)	16.9 (2.6)	17.0 (2.7)	.06
Lifetime partners (#) [b]	11.4 (10.5)	6.7 (5.1)	8.2 (8.3)	.06	9.6 (8.9)	6.5 (5.1)	8.5(7.8)	.17	10.1 (9.0)	7.2 (5.5)	8.9 (14.5)	.47
Income/month (US$) [b]	1137 (752)	1040 (491)	1025 (568)	.63	1456 (1429)	1687 (2265)	1347 (1995)	.67	1286 (913)	1213 (775)	1278 (785)	.92
How often do you visit the doctor when sick [c]												
Always	13 (31.0)	7 (25.0)	19 (21.1)		20 (35.7)	8 (21.6)	28 (26.7)		23 (34.9)	17 (51.5)	18 (26.9)	
Sometimes	20 (47.6)	14 (50.0)	49 (54.4)	.90	33 (58.9)	26 (70.3)	62 (59.1)	.36	34 (51.5)	9 (27.3)	41 (61.2)	.04
Never	4 (9.6)	4 (14.3)	13 (14.4)		1(1.8)	2 (5.4)	4 (3.8)		5 (7.6)	2 (6.1)	2 (3.0)	
Not sick	5 (11.9)	3 (10.7)	9(10.0)		2(3.6)	1(2.7)	11(10.5)		4 (6.1)	5 (15.2)	6 (9.0)	
Pap Recommendation [c]	11 (26.2)	3(10.7)	22(24.4)	.25	16 (28.6)	7 (18.9)	13 (12.4)	.04	22 (33.3)	8 (24.2)	15 (22.4)	.34
Family history [c]	27 (64.3)	14 (50.0)	49 (54.4)	.44	42 (75.0)	16 (43.2)	49 (46.7)	<.01	50 (75.8)	15 (45.5)	39 (58.2)	<.01
Perceived seriousness of cervical cancer [c]												
Slight/moderate	1 (2.4)	3 (10.7)	3 (3.3)		0 (0.0)	1 (2.7)	1 (0.9)		2 (3.0)	1 (3.0)	3 (4.5)	
Serious	10 (23.8)	4 (14.3)	28 (31.1)	.27	10 (17.9)	10 (27.0)	21 (20.0)	.12	15 (22.7)	9 (27.3)	19 (28.3)	.40
Extreme	30 (71.4)	20 (71.4)	58 (64.5)		46 (82.1)	24 (64.9)	74 (70.5)		49 (74.2)	23 (69.7)	41 (61.2)	
DK	1 (2.4)	1 (3.6)	1 (1.1)		0 (0.0)	2 (5.4)	9 (8.6)		0 (0.0)	0 (0.0)	4 (6.0)	
Perceived prior HPV exposure [c]												
No	15 (35.7)	19 (67.9)	26 (28.9)		14 (25.0)	29 (78.4)	31 (29.5)	<.01	12 (18.2)	18 (54.6)	21 (17.9)	
Yes	6 (14.3)	0 (0.0)	0 (0.0)	<.01	18 (32.1)	0 (0.0)	6 (5.7)		22 (33.3)	7 (21.2)	10 (14.9)	<.01
DK	21 (50.0)	9 (32.1)	64 (71.1)		24 (42.9)	8 (21.6)	68 (64.8)		32 (48.5)	8 (24.2)	45 (67.2)	

Abbreviations: DK, I don’t know; Sexual initation, age at first intercourse; Lifetime partners: lifetime sexual partners; Family history:

cancer-related death; Pap recommendation: Provider recommendation in past year; HPV: Human Papillomavirus

[a] ANOVA for continuous variables, Pearson χ^2 for categorical variables, and Exact *P*-value for categorical variables with cell size ≤ 5

[b] Mean (standard deviation)

[c] n (%)

Table 3.

Multinomial logistic regression models of factors associated with perceived susceptibility to cervical cancer by study group (Un/under-screened, Screened, Colposcopy)

Odds Ratio (95% Confidence Interval) Yes=1.0 (Reference)												
	Un/under-screened				Screened				Colposcopy			
	Unadjusted[a]		Adjusted		Unadjusted[a]		Adjusted		Unadjusted[a]		Adjusted	
Variables	No	DK	No	DK	No	DK	No	DK	No	DK	No	DK
Age	1.03 (.97–1.09)	**1.06 (1.02–1.11)**	1.02 (.97–1.08)	**1.06 (1.01–1.11)**	-	-	-	-	1.06 (.99–1.12)	1.00 (.95–1.05)	-	-
Married/cohabitate	-	-	-	-	1.05 (.45–2.46)	0.52 (.26–1.03)	-	-			-	-
Sexual initiation	**1.19 (1.00–1.42)**	**1.23 (1.06–1.43)**	1.18 (.99–1.40)	**1.22 (1.06–1.42)**	-	-	-	-	1.15 (.98–1.36)	**1.18 (1.02–1.35)**	1.12 (.94–1.34)	1.15 (.99–1.34)
Lifetime partners	**0.93 (.85–1.01)**	**0.96 (.93–1.01)**	-	-	-	-	-	-	-	-	-	-
How often do you visit the doctor when sick (Always=1.0)												
Sometimes	-	-	-	-	-	-	-	-	**0.36 (.14–.94)**	1.54 (.72–3.32)	-	-
Never	-	-	-	-	-	-	-	-	0.54 (.94–3.13)	.51 (.09–2.95)	-	-
Not sick	-	-	-	-	-	-	-	-	1.69 (.39–7.26)	1.92 (.47–7.83)	-	-
Recent Pap recommendation	-	-	-	-	0.58 (.21–1.60)	**0.35 (.16–.80)**	0.61 (.19–1.94)	**0.40 (.16–.97)**	-	-	-	-
Family history	-	-	-	-	**0.25 (.10–.62)**	**0.29 (.14–.60)**	**0.29 (.11–.79)**	**0.40 (.19–.86)**	**.27 (.11–.65)**	**.45 (.21–.94)**	**.28 (.11–.72)**	**.49 (.08–.79)**
Perceived prior HPV exposure (No=1.0)												
Yes	-	-	-	-	-	-	-	-	**0.21 (.07–.65)**	0.45 (.15–1.36)	**0.28 (.09–.92)**	0.63 (.20–1.98)
I don't know	-	-	-	-	-	-	-	-	**0.17 (.06–.48)**	1.41 (.56–3.53)	**0.18 (.06–.55)**	1.66 (.64–4.33)

Bold: statistical significance with a $p \leq .05$ variables with $p \leq 0.1$ DK: I don't know; Sexual initiation: age at first intercourse; Lifetime partners: lifetime sexual partners; Family History: history of cancer-related death; HPV: Human Papillomavirus