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## Evaluating the stage of change model to a cervical cancer screening intervention among Ohio Appalachian women

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### Abstract

Cervical cancer incidence and mortality rates are disproportionately high among women living in Ohio Appalachia. This study used the Transtheoretical Model to examine screening barriers before and after a lay health advisor (LHA) intervention (2005–2009) to increase cervical cancer screening rates. Ohio Appalachian women ( $n = 90$ ) who were in need of a Pap test, based on risk-appropriate guidelines, and were randomized to a 10-month LHA intervention, received two in-person visits, two phone calls, and four mailed postcards targeted to the participant's stage of change. Findings revealed that 63% had forward stage movement ten months after the intervention. The most frequently reported screening barriers were time constraints, forgetting to make an appointment, and cost. Women reporting the following barriers: doctor not recommending the test, unable to afford the test, and being embarrassed, nervous, or afraid of getting a Pap test were less likely to be in the action stage. Understanding the stages of change related to Pap testing and reported barriers among this underserved population may help inform researchers and clinicians of this population's readiness for change and how to set realistic intervention goals.

### Keywords

Pap testing; stage of change; lay health advisor; cervical cancer; Appalachia

## INTRODUCTION

Cervical cancer incidence and mortality rates have decreased markedly in the United States (U.S.) since the widespread uptake of the Papanicolaou (Pap) test (Simard, Ward, Siegel, & Jemal, 2012). Women living in the Appalachian region, however, are a segment of the U.S. population that is at increased risk of developing and dying of cervical cancer (Appalachia Community Network, 2010). In 2010, cervical cancer incidence rates were 11.5% higher and mortality rates were 20.8% higher among women living in Appalachia Ohio compared with U.S. women not from Appalachia Ohio. The many reasons for these cancer disparities include: (a) lack of health insurance and lower household incomes and education levels; (b) inadequate knowledge, about cancer screening benefits; (c) beliefs and attitudes, poor health behaviors (e.g., greater tobacco use and increased risky sexual behaviors); (d) social norms about health behaviors; and (e) provider factors, and limited access to health care and transportation (Katz et al., 2007; McAlearney et al., 2010; Paskett et al., 1999; 2011; Studts, Tarasenko, & Schoenberg, 2013). Understanding the relation of sociocultural attitudes and beliefs, as well as provider factors, to women's cervical cancer screening practices will help develop more effective cancer screening programs to reduce cervical cancer incidence and mortality.

Multifaceted prevention strategies that incorporate these factors are needed to reduce cervical cancer disparities. Lay health advisor (LHA) interventions among underserved populations have been successful because they typically use trusted community members who serve as a liaison to the health care system and provide information, support, and encouragement (Han et al., 2009; Paskett et al., 2011). Previous studies using LHA intervention programs to promote cancer screening have found significantly increased screening rates for breast, cervical, prostate, and colorectal cancer (Holt et al., 2013; Luque et al., 2011; Paskett et al., 1999; Russell et al., 2010). In fact, a LHA intervention significantly improved cervical cancer screening among Ohio Appalachian women who were not within recommended screening guidelines (Paskett et al., 2011). In the context of cancer screening, LHAs addressed screening barriers, assisted with access to cancer screening, and encouraged screening by tailoring health messages to the specific individual (Holt et al., 2013; Luque et al., 2011; Paskett et al., 1999; Russell et al., 2010).

Tailored cancer screening messages, used by LHAs to address screening barriers, have been based on the Transtheoretical Model (TTM). Specifically, the stages of change construct, provides a method to deliver messages based on the participant's readiness to change their cancer screening behavior (Norcross, Krebs, & Prochaska, 2011; Prochaska & Norcross, 2001). Women with a lapse in a behavior or adopting a new behavior, such as cervical cancer screening, progress through a series of stages of readiness to change including: (a) pre-contemplation, no intention to complete screening; (b) contemplation, serious thoughts about completing screening in the next six months; (c) preparation, intention to complete screening in the next month; (d) action, completed screening; (e) maintenance, work to prevent relapse in not undergoing screening; and (f) termination, behavior change is complete and not at risk for relapse (Norcross, Krebs, & Prochaska, 2011; Prochaska & Norcross, 2001). According to the TTM, individuals in later stages (e.g., action) have reported higher levels of self-efficacy, more perceived benefits, and lower levels of perceived

barriers than people in earlier stages (e.g., pre-contemplation) (Norcross, Krebs, & Prochaska, 2011; Prochaska & Norcross, 2001).

Research on the TTM as it relates to cervical cancer screening has supported these hypothesized associations between stages of change and perceived benefits and barriers (Kwak et al., 2009; Luszczynska et al., 2011; Spadea et al., 2010; Tung, Nguyen, & Tran 2008). Although previous studies have successfully applied the constructs of the TTM to cervical cancer screening, little evaluation of associations among Appalachian women has occurred regarding cervical cancer screening behavior, reported screening barriers, and movement among the different TTM stages after receiving an LHA intervention among Appalachian women.

The objective of this study was to evaluate data from participants receiving a LHA intervention designed to increase movement toward the action stage, i.e., completion of cervical cancer screening, by: (a) describing the differences in TTM staging among Appalachian women before and after the intervention; (b) examining cervical cancer screening barriers and their change before and after the intervention; and (c) exploring the association of demographic characteristics, stage of change, and reported screening barriers. Because behavior change is a dynamic process, we thought that Appalachian women participating in a LHA intervention to increase cervical cancer screening would show progressive change in TTM stage (i.e., forward movement through the TTM stages) and report different barriers to cervical cancer screening based on their TTM stage. We also hypothesized that a woman's sociodemographic characteristics and number of reported barriers would be related to progression through TTM stages.

## METHODS

### Study Population

The Community Awareness Resources and Education (CARE I) initiative was conducted from March 2005 through February 2009 as one of eight Centers for Population Health and Health Disparities (P50) funded by the National Institutes of Health. The overall goal of CARE was to address the increased cervical cancer incidence and mortality rates among women living in Ohio Appalachia. This report focused on the process data from the intervention group from one of the projects, a randomized controlled trial of a LHA intervention vs. a usual care group (letter from physician and a National Cancer Institute brochure on cervical cancer screening) to increase cervical cancer screening. Details of the randomization, intervention design, and outcomes have been previously reported (Paskett et al., 2011).

A total of 22 health clinics in Ohio Appalachia were approached to participate in the CARE study, 14 of which (64%) agreed. Within each participating clinic, a monthly random sample of women was selected, and their medical records were reviewed to determine eligibility. To be eligible for the parent study, participants had to be female, aged 18 years or older, not pregnant, a resident of Ohio Appalachia, and had no history of invasive cervical cancer or hysterectomy. Finally, to be eligible, participants had to be in need of a Pap test based on risk-appropriate guidelines recommended at the time the study was conducted (i.e., Pap test

within 1 year for participants at higher risk for cervical cancer and Pap test within 3 years for lower risk participants) (Paskett et al., 2010). Specifically, women with any risk factors for cervical cancer (i.e., smoking, early age at first intercourse, five or more sexual partners in a lifetime, or having a personal history or partner with a history of Human Papillomavirus (HPV) or a sexually transmitted infection) should have had a Pap test annually, while women with no identified risk factors should have had a Pap test at least every three years (American College of Obstetricians and Gynecologists, 2008). Individuals who were eligible and agreed to participate in the study completed a baseline survey.

In the 14 clinics, 16,186 patients were sampled and screened for recruitment in two phases. During the first phase (March 2005–June 2006), potential participants were asked to complete a baseline cross-sectional interview to determine eligibility for this study and eligible participants were invited to participate. To increase efficiency, during the second phase (July 2006–February 2009), participants' potential eligibility was determined first by telephone survey, and only participants who were potentially eligible for this study were asked to complete the baseline interview to determine final eligibility. After the two recruitment phases, 13,194 were ineligible, 1,296 could not be contacted, and 924 (54.5% of those remaining) refused participation; 772 patients completed the baseline interview, and a further 423 of these patients were found to be ineligible. The response rate among those found eligible after the interview was 81.9% (286 of 349 eligible women). Of the 286 women who were eligible and consented, 145 were randomized to the LHA intervention and formed the study sample for the present analyses. Written, signed informed consent was obtained from all study participants. Informed consent procedures and study protocols were approved by the Institutional Review Boards of The Ohio State University and the University of Michigan.

### **LHA Intervention**

The intervention design followed the PRECEDE-PROCEED program planning model, a comprehensive framework for the assessment of health and quality of life needs, and the design, implementation, and evaluation of public health promotion programs to meet those needs (Gielen et al., 2008). This model focused attention on outcomes (in this study, Pap test completion) and worked toward this goal, addressing constructs of the Health Belief Model (Green & Kreuter, 1991) (e.g., perceived severity) and Social Learning (Social Cognitive) Theory (e.g., expectancies, the values that a person places on an outcome) in semi-structured questionnaires and personalized educational materials (Bandura, 1977). The TTM, specifically the stage of change construct, was used to assess each participant's readiness to change cervical cancer screening behaviors, and the subsequent LHA intervention components were tailored to the individual participant's stage of change and cervical cancer screening barriers. If a participant had a barrier to screening, such as having no health insurance, the LHA assisted her by locating free or reduced cost screening in their community. Stage-tailoring was accomplished through different language and approaches used by LHAs when speaking with participants, as well as different messages on mailed postcards. A participant's stage was not formally assessed until after she completed the first in-person session with the LHA, and the structure of the initial meeting with the LHA was

uniform across all participants, with much attention focused on personalized risk assessment and barrier counseling.

The four LHAs who delivered the intervention in this study were women indigenous to the Ohio Appalachia region, were aged 40 to 50 years old, and had no post-secondary education. LHAs completed an intensive, week-long, in-person training course and were subsequently observed by a study coordinator in the field throughout the study period.

To maintain continuous contact during the 10-month intervention, following their baseline interview, participants randomized to the LHA intervention received two in-person visits (at baseline and at 10 months), two phone calls (1 and 5 months), and four mailed postcards (2, 3, 6, and 7 months) targeted to the participant's stage of change from one of the four trained LHAs. The in-person visits took place either in the woman's home or a convenient location in the community. During the initial visit (Visit 1), the LHA assessed each participant's perceived lifetime cervical cancer risk and her cervical cancer screening barriers. Barriers to screening were assessed using a standardized assessment survey used in previous research that included items focused on cervical cancer screening (Paskett et al., 2006). Next, the LHA provided information about the Pap test, the value of completing a Pap test per recommended guidelines, and the importance of abnormal Pap test follow-up. The LHA concluded each call and visit by providing counseling to address identified barriers and support to encourage the woman to schedule a Pap test with a healthcare provider. Each participant's stage of change was determined during the two follow-up phone calls using a series of staging questions such as "How likely is it that you will have a Pap test in the next six months?" and "Are you planning to have a Pap test in the coming month?" Study investigators developed the questions based on TTM stage characteristics and current (at the time) screening guidelines. Postcards mailed in the two consecutive months following each of these phone calls addressed the participant's current stage of change and the one that followed if she moved forward on the continuum. For example, a participant in the precontemplation stage at the first phone call received a postcard the following month reminding her about the importance of having a Pap test (e.g., It could save your life). The following month, she received a postcard with a contemplation stage message (e.g., Go ahead...Get your Pap test today!). Stage of change was re-assessed during the second phone call, followed by two new postcards reflecting her current stage of change and the stage that followed. A participant never saw the same message twice. The second in-person visit (Visit 2) was the last component of the intervention during which LHAs again assessed perceived cervical cancer risk and cervical cancer screening barriers, followed by additional barrier counseling, if necessary.

## Measures

The baseline survey conducted with all participants collected information on the factors included in the Social Determinants of Health model (Marmot & Wilkinson, 1999), including demographic characteristics, and socioeconomic status, as well as health behaviors (e.g., receipt of Pap test) and barriers related to cervical cancer screening.

### **Demographic Characteristics**

Participants provided information about age, race, marital status, employment status, health insurance, household income, and educational level using questions from the NHANES (Centers for Disease Control and Prevention, 2013) or BRFSS (Centers for Disease Control and Prevention, 2014).

### **Socioeconomic Status**

Socioeconomic status (SES) was calculated by combining information about occupation, education and income. This measure of SES was derived from the Hollingshead index (Hollingshead, 1975) and yielded three levels: low (0–1), middle (2–3), and high (4–6).

### **Receipt of Pap Test**

Receipt of a Pap test during the study period was assessed by both self report and medical record review; however, for the purposes of these analyses, receipt of a Pap test was determined by medical record review.

### **Barriers to Cervical Cancer Screening**

The barriers to cervical cancer screening score and the beliefs about Pap testing scale were based on previously reported measures (Hill & Gick, 2013). The barriers to cervical cancer screening included 11 items (response: yes/no) that addressed frequent personal and provider factors that may reduce the likelihood of the receipt of a Pap test. Sample items included: “Having a Pap test is embarrassing,” “My doctor didn’t recommend it,” and “I have problems finding transportation.” One point was given for each endorsed barrier with possible scores ranging from 0 to 11. Higher scores reflected more barriers to completing a Pap test.

### **Stages of Change for Pap Testing**

During each of two follow-up phone calls, participants were categorized as being in one of five stages. Participants in the precontemplation stage had either never heard of a Pap test or had one in the past (more than 1 year ago), but did not plan to have one in the next 6 months. Participants in the contemplation stage had a Pap test in the past and planned to have one in the next 6 months, but not within the next month. Participants in the preparation stage planned to have a Pap test in the next month, while those in the action stage self-reported having a Pap test within the last 6 months. Finally, participants in the maintenance stage had a Pap test at least 6 months ago and planned to have a Pap test in the coming year.

### **Statistical Analyses**

Fisher’s exact test was used to test for differences between those included and excluded from analyses and to investigate possible associations between stage of change and each of the screening barriers. McNemar’s test was used to evaluate change in the barriers identified from Visit 1 to Visit 2. Poisson regression models were used to test if the number of reported barriers was associated with being in the action stage. Odds ratios for the demographic and psychosocial variables and individual barriers (independent variables) associated with being in the action stage (dichotomized dependent variable) were calculated by univariate logistic

regression. A backwards selection process, including both demographic factors and barriers (independent variables) significantly associated with being in the action stage at the  $p < .1$  level was used to build a multivariable model of factors associated with being in the action stage. Statistical significance of associations in logistic regression was assessed by Wald statistic. Model fit was assessed using the deviance goodness-of-fit test, and two-way interactions were explored.

## RESULTS

### Sample Characteristics

Of the 145 women randomized to the intervention group, 14 were excluded because of missing stage or barrier data; 7 refused to participate in follow-up visits, and 2 women did not meet study inclusion criteria (recognized after randomization). Thirty-two women in the intervention group were also excluded because at Visit 1, they were at the action stage (i.e., had had a Pap test). The final sample for this report included 90 women who received all components for the intervention (both visits, both phone calls, and 4 mailed postcards). The 55 women excluded from analyses were not significantly different from the 90 women included in the analyses.

The mean age of the 90 participants was 43.8 years, and the majority of participants (96.7%) were white, which is representative of the Ohio Appalachian region (Table 1). Most women reported being married or living as a couple (71.1%), being employed full or part-time (66.7%), having private health insurance (63.3%), having annual household incomes < \$50,000/year (74.2%), having at least a high school education (95.6%), and classified as having either middle or high SES (86.7%). Less than one-third (28.9%) of the women reported having a history of an abnormal Pap test.

### Impact of Intervention on Stage of Change

Among the 90 participants in the intervention group, from the initial LHA visit (Visit 1) to the end of the intervention (Visit 2), 57 (63.3%) moved forward at least one stage toward completing a Pap test (i.e., being in action stage); 26 (28.9%) remained in the same stage, and 7 (7.8%) moved back at least one stage (Table 2).

### Barriers to Screening

Most women ( $n = 76$ ; 84.4%) at Visit 1 were categorized in the contemplation or preparation stage, and 14 (15.6%) women were in the precontemplation stage. At Visit 2, 45 (50%) of the women were categorized in the action stage (e.g., completed screening within past 6 months), followed by 20 (22.2%) women in the contemplation stage, 13 (14.4%) women in the preparation stage, and 12 (13.3%) women in the precontemplation stage (Table 2).

Participants in the contemplation and preparation stages at Visit 1 reported more barriers than those in the precontemplation stage. At Visit 2, the number of reported barriers declined, and a higher number of barriers were reported by women in the early stages of change (i.e., mean number of reported barriers was 2.83 vs. 1.69 for the precontemplation and action stages, respectively) (Table 3). Frequently reported barriers at Visit 1 included “I

don't have time" ( $n = 39$ , 43%), "I forgot to make my appointment" ( $n = 38$ , 42%), and "I can't afford it" ( $n = 25$ , 28%). At Visit 2, although the frequency of barriers had decreased for those in the preparation (mean number of reported barriers ranged from 2.75 to 2.62), the same barriers were the most frequently reported, including "I forgot to make my appointment" ( $n = 36$ , 40%), "I don't have time" ( $n = 33$ , 37%), and "I can't afford it" ( $n = 26$ , 29%) (Table 3).

Poisson regression models explored if the number of barriers reported at Visit 2 was related to being in the action stage. Being in the action stage at Visit 2 was significantly related to a reduced number of reported barriers ( $p < .001$ ) with a rate ratio of 0.61 (95% confidence interval [CI]: 0.46 – 0.82) for those in the action stage. This indicated roughly a 39% decrease in the number of barriers for those participants in the action stage compared to those in the other three stages (precontemplation, contemplation, and preparation).

### Factors Related to the Action Stage

Univariate logistic regression analyses were used to explore demographic and health factors associated with being in the action stage at Visit 2 (Table 4). At the completion of the intervention (at Visit 2), women  $< 30$  years (odds ratio [OR] = 1.92, 95% CI = 0.63, 5.85) or  $> 30$  years and  $< 50$  years (OR = 4.20, 95% CI = 1.51, 11.68) were more likely to be in the action group than those over age 50 years. All other measured variables were not significantly related to being in the action stage.

We also examined the association between endorsement of barriers, stage of change, and screening attendance using univariate and multiple logistic regression analyses. In unadjusted analyses, women with the following barriers were less likely to be in the action stage at Visit 2: lack of provider recommendation ( $p = 0.004$ ), being embarrassed by having a Pap test ( $p = 0.05$ ), cost ( $p = 0.03$ ), and being nervous and afraid of completing a Pap test ( $p = 0.05$ ) (Table 5). Barriers reported by less than 5 women were not included.

A multivariable model considering both demographic factors and barriers associated with being in the action stage resulted in a model containing the following three barriers: lack of provider recommendation (OR = 0.08,  $p = 0.002$ ), cost (OR = 0.24,  $p = 0.009$ ), and being nervous or afraid (OR = 0.16,  $p = 0.014$ ) (Table 5). The deviance goodness-of-fit test did not indicate a lack of model fit ( $p = 0.91$ ), and none of the two-way interactions were significant.

## DISCUSSION

This study described the changes in TTM staging and reported barriers among Ohio Appalachian women before and after participation in a LHA intervention designed to improve cervical cancer screening rates. Multiple factors were associated with being in the action stage for Pap test completion, although women in the action stage still reported some screening barriers at the end of the study. Specifically, being younger than 50 years old was significantly related to being in the action stage at Visit 2. This result was supported by the previous literature that has shown older women are less likely than younger women to complete a Pap test (Coughlin et al., 2008; Studts et al., 2012). Perceptions of reduced risk for cervical cancer with older age may explain this finding (Marlow, Waller, & Wardle,



2009), despite current recommendations that cervical cancer screening should continue until women are age 65 years old (American College of Obstetricians and Gynecologists, 2012).

In addition, the barriers associated with action staging at Visit 2 were lack of provider recommendation, cost, and embarrassment, nervousness or fear of completing a Pap test. Similar to previous studies (Paskett et al., 2011; Russell et al., 2010; Studts et al., 2012), these results suggested that the LHAs may have been successful in helping participants randomized to the intervention group confront and overcome barriers that may have prevented them from receiving a Pap test prior to receiving the intervention. Although we did not measure the participants' perceived benefits and cancer risk and did not evaluate the control group, perhaps the LHA intervention encouraged women to understand the benefits of receiving a Pap test outweighed the barriers faced.

Women not reporting barriers of cost, lack of doctor's recommendations, embarrassment, and fear were more likely to be in the action stage (completing a Pap test) at the end of the study. Previous studies examining factors related to Pap testing among racially and ethnically diverse women found that younger age, being married, higher socioeconomic status, higher education, private insurance status, higher physical and mental health, and being a non-smoker were significantly associated with being within recommended cervical cancer screening guidelines (Black et al., 2011; Eggleston et al., 2007; Hill & Gick, 2013; McKee et al., 1999; Sloane et al., 2013; Watson et al., 2008). This study found that the majority of demographic characteristics may not be predictors among this high-risk, underserved population of Ohio Appalachian women.

Unfortunately, not all participants maintained or moved forward in their stage from Visit 1 to Visit 2. A small proportion (7.8%) of intervention participants moved backward at least one stage. This was a slightly higher proportion than that reported by Russell and colleagues for mammography (3% among intervention participants) and may have reflected a change in life circumstances between the two visits (e.g., change in other health priorities, change in insurance, change in life priorities, etc.) (Russell et al., 2010). In addition, the backward stage movement observed in this study followed the assumption for the TTM that individuals do not usually progress linearly through stages and often regress to earlier stages before successfully completing a behavior change (Prochaska & Velicer, 1997). Future studies should explore if previously reported determinants of backward stage movement, i.e., decisional balance and self-efficacy, influence stages of change among Ohio Appalachian women outside of cervical cancer screening guidelines (Eiser & Cole, 2002; Kelaheer et al., 1999; Rimer et al., 2002).

### **Implications for Practice**

Stage-matched tailoring is increasingly used to guide behavioral interventions more effectively (Han et al., 2009). This study, which was guided by the stages of change from the TTM, showed 63% of the women had forward stage movement during the intervention period. Previous studies have shown the effectiveness of LHA interventions using the stages-of-change construct from the TTM on other types of cancer screenings, specifically mammography (Albada et al., 2009; Campbell et al., 2004; 2007; Campbell & Quintiliani, 2006; Han et al., 2009; Hurd et al., 2003; Katz et al., 2007; Kobetz et al., 2005; Leone et al.,

2010; Margolis et al., 1998; Paskett et al., 1999; Rimer et al., 2002). Two studies using the stages-of-change construct have reported a range of forward stage movement. Russell et al. (2010) found a 76% forward stage movement for mammography among African American women who received a six-month combined intervention of a LHA and tailored computer program. Han et al. (2009) found a 32% forward stage movement for mammography among Korean American women who received a six-month LHA intervention. Collectively, these study results suggest the need for future interventions tailored to participant stage of change and delivered by LHAs to maximize intervention effectiveness. Before refining the intervention, more work is needed to explore how to reduce barriers among underserved populations to increase recommended cervical cancer screening behaviors.

This study was unique because it compared the number of reported barriers and the barriers in contributing to stage of change as related to Pap testing. Corresponding with the TTM, there were fewer barriers reported by women in the action stage at the end of the intervention, suggesting that the LHA intervention was effective in not only moving women forward in stages of change, but also reducing the number of barriers experienced. However, significant barriers still remained after the LHA intervention, including perceived cost, lack of physician recommendation, and emotional barriers such as embarrassment or fear. Yet, these results were encouraging because attitudinal and practical barriers are modifiable compared to demographic factors (Waller et al., 2009). Sophisticated methods, such as a mixed methods approach, may be needed to better understand non-adherence to cervical cancer screening practices, including cultural norms, prior abnormal Pap test results, and the factors that are included in the decisional balance among Ohio Appalachian women who are at higher risk of cervical cancer. Future studies should consider using community-based methodology, such as cultural grounding, that may include cultural elements of underserved populations and nurture the relationship with the targeted audience by calling upon their own meanings, messages, and identities in educational interventions to increase cervical cancer screening rates (Hecht & Lee, 2008).

### Limitations

This study had several limitations. First, participation in the screening interview for eligibility was modest. Preventive health behavior patterns of intervention participants may differ from those who refuse to participate (Wilcox, 1997). For example, women with more interest in or need for a Pap test may have been more likely to participate in the study, biasing the distribution of stages toward greater readiness to change. Further, process-of-change, decisional balance, self-efficacy, and perceived benefits were not measured, which would have provided a more comprehensive exploration of participant screening intention (Rakowski et al., 1998). Additionally, because the control group from the larger randomized study lacked repeated TTM staging information, we could not determine which intervention component (e.g., phone calls, in-person visits) contributed more or less to improving screening rates. This study was also limited by lack of follow-up after the intervention to measure its long-term effectiveness to increase cervical cancer screening behavior over time and hopefully, continued screening practices. Furthermore, this study measured stage of change twice, and participants may have changed stages in between measurements. Finally, study results have limited generalizability because participants lived in one region of the

U.S. and were primarily white and middle-aged so that the observed barriers and facilitators may be unique to these study participants and may not be generalizable. Further research is needed to determine the extent to which the results reported here extend to other underserved populations.

This study focused on evaluation of the process data from a LHA intervention to increase cervical cancer screening among women living in Ohio Appalachia. The results found common barriers and demographic factors related to cervical cancer screening among a high-risk population. Future studies should continue to explore stage-matched interventions among vulnerable populations, measure participant readiness for change, and set realistic goals for stage progression.

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## References

- Albada A, Ausems MG, Bensing JM, van Dulmen S. Tailored information about cancer risk and screening: A systematic review. *Patient Educ Couns*. 2009; 77(2):155–71.
- American College of Obstetricians and Gynecologists. New evidence-based screening guidelines for Pap test. Washington, DC: The American College of Obstetricians and Gynecologists; 2008.
- American College of Obstetricians and Gynecologists. Screening for cervical cancer. Washington, DC: The American College of Obstetricians and Gynecologists; 2012.
- Appalachia Community Cancer Network. Addressing the cancer burden in Appalachian communities. 2010. <http://www.accnweb.com/docs/2010/AddressingtheCancerBurdenAppCommunities2010.pdf>
- Bandura, Albert. Social learning theory. Englewood Cliffs, NJ: Prentice Hall; 1977.
- Black AT, McCulloch A, Martin RE, Kan L. Young women and cervical cancer screening: what barriers persist? *Can J Nurs Res*. 2011; 43(1):8–21. [PubMed: 21661613]
- Campbell MK, Hudson MA, Resnicow K, Blakeney N, Paxton A, Baskin M. Church-based health promotion interventions: evidence and lessons learned. *Ann Rev Pub Health*. 2007; 28:213–34. [PubMed: 17155879]
- Campbell MK, Quintiliani LM. Tailored Interventions in Public Health Where Does Tailoring Fit in Interventions to Reduce Health Disparities? *Am Behavior Scientist*. 2006; 49(6):775–93.
- Centers for Disease Control and Prevention. Behavioral Risk Factor Surveillance System Questionnaire. Hyattsville, MD: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention; 2014.
- Centers for Disease Control and Prevention. National Center for Health Statistics, National Health and Nutrition Examination Survey Questionnaire. Hyattsville, MD: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention; 2013.
- 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]
- Eggleston KS, Coker AL, Das IP, Cordray ST, Luchok KJ. Understanding barriers for adherence to follow-care for abnormal Pap tests. *J Women Health*. 2007; 16(3):311–30.
- Eiser JR, Cole N. Participation in cervical screening as a function of perceived risk, barriers and need for cognitive closure. *J Health Psychol*. 2002; 7(1):99–105. [PubMed: 22114230]
- Gielen, Andrea C.; McDonald, Eileen M.; Gary, Tiffany L.; Bone, Lee R. Using the PRECEDE-PROCEED model to apply health behavior theories. In: Glanz, Karen; Rimer, Barbara K.;

- Viswanath, K., editors. Health behavior and health education: Theory, research and practice. San Francisco: Jossey-Bass; 2008. p. 407-433.
- Green, Laurence W.; Kreuter, Marshall W. Health promotion planning: An educational and environmental approach. Mountain View, CA: Mayfield Publishing Company; 1991.
- Han HR, Lee H, Kim MT, Kim KB. Tailored lay health worker intervention improves breast cancer screening outcomes in non-adherent Korean-American women. *Health Edu Res.* 2009; 24(2):318–29.
- Hecht, Michael L.; Lee, Jeoyng Kyu. Branding through cultural grounding: The keepin' it REAL curriculum. *Public Health Branding: Applying marketing for social change.* 2008:161–79.
- Hill EM, Gick ML. Attachment and barriers to cervical screening. *J Health Psychol.* 2013; 18(5):648–57. [PubMed: 22933580]
- Hollingshead, August B. Four factor index of social status. New Haven: Department of Sociology, Yale University; 1975.
- Holt CL, Litaker MS, Scarinci IC, Debnam KJ, McDavid C, McNeal SF, et al. Spiritually based intervention to increase colorectal cancer screening among African Americans screening and theory-based outcomes from a randomized trial. *Health Educ Behav.* 2013; 40(4):458–68. [PubMed: 23033548]
- Hurd TC, Muti P, Erwin DO, Womack S. An evaluation of the integration of non-traditional learning tools into a community based breast and cervical cancer education program: the Witness Project of Buffalo. *BMC Cancer.* 2003; 3(1):18–25. [PubMed: 12775219]
- Katz ML, Tatum C, Dickinson SL, Murray DM, Long-Foley K, Cooper MR, et al. Improving colorectal cancer screening by using community volunteers. *Cancer.* 2007; 110(7):1602–10. [PubMed: 17665496]
- Katz ML, Wewers ME, Single N, Paskett ED. Key informants' perspectives prior to beginning a cervical cancer study in Ohio Appalachia. *Qual Health Res.* 2007; 17(1):131–41. [PubMed: 17170251]
- Kelaher M, Gillespie AG, Allotey P, Manderson L, Potts H, Sheldrake M, et al. The transtheoretical model and cervical screening: Its application among culturally diverse communities in Queensland, Australia. *Ethn Health.* 1999; 4(4):259–76. [PubMed: 10705563]
- Kobetz E, Vatalaro K, Moore A, Earp JA. Taking the transtheoretical model into the field: A curriculum for lay health advisors. *Health Prom Prac.* 2005; 6(3):329–37.
- Kramish Campbell M, James A, Hudson MA, Carr C, Jackson E, Oakes V, et al. Improving multiple behaviors for colorectal cancer prevention among African American church members. *Health Psychol.* 2004; 23(5):492–502. [PubMed: 15367069]
- Kwak MS, Choi KS, Spring BJ, Park S, Park EC. Predicting the stages of adoption of cervical cancer screening among Korean women. *Prev Med.* 2009; 49(1):48–53. [PubMed: 19465046]
- Leone LA, James AS, Allicock M, Campbell MK. Obesity predicts differential response to cancer prevention interventions among African Americans. *Health Edu Behav.* 2010; 37(6):913–25.
- Luque JS, Rivers BM, Gwede CK, Kambon M, Green BL, Meade CD. Barbershop communications on prostate cancer screening using barber health advisors. *Am J Mens Health.* 2011; 5(2):129–39. [PubMed: 20413392]
- Luszczynska A, Goc G, Scholz U, Kowalska M, Knoll N. Enhancing intentions to attend cervical cancer screening with a stage-matched intervention. *Brit J Health Psychol.* 2011; 16(1):33–46. [PubMed: 21226782]
- Marlow LA, Waller J, Wardle J. The impact of human papillomavirus information on perceived risk of cervical cancer. *Cancer Epidemiol Biomarkers Prev.* 2009; 18(2):373–76. [PubMed: 19190156]
- Margolis KL, Lurie N, McGovern PG, Tyrell M, Slater JS. Increasing breast and cervical cancer screening in low-income women. *J Gen Intern Med.* 1998; 13(8):515–21. [PubMed: 9734787]
- Marmot, Michael; Wilkinson, Richard. Social determinants of health. Oxford, UK: Oxford Press; 1999.
- McAlearney AS, Song PH, Rhoda DA, Tatum C, Lemeshow S, Ruffin M, et al. Ohio Appalachian women's perceptions of the cost of cervical cancer screening. *Cancer.* 2010; 116(20):4727–34. [PubMed: 20597135]

- McKee MD, Lurio J, Marantz P, Burton W, Mulvihill M. Barriers to follow-up of abnormal Papanicolaou smears in an urban community health center. *Arch Fam Med*. 1999; 8(2):129–34. [PubMed: 10101983]
- Norcross JC, Krebs PM, Prochaska JO. Stages of change. *J Clin Psychol*. 2011; 67(2):143–54. [PubMed: 21157930]
- Paskett ED, McLaughlin JM, Lehman AM, Katz ML, Tatum CM, Oliveri JM. Evaluating the efficacy of lay health advisors for increasing risk-appropriate Pap test screening: a randomized controlled trial among Ohio Appalachian women. *Cancer Epidemiol Biomarkers Prev*. 2011; 20(5):835–43. [PubMed: 21430302]
- Paskett ED, McLaughlin JM, Reiter PL, Lehman AM, Rhoda DA, Katz ML, et al. Psychosocial predictors of adherence to risk-appropriate cervical cancer screening guidelines: a cross sectional study of women in Ohio Appalachia participating in the Community Awareness Resources and Education (CARE) project. *Prev Med*. 2010; 50(1):74–80. [PubMed: 19744509]
- Paskett ED, Tatum CM, D'Agostino R, Rushing J, Velez R, Michielutte R, et al. Community-based interventions to improve breast and cervical cancer screening: results of the Forsyth County Cancer Screening (FoCaS) Project. *Cancer Epidemiol Biomarkers Prev*. 1999; 8(5):453–59. [PubMed: 10350442]
- Paskett E, Tatum C, Rushing J, Michielutte R, Bell R, Foley KL, et al. Randomized trial of an intervention to improve mammography utilization among a triracial rural population of women. *J Nat Cancer Inst*. 2006; 98(17):1226–37. [PubMed: 16954475]
- Prochaska JO, Norcross JC. Stages of change. *Psychotherapy: Theory, Research, Practice, Training*. 2001; 38(4):443–48.
- Prochaska JO, Velicer WF. The transtheoretical model of health behavior change. *Am J Health Promot*. 1997; 12(1):38–48. [PubMed: 10170434]
- Rakowski W, Ehrich B, Dubé CE, Pearlman DN, Goldstein MG, Peterson KK, et al. Screening mammography and constructs from the transtheoretical model: Associations using two definitions of the stages-of-adoption. *Ann Behavior Med*. 1996; 18(2):91–100.
- Rhodes SD, Foley KL, Zometa CS, Bloom FR. Lay health advisor interventions among Hispanics/Latinos: a qualitative systematic review. *Am J Prev Med*. 2007; 33(5):418–27. [PubMed: 17950408]
- Rimer BK, Halabi S, Sugg Skinner C, Lipkus IM, Strigo TS, Kaplan EB, Samsa GP. Effects of a mammography decision-making intervention at 12 and 24 months. *Am J Prev Med*. 2002; 22(4):247–57. [PubMed: 11988381]
- Russell KM V, Champion L, Monahan PO, Millon-Underwood S, Zhao Q, Spacey N, et al. Randomized trial of a lay health advisor and computer intervention to increase mammography screening in African American women. *Cancer Epidemiol Biomarkers Prev*. 2010; 19(1):201–10. [PubMed: 20056639]
- Simard EP, Ward EM, Siegel R, Jemal A. Cancers with increasing incidence trends in the United States: 1999 through 2008. *CA Cancer J Clin*. 2012; 62(2):118–28. [PubMed: 22281605]
- Slone S, White C, Shelton B, Van Meter E, DeSimone C, Schoenberg N, Dignan M. Inconsistencies between medical records and patient-reported recommendations for follow-up after abnormal Pap tests. *J Womens Health*. 2013; 22(2):147–52.
- Spadea T, Bellini S, Kunst A, Stirbu I, Costa G. The impact of interventions to improve attendance in female cancer screening among lower socioeconomic groups: a review. *Prev Med*. 2010; 50(4):159–64. [PubMed: 20093138]
- Studs CR, Tarasenko YN, Schoenberg NE. Barriers to cervical cancer screening among middle-aged and older rural Appalachian women. *J Community Health*. 2013; 38(3):500–12. [PubMed: 23179390]
- Studs 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*. 2013; 54(6):408–414. [PubMed: 22498022]
- Tung WC, Nguyen DHT, Tran DN. Applying the transtheoretical model to cervical cancer screening in Vietnamese-American women. *Int Nursing Rev*. 2008; 55(1):73–80.

- Waller J, Bartoszek M, Marlow L, Wardle J. Barriers to cervical cancer screening attendance in England: a population-based survey. *J Med Screening*. 2009; 16(4):199–204.
- Watson M, Saraiya M, Benard V, Coughlin SS, Flowers L, Cokkinides V, Giuliano A. Burden of cervical cancer in the United States, 1998–2003. *Cancer*. 2008; 113(S10):2855–64. [PubMed: 18980204]
- Wilcox JB. The interaction of refusal and not-at-home sources of non-response bias. *J Marketing Res*. 1977; 14(4):592–97.

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**Table 1**Demographic characteristics of participants who completed the LHA intervention<sup>a</sup>

Characteristic	Participants ( <i>n</i> = 90) <i>n</i> (%)
Age, years	
18–30	23 (25.6)
31–50	36 (40.0)
51	31 (34.4)
Race	
White	87 (96.7)
Nonwhite	3 (3.3)
Marital Status	
Never married	6 (6.7)
Married/member of couple	64 (71.1)
Divorced/widowed/separated	20 (22.2)
Employment Status	
Full- or part-time	60 (66.7)
Unemployed or disabled	9 (10.0)
Other	21 (23.3)
Health Insurance	
Private	57 (63.3)
Medicare and/or Medicaid only	15 (16.7)
No coverage	18 (20.0)
Annual household income	
\$0–\$20,000	24 (27.0)
\$20,001–\$50,000	42 (47.2)
\$50,001	23 (25.8)
Education	
Less than high school	4 (4.4)
High school graduate/GED	36 (40.0)
At least some college	50 (55.6)
SES	
0–1 (low)	12 (13.3)
2–3 (middle)	44 (48.9)
4–6 (high)	34 (37.8)
Previous abnormal Pap test	
Yes	26 (28.9)
No	64 (71.1)

<sup>a</sup> = Some variables do not total 90 because of missing data

LHA=Lay Health Advisor; GED=General Educational Development; SES=Socioeconomic Status

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**Table 2**

TTM stage movement for cervical cancer screening among intervention participants from LHA Visit 1 to Visit 2

TTM Stages	Participants ( <i>n</i> = 90) <i>n</i> (%)
<i>Pre-intervention</i>	
Precontemplation	14 (15.6)
Contemplation	36 (40.0)
Preparation	40 (44.4)
<i>Post-intervention</i>	
Precontemplation	12 (13.3)
Contemplation	20 (22.2)
Preparation	13 (14.4)
Action	45 (50.0)
<i>Stage Movement from LHA Visit 1 to Visit 2</i>	
Went back 3 stages	0 (0.0)
Went back 2 stages	1 (1.1)
Went back one stage	6 (6.7)
Stayed in the same stage	26 (28.9)
Moved forward 1 stage	42 (46.7)
Moved forward 2 stages	14 (15.5)
Moved forward 3 stages	1 (1.1)
Total forward stage movement at 2 <sup>nd</sup> visit	57 (63.3)

TTM=Transtheoretical Model; LHA=Lay Health Advisor

**Table 3**

Number of participant reported barriers by stage at Visit 1 (V1) and Visit 2 (V2)

Number of Barriers					
Participant's Stage at V1	N of participants	Mean	SD	Minimum	Maximum
1. Precontemplation/Relapse	14	1.79	1.25	1.00	5.00
2. Contemplation	36	2.36	1.36	1.00	5.00
3. Preparation	40	2.75	1.69	1.00	7.00
Participant's Stage at V2					
1. Precontemplation/Relapse	12	2.83	2.08	1.00	8.00
2. Contemplation	20	2.80	1.96	0.00	8.00
3. Preparation	13	2.62	2.22	1.00	9.00
4. Action	45	1.69	1.52	0.00	8.00

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**Table 4**

Unadjusted participant demographic factors associated with being in the action stage at Visit 2

Variable	Level	Odds Ratio (95% Confidence Interval)
Age, years *	30	1.92 (0.63, 5.85)
	> 30 and 50	4.20 (1.51, 11.68)
	> 50 (referent)	1.00
Race	White	0.49 (0.04, 5.59)
	Nonwhite (referent)	1.00
Marital status	Divorced/widowed/Separated	1.30 (0.48, 3.57)
	Never married	1.07 (0.20, 5.68)
	Married/member of a couple (referent)	1.00
Employment status	Unemployed/disabled	0.44 (0.10, 1.91)
	Other	0.80 (0.30, 2.15)
	Full-time/part-time	1.00
Health insurance	No coverage	0.28 (0.09, 0.89)
	Medicare and/or Medicaid	0.64 (0.20, 2.00)
	Private (job or purchased, referent)	1.00
Annual Household Income	0–\$20,000	0.32 (0.10, 1.06)
	\$20,001–\$50,000	0.71 (0.25, 1.99)
	\$50,001 (referent)	1.00
Education	< High School	1.17 (0.15, 9.00)
	High school graduate/GED	1.47 (0.62, 3.47)
	At least some college (referent)	1.00
SES level	0–1	0.44 (0.11, 1.76)
	2–3	0.97 (0.40, 2.39)
	4–6 (referent)	1.00
Previous abnormal Pap test	No	0.41 (0.16, 1.06)
	Yes	1.00

\*  $p < .05$ 

GED=General Educational Development; SES=Socioeconomic Status derived from Hollingshead (1975)

**Table 5**

Unadjusted and adjusted<sup>a</sup> results of logistic regressions for reported participant barriers to cervical cancer screening associated with the action stage at Visit 2

Variable	# Reported (%)	Unadjusted Odds Ratio (95% Confidence Interval)	Adjusted Odds Ratio (95% Confidence Interval)
I don't have any symptoms.			
No	69 (77%)	1.00	--
Yes	21 (23%)	0.53 (0.20, 1.45)	--
My doctor didn't recommend it.			
No	74 (82%)	1.00	1.00
Yes	16 (18%)	0.10 (0.02, 0.49)**	0.08 (0.02, 0.39)**
Having a Pap test is embarrassing.			
No	76 (84%)	1.00	--
Yes	14 (16%)	0.34 (0.10, 1.18)	--
I don't have time.			
No	57 (63%)	1.00	--
Yes	33 (37%)	1.33 (0.56, 3.15)	--
I forget to make my appointment.			
No	54 (60%)	1.00	--
Yes	36 (40%)	2.12 (0.90, 5.01)	--
I can't afford it.			
No	64 (71%)	1.00	1.00
Yes	26 (29%)	0.32 (0.12, 0.86)*	0.24 (0.08, 0.70)**
Getting a Pap test makes me nervous and afraid.			
No	77 (86%)	1.00	1.00
Yes	13 (14%)	0.25 (0.06, 0.98)*	0.16 (0.04, 0.69)*
I don't want to know.			
No	82 (91%)	1.00	--
Yes	8 (9%)	1.00 (0.23, 4.27)	--
Pap tests are painful or uncomfortable.			
No	84 (93%)	1.00	--
Yes	6 (7%)	0.18 (0.02, 1.62)	--

<sup>a</sup>Model included all retained variables for which values are displayed in the table.

\*  $p < .05$ ; \*\*  $p < .01$