Published in final edited form as:
Women Health. 2013 ; 53(6): . doi:10.1080/03630242.2013.809400.

Patterns and determinants of breast and cervical cancer non-screening among Appalachian women

Nancy E. Schoenberg, Ph.D., **Christina R. Studts, Ph.D.**, **Jenna Hatcher-Keller, Ph.D.**, **Eliza Buelt, BA**, and **Elwanda Adams, BA**
University of Kentucky

Abstract

Breast and cervical cancer account for nearly one-third of new cancer cases and one-sixth of cancer deaths. Cancer, the second leading cause of all deaths in the US, will claim the lives of nearly 800,000 women this year, which is particularly unfortunate because effective modes of early detection could significantly reduce mortality from breast and cervical cancer. We examined patterns of non-screening among Appalachian women. In-person interviews were conducted with 222 Appalachian women who fell outside of screening recommendations for timing of Pap tests and mammograms. These women, from six Appalachian counties, were participating in a group-randomized, multi-component trial aimed at increasing adherence to cancer screening recommendations. Results indicated that participants who were rarely or never screened for breast cancer were also likely to be rarely or never screened for cervical cancer. In addition, four key barriers were identified as independently and significantly associated with being rarely or never screened for both cervical and breast cancer. An improved understanding of cancer screening patterns plus the barriers underlying lack of screening may move us closer to developing effective interventions that facilitate women's use of screening.

INTRODUCTION

Cancer is the second leading cause of death among adults in the United States (Jiaquan et al. 2010). In 2012, an estimated 790,740 new cancer cases will be diagnosed among women, with breast and cervical cancer combined accounting for nearly one-third of new cases and almost one-sixth of cancer deaths (American Cancer Society 2012). The regular use of breast and cervical screening tests facilitate early detection of abnormalities, leading to more effective treatment and higher likelihood of survival (Gotzsche 2006; Sasieni, Castanon, and Cuzick 2009). Unfortunately, current screening rates fall significantly below the *Healthy People 2020* target goals (Centers for Disease Control and Prevention 2010). Screening rates are even lower among certain groups of women, including rural residents, those with lower socioeconomic status (SES), and those without health insurance (Horner et al. 2011; Peek and Han 2004).

Rural residence, low SES, and lack of health insurance and other resources are prevalent among residents of Appalachian Kentucky. Eastern Kentucky's 54 Appalachian rural counties suffer from high levels of poverty and unemployment, low levels of educational attainment, low rates of health insurance coverage, and shortages of health care providers (Appalachia Community Cancer Network 2009). The cancer mortality rate in Appalachian Kentucky is 17% higher than the national rate (Kentucky Cancer Registry 2008). Of particular concern are the elevated incidence and mortality rates from invasive cervical

Address correspondence to: Nancy E. Schoenberg, University of Kentucky, 125 College of Medicine Office Bldg., Lexington, KY 40536, USA. nesch@uky.edu.

cancer, which are 67% and 33% higher than national averages, respectively (Jiaquan et al. 2010; American Cancer Society 2012; Centers for Disease Control and Prevention (CDC) 2010). Although the incidence rate of breast cancer is lower among Appalachian Kentuckians when compared to the general US population, mortality rates are slightly higher (Appalachia Community Cancer Network 2009; Howlader et al. 2010). Inadequate screening for early detection (Berry et al. 2005; Davis et al. 2006; Hall et al. 2002) is likely implicated in these mortality elevated rates and is a special concern because a mammogram performed every 1–2 years for women aged 40 years and over could reduce mortality by approximately 20%–25% during a 10-year period (Centers for Disease Control and Prevention 2008).

Cancer Screening in Appalachia

Cancer screening determinants fall into several major categories: individuals' beliefs, knowledge, and attitudes (Spurlock 2006); community and environmental contexts (Schoenberg 2006; Katz et al. 2007); and factors related to the health care delivery system (Hatcher 2011). Certain attitudes and beliefs may contribute to lower rates of cancer screening within this largely rural population: the belief that cervical or breast cancer has noticeable symptoms before diagnosis; the fear of finding cancer; or the association of cancer with death (Tessaro et al. 2006; Vanderpool and Huang 2010). Anticipation of pain and embarrassment during the screening test constitutes an additional barrier frequently reported in this population (Hatcher et al. 2011; Lyttle and Stadelman 2006). Appalachian women have also expressed reluctance to present themselves to providers for screenings, fearing being chastised by providers about other health problems and behaviors, including smoking or being overweight (Leach and Schoenberg 2007). Several studies of groups that underutilize cancer screening have found misperceptions and low levels of knowledge about cancer signs and symptoms, screening guidelines, and the purpose of screening (Gany et al. 2006; Rahman and Rahman 2008).

Qualities specific to rural Appalachian community and environmental contexts may shape these attitudes, knowledge and beliefs to influence the likelihood of screening. For example, given the close-knit nature of many rural Appalachian communities, concerns about privacy and confidentiality may pose a challenge to screening (Schoenberg, Howell, and Fields 2012). Geographic isolation, lack of transportation, and low rates of health insurance limit access to preventative health care and may thwart cancer screening (Schoenberg et al. 2008).

Finally, aspects of the health care delivery system are influential in obtaining cancer screening. The majority of Kentucky's Appalachian counties–46 out of 54–are designated health professional shortage areas for primary medical care (Health Resources and Services Administration 2012). A scarcity of female providers creates a barrier to screening when patients express concerns about privacy and embarrassment during breast and cervical cancer screenings. The lack of physicians may also lead to inadequate levels of patient counseling (DuBard et al. 2008).

Patterns of Cancer Screening

Health behaviors, including cancer screenings, tend to cluster in specific combinations (Berrigan et al. 2003; Fine et al. 2004; Pronk et al. 2004). For example, individuals who were current on both cervical and breast cancer screenings were more likely to be up to date with colorectal cancer screening than women who were adherent to either screening test alone (Carlos et al. 2004; Carlos et al. 2005). A gap exists in our understanding of patterns of screening (or non-screening) among the most vulnerable. Additionally, we lack insights on whether barriers to screening for one cancer site generalize to other sites. To rectify these knowledge gaps, the current study focused on differentiating Appalachian women by their

joint screening status for cervical and breast cancer: Participants were categorized as either *rarely or never screened* (those who had not had either a Pap test or mammogram in five or more years or ever) or *recently screened* (those who fell outside of the timing recommended for screening in national guidelines but had been screened for either breast or cervical cancer or both within the past five years). Identification of individual characteristics and/or specific barriers that are related to being rarely or never screened for both cancers could help: (a) target interventions toward those most at risk for being unscreened (and thus at higher risk for both cancers), and (b) direct the focus of the interventions to modifiable barriers.

We hypothesized that: (1) screening status for breast and cervical cancer would be related, and (2) participant characteristics and barriers could be identified to differentiate women who were rarely or never screened for both cancers from those who were more recently screened for one or both.

METHODS

Overview

Baseline data were drawn from a multi-year, community-based participatory research intervention study, entitled “Faith Moves Mountains” (FMM; R24 MD002757), conducted in rural, Appalachian Kentucky. This group-randomized trial used a wait list control group design to test a faith-placed intervention aimed at increasing receipt of cancer screening tests (breast, cervical, and colorectal) to facilitate early detection of abnormalities (American Cancer Society 2011). Faith-based or faith-placed health promotion projects have gained currency, as they tend to be sustainable, trusted, and conducive to involvement of a diverse cross-section of the population (DeHaven et al. 2004). Although we lacked data specifying the percentage of Appalachian residents affiliated with a religious congregation, it is estimated that 90% of Southerners have a congregational affiliation, with higher rates of church attendance among women (Kosmin, Mayer, and Keysar 2006).

Approval for the project was granted by the University of (Blinded for review) Institutional Review Board, and written informed consent was obtained from all study participants.

Setting

The project took place in six rural counties in Appalachian Kentucky. All of the counties experience persistent poverty and have health care professional shortages (Appalachian Regional Commission 2012, 2007). Local churches served as recruitment sites for the cancer-screening intervention modules. Baseline data were collected between March 2010 and October 2011.

Study Design

FMM employed a group-randomized, multi-component trial, including a menu of intervention modules targeting health behaviors prioritized by the community (i.e., breast cancer screening, cervical cancer screening, colorectal cancer screening, and smoking cessation). Within each intervention module, assessments occurred at baseline, post-test (3 months after baseline), and exit interviews (9 months after baseline). In the cross-sectional sub-study, only baseline data for a subset of participants enrolled in the breast cancer and cervical cancer screening modules were used.

Recruitment

Recruitment of individual participants was conducted through local churches (Schoenberg et al. 2009). Thirty-three Appalachian churches were identified and recruited by field staff using snowball sampling procedures. Churches were randomly assigned to the intervention

or wait list control group by a biostatistician. Once a church agreed to participate in the project, a church liaison was identified by local field staff to publicize an information session and the project overall within the church. All congregation members were invited to an informational lunch and to enroll in all modules for which they were eligible. Interested and eligible individuals who were not church members were enrolled if willing to attend intervention sessions at a participating church. Because entire church congregations were invited to these lunches, and recruitment and enrollment for four distinct intervention modules occurred simultaneously, the only potential participants who were screened for eligibility were those who approached the local field staff at each event; thus, many more attendees may have been eligible than those of whom we were aware at a given recruitment session. Trained field staff screened potential participants, obtained informed consent, enrolled participants in the project, and scheduled baseline interviews within two weeks.

Consistent with recommendations at the time the project was initiated, eligibility for the breast cancer screening module included women who: (a) were age 40 years or older; (b) had never been diagnosed with breast cancer; and (c) had not had a mammogram in the past 12 months. Eligibility for the cervical cancer screening module included those who (a) were age 18 years or older; (b) had no history of hysterectomy; (c) had never been diagnosed with cervical cancer; and (d) had not had a Pap test within a specified timeframe determined by guidelines based on age, risk factors, and screening history. Eligibility and participation rates were not available for each module because of the community-based nature of recruitment and enrollment. Potential participants were only screened for eligibility if they approached the field staff following the lunch presentation at the church; others in attendance may have been eligible but were not screened due to lack of interest in participating. In addition, determination of eligibility and rates was not possible for the subsample used in this manuscript. Women eligible for both screening modules may have only enrolled in one of them, and our recruitment and enrollment procedures did not allow us to track this; therefore, any eligibility and participation rate estimates could be misleading.

Subsample Eligibility

All participants were enrolled in both the breast cancer and cervical cancer screening modules. Only those aged 46 years or older were included. The age criterion was set to ensure that screening guidelines for all participants would have included both cervical and breast cancer screenings within at least the prior five years. This restriction allowed the classification of participants into those who were rarely or never screened for both cancers (i.e., last Pap test and last mammogram five years ago, or never) versus those who were still outside of the recommended screening times for one or both cancers, but more recently screened (i.e., less than five years but more than one year ago). Colorectal cancer screening status was not addressed, because none of the participants had been screened for colorectal cancer.

Measures

Trained interviewers administered the baseline assessment, generally in the participants' homes. Participants received $10 for completing the baseline interview. Baseline and subsequent assessments included: (a) standard sociodemographic information, including race, education, household income, perceived financial status, employment status, health insurance coverage, and marital status; (b) items about receiving cancer screening, taken from the National Health Interview Survey (National Center for Health Statistics 2012); and (c) indices of perceived barriers to cervical and breast cancer screening developed by the authors and based on prior qualitative developmental work with Appalachian women.

Data Analysis

Descriptive statistics were used to summarize the participants' characteristics. Bivariate analyses tested: (a) the association between screening status for breast cancer and cervical cancer, using unadjusted odds ratios obtained via logistic regression; and (b) associations between each independent variable of interest (e.g., age, health insurance status, etc.) and membership in the group of women who were never or rarely screened for both breast and cervical cancer. Categorical characteristics (e.g., health insurance status) were tested using logistic regression, while continuous characteristics (e.g., age) were assessed using independent sample t-tests.

A multiple logistic regression model was fit to identify independent variables significantly associated with screening status, guided by Hosmer and Lemeshow (1989). Model fitting procedures followed several steps: First, independent variables with $p > .25$ in the bivariate analyses were excluded. Independent variables associated with screening status with $p \leq .25$ in the bivariate analyses were retained for the multivariable analysis. These variables were entered in a backward stepwise logistic regression model to determine association with membership in the group of women who were never or rarely screened for both breast and cervical cancer, compared to the group of women who were recently screened for breast cancer and/or cervical cancer. Likelihood ratio tests were conducted at each step to remove variables with the least impact on model deviance ($p \geq .10$). Statistical significance was set at $p < .05$ for two-sided tests in all analyses. Data analyses were conducted with SPSS for Windows, version 18.0.3.

RESULTS

Participant Characteristics

The mean age of the subsample (N=222) was 56 years (SD=9), with a range from 46 to 88 years (Table 1). Consistent with the demographics of the counties in which this study took place, ninety-eight percent of participants were non-Hispanic White. Most (56%) were married or partnered; only 3% had never been married. Almost a quarter of the participants reported less than a high school education (24%), while 20% reported at least some college. Over half of participants reported sometimes struggling financially, while 39% described having just enough income to get by. More than half were unemployed. One-third of participants had no health insurance; one-third reported coverage by either Medicaid or Medicare; and one-third reported having private insurance.

Over half of the participants reported being rarely or never screened for cervical cancer: 52% had their last Pap test five or more years ago, while 2% reported never having had a Pap test. The remaining 46% were recently screened: they had received a Pap test more than 12 months but less than five years ago. In contrast, 30% of participants had never had a mammogram, while 32% reported having their last mammogram five or more years ago. Only 38% were screened for breast cancer more than 12 months but less than five years ago.

The chi-square test of independence between cervical cancer and breast cancer screening status revealed that these variables were significantly related, χ^2 (1, N = 220) = 84.61, $p <$ .001. Participants who were rarely or never screened for breast cancer were likely to be rarely or never screened for cervical cancer as well.

Bivariate Associations with Joint Screening Status

Next, given the significant association between screening behaviors for both cancers, participants were grouped to reflect their *joint* screening status for breast and cervical cancer (i.e., rarely or never screened for both, recently screened for both, etc.). While only 33%

were recently screened for both breast and cervical cancer, 48% were rarely or never screened for both. This group (henceforth "rarely or never screened") was the focus of the remaining analyses, given the heightened cancer risk associated with being far out of compliance with guidelines for the timing of screening for both breast and cervical cancers.

Only two demographic characteristics were significantly associated with joint screening status: physician recommendation for a Pap test within the past 12 months ($p < .01$) and physician recommendation for a mammogram within the past 12 months ($p < .01$) (Table 2). Of the 15 self-reported barriers to cervical cancer screening, seven were significantly associated ($p < .05$) with being rarely or never screened for both breast and cervical cancer. These included: perceiving one's financial situation as making it difficult to be screened for cervical cancer; believing that cervical cancer screening is not needed without symptoms; being too worried about cervical cancer screening results; believing that a Pap test is painful or uncomfortable; feeling that cervical cancer screening is embarrassing; believing that lack of health insurance makes it difficult to obtain a Pap test; and believing that one's physician does not recommend cervical cancer screening. Two additional cervical cancer screening barriers were retained for inclusion in the multivariable analysis due to associations with joint screening status at $p \leq .25$: believing that cervical cancer screening is a low priority and believing that lack of transportation makes it difficult to access cervical cancer screening.

Similarly, of the 14 self-reported barriers to breast cancer screening, five were significantly associated ($p < .05$) with joint screening status: believing that breast cancer screening is not needed without symptoms; being too worried about breast cancer screening results; believing that mammograms are painful or uncomfortable; feeling that breast cancer screening is embarrassing; and believing that one's physician does not recommend breast cancer screening. Three additional breast cancer screening barriers were retained for inclusion in the multivariable analysis due to associations with joint screening status at $p \leq .25$: believing that one's financial status makes it hard to obtain screening for breast cancer; believing that lack of transportation makes it difficult to access breast cancer screening; and believing that home responsibilities make it hard to obtain breast cancer screening.

While the substantive content of items delineating barriers to cervical and breast cancer was very similar, analyses assessing whether participants identified the same barrier to both cervical and breast cancer screening (e.g., endorsing worry about results as a barrier to both screenings) revealed only modest agreement across screening types. Kappa values calculated for each barrier ranged from .31 to .66 (detailed results are available from the authors), suggesting that the barrier items, despite similar content, performed differently between screening types.

Multivariable Analyses

The 19 variables associated with joint screening status ($p \leq .25$) were entered into a backward stepwise logistic regression model, along with several standard demographic variables (insurance status, perceived financial status, employment status, and marital status). Twelve cases were excluded from this analysis by listwise deletion due to missing data, for a total N=210 in the multivariable analysis. The final model was estimated in 20 steps and fit the data well for joint screening status (i.e., rarely or never screened for both cancers versus recently screened for at least one cancer) (χ^2 (4, N = 210) = 38.19, $p < .001$) (Table 3). The overall correct classification rate for the final model was 71%, compared to 53% for the null model. Model specificity was higher than sensitivity: 76% of those in the recently-screened group were correctly classified, compared to 65% of those in the rarely- or never-screened group (though this represented an increase from 0% sensitivity in the null model). The final model accounted for between 16% (Cox and Snell pseudo-R^2) and 22% (Nagelkerke pseudo-R^2) of the variance in group membership.

Only four variables were independently associated with significantly increased odds of being never or rarely screened for both breast and cervical cancer, compared to being recently screened for one or both: (a) belief that a Pap test is embarrassing (OR = 2.48, 95% CI: 1.22–5.02); (b) belief that lack of health insurance makes it difficult to obtain a Pap test (OR = 2.18, 95% CI: 1.19–3.98); (c) belief that breast cancer screening is unnecessary without symptoms (OR = 2.56, 95% CI: 1.36–4.82); and (d) reporting no physician recommendation of a mammogram in the prior 12 months (OR = 2.20, 95% CI: 1.13–4.28). All other variables included in step one of the multivariable logistic regression were deleted from the final model due to lack of significance via the backward stepwise procedure.

DISCUSSION

Our results were consistent with existing literature that suggests that receipt of one type of cancer screening increases the uptake of other cancer screenings (Carlos et al. 2005; Guerrero-Preston et al. 2008). While the design of this study precluded investigation of potential relationships between cancer screening behaviors and other health behaviors (e.g., tobacco use, physical activity), research suggests that individuals who fall outside recommendations for cancer screening report a greater number of health behavior risk factors than individuals who are adherent to the screening guidelines (Coups et al. 2007). Future research examining the clustering of multiple risk behaviors and approaches to improve these clusters of behaviors is warranted.

In addition to finding an association between breast and cervical cancer screening status, joint screening status was associated with four modifiable barriers: believing that Pap tests are embarrassing, believing that lack of health insurance makes obtaining Pap tests difficult, believing that lack of symptoms makes breast cancer screening unnecessary, and not receiving a physician referral for a mammogram within the past 12 months.

Embarrassment Over Pap Tests

Embarrassment over the Pap test was a barrier confirmed by existing literature (Guilfoyle, Franco, and Gorin 2007; Waller et al. 2009). Some women avoid cervical cancer screening because of concern or embarrassment over their body size, being a smoker, or being stigmatized due to sexual orientation (Clark et al. 2009). Obese women may have poor self-image related to body weight, and underweight women may be concerned about being questioned during the examination about their low weight, both of which are associated with lower likelihood of screening (Amy et al. 2006).

Embarrassment is an emotion that, unlike knowledge, cannot be rectified through a classroom or didactic presentation, but instead requires a comfortable and affirming Pap test experience. Such support may be facilitated by a trustworthy individual, such as a lay health advisor, or by ensuring that providers offer a non-judgmental environment. The availability of female providers may also decrease the barrier of embarrassment (Guilfoyle, Franco, and Gorin 2007). Preference for a female provider is especially strong in rural, close knit communities (Ahmad et al. 2001). However, because we did not specifically query participants about preferences for a female provider, we cannot be sure that having more female providers would increase screening uptake. Moreover, such a recommendation may be impractical in a region that has an inadequate supply of any health care provider.

Lack of Health Insurance Coverage

Lack of health insurance makes it difficult to obtain screening (Freeman and Wingrove 2005; Studts et al. 2012); however, the perception that lack of health insurance precludes cervical and breast cancer screening suggests a knowledge deficit that easily can be

corrected. Federally qualified health clinics and local health departments that offer the CDC's National Breast and Cervical Cancer Early Detection Program (NBCCEDP) provide low-income and uninsured women with access to timely, high-quality cervical and breast cancer screening, diagnostic, and treatment services (Centers for Disease Control and Prevention 2008). We currently lack insights on the most fruitful approaches to informing rarely or never screened women about these options, suggesting an important topic for future research. Contact points might include informational messages distributed by schools, safety net programs, or telephone or utility bills. Alternatively, a lay health advisor or other trusted local person who can convey this message may be an effective conduit for rectifying the misperception that health insurance is needed for cervical and breast cancer screening.

Breast Cancer Symptoms and Screening

The belief that breast cancer screening is not needed unless symptoms are experienced—and particularly the association of this belief with the screening status for both breast and cervical cancers—is concerning: By the time a woman experiences symptoms or feels a lump, breast cancer may be at a more advanced stage. Breast self-examination (BSE) had been promoted to women since the 1950s as an essential strategy that would lead to early detection of breast cancer, specifically a lump. However, in 2003, ACS changed its long-standing recommendation and made BSE optional (American Cancer Society 2003). In 2009, the U.S. Preventive Services Task Force advised clinicians to stop teaching women how to perform BSE. Despite these recommendations, which were based on two large clinical trials (UK Trial of Early Detection of Breast Cancer Group 1999; Thomas et al. 2002), health professionals and their female patients, especially breast cancer survivors, continue to believe that BSE allows women to detect breast cancer before a mammogram. In a recent study, only 71% of providers were aware of the recommendation to stop teaching BSE (Hinz et al. 2011). Future research should verify whether the perceived necessity of BSE persists.

Physician Referral

Provider recommendation is one of the key indicators of adherence to screening guidelines (Coughlin et al. 2005; Coughlin et al. 2008). Rural health care professional shortages, particularly the absence of female providers, make it challenging for women to obtain medical care. Additionally, the lack of a regular source of medical care, a frequent phenomenon among our participants, decreases the potential exposure to a provider. As recently noted in provider focus groups in Appalachia (Piercy 2012), few individuals now receive a standard annual physical unless seeking medication or birth control. As many of our participants fell between the ages of seeking birth control and needing checkups to control multiple chronic conditions, creative strategies should be developed to ensure patient exposure to health provider recommendations for cancer screening. One approach advocated by participants involved outreach at non-medical venues (beauty salons, community colleges, public housing offices, churches, family resource centers in schools) by community prevention navigators who can respectfully but persuasively advocate for screening and address local barriers to screening. An extension of this idea involves a community to clinic navigation service. Patient navigation programs have been shown to improve uptake of cancer screening; however, few attempts have been made to bridge community and clinical navigation, and no known efforts exist in the underserved rural region of Appalachia (Paskett, Harrop, and Wells 2011; WestRasmus et al. 2012).

Limitations

We acknowledge several limitations to this study. First, although many Appalachian residents are affiliated with a religious congregation, it is possible that unaffiliated women or those who were uncomfortable in a church setting may have been reluctant to participate

in the project, thereby producing an unrepresentative sample. Similarly, church-affiliated women who were not interested in participating in this study may have differed in important ways from those who did participate, also causing bias. However, given our inability to track eligibility and participation rates, a mentioned in the Methods section, we were not able to assess the existence or potential impact of selection and participation biases, which could have affected the accuracy and/or generalizability of the results. In addition, given the exploratory, cross-sectional nature of this study, we can identify associations but were unable to determine temporal, causal relationships among the variables. Another limitation of this study was the reliance on self-reported data for screening, perhaps leading to socially desirable or otherwise inaccurate responses. Finally, the possibility of residual confounding exists due to unmeasured variables associated with our dependent and/or independent variables. Despite these limitations, we have identified a compelling trend of associated risk behaviors and four modifiable barriers that, if overcome, may address two significant health disparities experienced by Appalachian women.

Acknowledgments

Support for this research was provided by the National Institutes of Health/ National Center on Minority Health and Health Disparities (R24 MD002757: Schoenberg). Support was also provided to Dr. Studts by the University of Kentucky's Center for Clinical and Translational Science (UL1TR000117: Kern).

References

Ahmad F, Stewart DE, Cameron JI, Hyman I. Rural physicians' perspectives on cervical and breast cancer screening: a gender-based analysis. J Womens Health Gend Based Med. 2001; 10(2):201–8. [PubMed: 11268303]

American Cancer Society. Updated Breast Cancer Screening Guidelines (Released May 15, 2003). 2003. Available from http://www.cancer.org/docroot/NWS/content/NWS_1_1x_Updated_Breast_Cancer_Screening_Guidelines_Released.asp

Repeated Author. Cancer Screening Guidelines. 2011. Available from http://www.cancer.org/Healthy/FindCancerEarly/CancerScreeningGuidelines/american-cancer-society-guidelines-for-the-early-detection-of-cancer

Repeated Author. Cancer Facts & Figures 2012. 2012. Available from http://www.cancer.org/acs/groups/content/@epidemiologysurveilance/documents/document/acspc-031941.pdf

Amy NK, Aalborg A, Lyons P, Keranen L. Barriers to routine gynecological cancer screening for White and African-American obese women. Int J Obes (Lond). 2006; 30(1):147–55. [PubMed: 16231037]

Appalachia Community Cancer Network. The Cancer Burden in Appalachia, 2009. 2009.

Appalachian Regional Commission. Health Maps and Health Status Charts. 2007. Available from http://www.mc.uky.edu/ruralhealth/ARC_AHPAC/ARC_Health_Maps.htm and http://www.mc.uky.edu/ruralhealth/ARC_AHPAC/health_status_charts.htm

Repeated Author. County Economic Status, Fiscal Year 2012: Appalachian Kentucky. 2012. [cited January 4, 2012. Available from http://www.arc.gov/reports/region_report.asp?FIPS=21999&REPORT_ID=37

Berrigan D, Dodd K, Troiano RP, Krebs-Smith SM, Barbash RB. Patterns of health behavior in U.S. adults. Prev Med. 2003; 36(5):615–23. [PubMed: 12689807]

Berry DA, Cronin KA, Plevritis SK, Fryback DG, Clarke L, Zelen M, Mandelblatt JS, Yakovlev AY, Habbema JD, Feuer EJ. Effect of screening and adjuvant therapy on mortality from breast cancer. N Engl J Med. 2005; 353(17):1784–92. [PubMed: 16251534]

Carlos RC, Fendrick AM, Ellis J, Bernstein SJ. Can breast and cervical cancer screening visits be used to enhance colorectal cancer screening? J Am Coll Radiol. 2004; 1(10):769–76. [PubMed: 17411698]

Carlos RC, Fendrick AM, Patterson SK, Bernstein SJ. Associations in breast and colon cancer screening behavior in women. Acad Radiol. 2005; 12(4):451–8. [PubMed: 15831418]

Centers for Disease Control and Prevention. National Breast and Cervical Cancer Early Detection Program. 2008. [cited January 29, 2010. Available from http://www.cdc.gov/cancer/nbccedp/

Repeated Author. Preventing Chronic Diseases: Investing Wisely in Health. U.S. Department of Health and Human Services; 2008.

Repeated Author. DATA2010: The Healthy People 2010 Database. U.S. Department of Health and Human Services; 2010. [cited September 1, 2011. Available from http://wonder.cdc.gov/data2010/obj.htm

Centers for Disease Control and Prevention (CDC). Behavioral Risk Factor Surveillance System Survey Data. Atlanta, Georgia: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention; 2010.

Clark MA, Rogers ML, Armstrong GF, Rakowski W, Bowen DJ, Hughes T, McGarry KA. Comprehensive cancer screening among unmarried women aged 40–75 years: results from the cancer screening project for women. J Womens Health (Larchmt). 2009; 18(4):451–9. [PubMed: 19361311]

Coughlin SS, Breslau ES, Thompson T, Benard VB. Physician recommendation for papanicolaou testing among U.S. women, 2000. Cancer Epidemiol Biomarkers Prev. 2005; 14(5):1143–8. [PubMed: 15894664]

Coughlin SS, Leadbetter S, Richards T, Sabatino SA. Contextual analysis of breast and cervical cancer screening and factors associated with health care access among United States women, 2002. Soc Sci Med. 2008; 66(2):260–75. [PubMed: 18022299]

Coups EJ, Manne SL, Meropol NJ, Weinberg DS. Multiple behavioral risk factors for colorectal cancer and colorectal cancer screening status. Cancer Epidemiol Biomarkers Prev. 2007; 16(3): 510–6. [PubMed: 17372246]

Davis RE, Armstrong DK, Dignan M, Norling GR, Redmond J. Evaluation of educational materials on colorectal cancer screening in Appalachian Kentucky. Preventing chronic disease. 2006; 3(2):A43. [PubMed: 16539784]

DeHaven MJ I, Hunter B, Wilder L, Walton JW, Berry J. Health programs in faith-based organizations: are they effective? Am J Public Health. 2004; 94(6):1030–6. [PubMed: 15249311]

DuBard CA, Schmid D, Yow A, Rogers AB, Lawrence WW. Recommendation for and receipt of cancer screenings among medicaid recipients 50 years and older. Arch Intern Med. 2008; 168(18): 2014–21. [PubMed: 18852404]

Fine LJ, Philogene GS, Gramling R, Coups EJ, Sinha S. Prevalence of multiple chronic disease risk factors. 2001 National Health Interview Survey. Am J Prev Med. 2004; 27(2 Suppl):18–24. [PubMed: 15275670]

Fleming ST, Schoenberg NE, Tarasenko YN, Pearce KA. Prevalence of colorectal cancer screening among a multimorbid rural Appalachian population. South Med J. 2011; 104(12):811–8. [PubMed: 22089360]

Freeman, HP.; Wingrove, BK. Excess Cervical Cancer Mortality: A Marker for Low Access to Health Care in Poor Communities. Rockville, Maryland: National Cancer Institute, Center to Reduce Cancer Health Disparities; 2005.

Gany FM, Herrera AP, Avallone M, Changrani J. Attitudes, knowledge, and health-seeking behaviors of five immigrant minority communities in the prevention and screening of cancer: a focus group approach. Ethn Health. 2006; 11(1):19–39. [PubMed: 16338753]

Gotzsche PC, Nielsen M. Screening for breast cancer with mammography. Cochrane Database of Systematic Reviews. 2006; (4)

Guerrero-Preston R, Chan C, Vlahov D, Mitchell MK, Johnson SB, Freeman H. Previous cancer screening behavior as predictor of endoscopic colon cancer screening among women aged 50 and over, in NYC 2002. J Community Health. 2008; 33(1):10–21. [PubMed: 18080204]

Guilfoyle S, Franco R, Gorin SS. Exploring older women's approaches to cervical cancer screening. Health Care Women Int. 2007; 28(10):930–50. [PubMed: 17987461]

Hall HI, Uhler RJ, Coughlin SS, Miller DS. Breast and cervical cancer screening among Appalachian women. Cancer Epidemiol Biomarkers Prev. 2002; 11(1):137–42. [PubMed: 11815412]

Hatcher J, Studts CR, Dignan MB, Turner LM, Schoenberg NE. Predictors of cervical cancer screening for rarely or never screened rural Appalachian women. J Health Care Poor Underserved. 2011; 22(1):176–93. [PubMed: 21317514]

Hatcher J, Studts CR, Dignan MB, Turner LM, Schoenberg NE. Predictors of Cervical Cancer Screening for Rarely or Never Screened Rural Appalachian Women. Journal of Health Care for the Poor & Underserved. 2011; 22:175–192.

Health Resources and Services Administration. Health Professional Shortage Areas Data. 2012

Hinz EK, Kudesia R, Rolston R, Caputo TA, Worley MJ Jr. Physician knowledge of and adherence to the revised breast cancer screening guidelines by the United States Preventive Services Task Force. Am J Obstet Gynecol. 2011; 205(3):201 e1–5. [PubMed: 21689807]

Horner MJ, Altekruse SF, Zou Z, Wideroff L, Katki HA, Stinchcomb DG. U.S. geographic distribution of prevaccine era cervical cancer screening, incidence, stage, and mortality. Cancer Epidemiol Biomarkers Prev. 2011; 20(4):591–9. [PubMed: 21266522]

Hosmer, D.; Lemeshow, S. Applied Logistic Regression. New York: Wiley; 1989.

Howlader, N.; Noone, AM.; Krapcho, M.; Neyman, N.; Aminou, R.; Waldron, W.; Altekruse, SF.; Kosary, CL.; Ruhl, J.; Tatalovich, Z.; Cho, H.; Mariotto, A.; Eisner, MP.; Lewis, DR.; Chen, HS.; Feuer, EJ.; Cronin, KA.; Edwards, BK., editors. SEER Cancer Statistics Review, 1975–2008. Bethesda, MD: National Cancer Institute; 2010.

Jiaquan X, Kochanek KD, Murphy SL, Tajeda-Vera B. Deaths: Final Data for 2007. National Vital Statistics Reports 2010. 2010

Katz, Mira L.; Wewers, Mary Ellen; Single, Nancy; Paskett, Electra D. Key Informants' Perspectives Prior to Beginning a Cervical Cancer Study in Ohio Appalachia. Qualitative Health Research. 2007; 17(1):131–141. [PubMed: 17170251]

Kentucky Cancer Registry. Kentucky Cancer Registry Annual Report: Cancer Incidence and Mortality in Kentucky, 2001–2005. Lexington, KY: Kentucky Cancer Registry; 2008.

Kosmin, BA.; Mayer, E.; Keysar, A. Religious Identification Survey, 2001. City University of New York (Graduate Center); 2006.

Leach CR, Schoenberg NE. The vicious cycle of inadequate early detection: a complementary study on barriers to cervical cancer screening among middle-aged and older women. Preventing chronic disease. 2007; 4(4):A95. [PubMed: 17875270]

Liang W, Shediac-Rizkallah MC, Celentano DD, Rohde C. A population-based study of age and gender differences in patterns of health-related behaviors. Am J Prev Med. 1999; 17(1):8–17. [PubMed: 10429747]

Lyttle NL, Stadelman K. Assessing awareness and knowledge of breast and cervical cancer among Appalachian women. Preventing chronic disease. 2006; 3(4):A125. [PubMed: 16978500]

National Center for Health Statistics. 2010 National Health Information Survey Questionnaire - Sample Adult Cancer Screening. 2012

Paskett ED, Harrop JP, Wells KJ. Patient navigation: an update on the state of the science. CA: a cancer journal for clinicians. 2011; 61(4):237–49. [PubMed: 21659419]

Peek ME, Han JH. Disparities in screening mammography. Current status, interventions and implications. J Gen Intern Med. 2004; 19(2):184–94. [PubMed: 15009798]

Piercy, J. Personal Communication. 2012 Apr.

Pronk NP, Anderson LH, Crain AL, Martinson BC, O'Connor PJ, Sherwood NE, Whitebird RR. Meeting recommendations for multiple healthy lifestyle factors. Prevalence, clustering, and predictors among adolescent, adult, and senior health plan members. Am J Prev Med. 2004; 27(2 Suppl):25–33. [PubMed: 15275671]

Rahman SM, Rahman S. Breast Cancer Perceptions, Knowledge and Behavioral Practices among Women Living in a Rural Community. Int J Canc Prev. 2008; 2(6):415–425. [PubMed: 20352034]

Sasieni, Peter; Castanon, Alejandra; Cuzick, Jack. Effectiveness of cervical screening with age: population based case-control study of prospectively recorded data. BMJ. 2009:339.

Schoenberg NE, Hatcher J, Dignan MB, Shelton B, Wright S, Dollarhide KF. Faith Moves Mountains: An Appalachian Cervical Cancer Prevention Program. Am J Health Behav. 2009; 33(6):627–38. [PubMed: 19320612]

Schoenberg NE, Hopenhayn C, Christian A, Knight EA, Rubio A. An In-Depth and Updated Perspective on Determinants of Cervical Cancer Screening Among Central Appalachian Women. Women & Health. 2008; 42(2):89–105. [PubMed: 16537302]

Schoenberg NE, Hopenhayn C, Christian A, et al. An in-depth and updated perspective on determinants of cervical cancer screening among central Appalacian women. Women & Health. 2006; 42(2):89–105. [PubMed: 16537302]

Schoenberg NE, Howell BM, Fields N. Community strategies to address cancer disparities in Appalachian Kentucky. Fam Community Health. 2012; 35(1):31–43. [PubMed: 22143486]

Spurlock WR, Cullins LS. Cancer fatalism and breast cancer screening in African American women. Association of Black Nursing Faculty. 2006 Jan-Feb;:38–43.

Studts CR, Tarasenko YN, Schoenberg NE, Shelton BJ, Hatcher-Keller J, Dignan MB. A community-based randomized trial of a faith-placed intervention to reduce cervical cancer burden in Appalachia. Prev Med. 2012; 54(6):408–14. [PubMed: 22498022]

Tessaro I, Mangone C, Parkar I, Pawar V. Knowledge, barriers, and predictors of colorectal cancer screening in an Appalachian church population. Preventing chronic disease. 2006; 3(4):A123. [PubMed: 16978498]

Thomas DB, Gao DL, Ray RM, Wang WW, Allison CJ, Chen FL, Porter P, Hu YW, Zhao GL, Pan LD, Li W, Wu C, Coriaty Z, Evans I, Lin MG, Stalsberg H, Self SG. Randomized trial of breast self-examination in Shanghai: final results. J Natl Cancer Inst. 2002; 94(19):1445–57. [PubMed: 12359854]

UK Trial of Early Detection of Breast Cancer Group. 16-year mortality from breast cancer in the UK Trial of Early Detection of Breast Cancer. Lancet. 1999; 353(9168):1909–14. [PubMed: 10371568]

Vanderpool RC, Huang B. Cancer risk perceptions, beliefs, and physician avoidance in Appalachia: results from the 2008 HINTS Survey. J Health Commun. 2010; 15(Suppl 3):78–91. [PubMed: 21154085]

Waller J, Bartoszek M, Marlow L, Wardle J. Barriers to cervical cancer screening attendance in England: a population-based survey. J Med Screen. 2009; 16(4):199–204. [PubMed: 20054095]

WestRasmus EK, Pineda-Reyes F, Tamez M, Westfall JM. Promotores de salud and community health workers: an annotated bibliography. Fam Community Health. 2012; 35(2):172–82. [PubMed: 22367264]

Table 1

Participant Characteristics (N=222)

Variable	Frequency (%)or Mean (SD)
Age (in years)	56 (8)
Race	
White	217 (98)
Black	5 (2)
Marital Status	
Married/partnered	124 (56)
Separated	7 (3)
Divorced	45 (20)
Widowed	38 (18)
Never married	7 (3)
Other	1 (0)
Education	
Less than high school	52 (23)
High school diploma/GED	122 (55)
More than high school diploma	45 (20)
Perceived financial status	
More than needed	15 (7)
Just about enough	86 (39)
Sometimes struggle	120 (54)
Annual household income	
$20,000 or less	113 (51)
$20,000 to $40,000	51 (23)
$40,000 and up	25 (11)
Refused or don’t know	33 (15)
Employed	
Yes	102 (46)
No	121 (54)
Health Insurance	
Private	73 (33)
Public	69 (31)
Both public and private	7 (3)
Veterans’ benefits	2 (1)
Other	2 (1)
None	66 (31)
Screening history	
Cervical: Recently	102 (46)
Cervical: Rarely	115 (52)
Cervical: Never	4 (2)
Breast: Recently	85 (38)

Variable	Frequency (%)or Mean (SD)
Breast: Rarely	70 (32)
Breast: Never	66 (30)
Both: Recently	72 (33)
Both: Rarely or Never	106 (48)

Notes. SD = standard deviation. GED = General Equivalency Diploma. Under screening history, “Cervical” refers to last reported Pap test; “Breast” refers to last reported mammogram; “Recently” refers to last screening reported > 12 months but < 5 years ago; “Rarely” refers to last screening reported ≥ 5 years ago; “Never” refers to no history of screening.

Table 2

Bivariate associations with joint screening status

	Rarely or Never Screened	Recently Screened	
Variable	**n or M (SD)**	**n or M (SD)**	**OR (95% CI) or test statistic**
Demographic characteristics			
Age (in years)	56.0 (8.6)	56.2 (8.2)	0.24[a]
Marital Status			
Partnered	55	68	0.74 (0.44–1.27)
Not partnered (ref)	51	47	1.00
Education			
Less than high school	28	24	1.60 (0.71–3.57)
High school diploma/GED	58	63	1.26 (0.63–2.51)
More than high school diploma (ref)	19	26	1.00
Current financial status			
Sometimes struggle	63	57	0.97 (0.33–2.84)
Just about enough	34	51	0.58 (0.19–1.76)
More than needed (ref)	8	7	1.00
Employed			
Not working	61	59	1.23 (0.68–2.24)
Part time	14	19	0.88 (0.38–2.04)
Full time (ref)	31	37	1.00
Health Insurance			
No	34	34	1.12 (0.63–1.99)
Yes (ref)	72	81	1.00
MD Pap recommendation in past year			
Yes	18	42	0.35 (0.18–0.66)**
No (ref)	87	71	1.00
MD mammogram recommendation in past year			
Yes	20	48	0.33 (0.18–0.61)**
No (ref)	83	66	1.00
Barriers to cervical cancer screening			
Financial situation makes it hard			
Yes	63	51	1.81 (1.06–3.09)*
No (ref)	43	63	1.00
Cervical cancer is a low priority			
Yes	19	11	2.04 (0.92–4.53)†
No (ref)	87	103	1.00
Screening is not needed without symptoms			
Yes	39	25	2.07 (1.14–3.75)*
No (ref)	67	89	1.00

	Rarely or Never Screened	Recently Screened	
Variable	**n or M (SD)**	**n or M (SD)**	**OR (95% CI) or test statistic**
Too worried about results			
Yes	33	14	3.23 (1.61–6.46) **
No (ref)	73	100	1.00
Test is painful/uncomfortable			
Yes	34	21	2.09 (1.12–3.91) *
No (ref)	72	93	1.00
Test is embarrassing			
Yes	41	18	3.36 (1.78–6.36) **
No (ref)	65	96	1.00
Not having health insurance makes it hard			
Yes	55	38	2.16 (1.25–3.72) **
No (ref)	51	76	1.00
Lack of transportation makes it hard			
Yes	30	23	1.56 (0.84–2.91) †
No (ref)	76	91	1.00
Job responsibilities make it hard			
Yes	16	15	1.16 (0.61–2.21)
No (ref)	90	99	1.00
Lack of a trustworthy doctor			
Yes	24	23	1.27 (0.66–2.42)
No (ref)	82	91	1.00
Spouse’s feelings make it hard			
Yes	3	4	0.80 (0.17–3.66)
No (ref)	103	110	1.00
Test is time-consuming			
Yes	20	19	1.16 (0.58–2.32)
No (ref)	86	95	1.00
Doctor does not recommend screening			
Yes	17	8	2.53 (1.04–6.14) *
No (ref)	89	106	1.00
Home responsibilities make it hard			
Yes	15	15	1.09 (0.50–2.35)
No (ref)	91	99	1.00
Barriers to breast cancer screening			
Financial situation makes it hard			
Yes	62	57	1.47 (0.86–2.50) †
No (ref)	43	58	1.00
Breast cancer is a low priority			

	Rarely or Never Screened	Recently Screened	
Variable	**n or M (SD)**	**n or M (SD)**	**OR (95% CI) or test statistic**
Yes	18	18	1.11 (0.55–2.28)
No (ref)	87	97	1.00
Screening is not needed without symptoms			
Yes	56	27	3.72 (2.09–6.63) **
No (ref)	49	88	1.00
Too worried about results			
Yes	37	23	2.21 (1.20–4.06) *
No (ref)	67	92	1.00
Test is painful/uncomfortable			
Yes	48	31	2.28 (1.30–4.01) **
No (ref)	57	84	1.00
Test is embarrassing			
Yes	41	21	2.84 (1.53–5.25) **
No (ref)	64	93	1.00
Not having health insurance makes it hard			
Yes	47	50	1.05 (0.62–1.79)
No (ref)	58	65	1.00
Lack of transportation makes it hard			
Yes	34	28	1.49 (0.82–2.68) †
No (ref)	71	87	1.00
Job responsibilities make it hard			
Yes	19	21	0.99 (0.50–1.96)
No (ref)	86	94	1.00
Spouse’s feelings make it hard			
Yes	5	6	0.91 (0.27–3.07)
No (ref)	100	109	1.00
Test is time-consuming			
Yes	23	19	1.43 (0.73–2.82)
No (ref)	81	96	1.00
Doctor does not recommend screening			
Yes	16	7	2.77 (1.09–7.04) *
No (ref)	89	108	1.00
Home responsibilities make it hard			
Yes	21	16	1.55 (0.76–3.15) †
No (ref)	84	99	1.00

[a]Test statistic for Age was Student’s t-test with 219 degrees of freedom.

Notes. OR = odds ratio. CI = confidence interval. (ref) = reference group. GED = general equivalency diploma. MD = physician. mo. = months.

† $p < .25$,

$^{*}p < .05$,

$^{**}p < .01$

Table 3

Final multivariable model: Backward stepwise logistic regression results for rarely- or never-screened versus recently-screened joint screening status (N=210)

Variable	OR (95% CI)
Pap test is embarrassing	
Yes	2.48 (1.22–5.02) *
No (ref)	1.00
Lack of health insurance makes it difficult to get a Pap test	
Yes	2.18 (1.19–3.98) *
No (ref)	1.00
Mammogram is not needed without symptoms	
Yes	2.56 (1.36–4.82) **
No (ref)	1.00
Physician recommended mammogram within prior 12 months	
No	2.20 (1.13–4.28) *
Yes (ref)	1.00

Notes. OR = odds ratio. CI = confidence interval. (ref) = reference group.

* $p < .05$,

** $p < .01$