Differences in Barriers to Mammography Between Rural and Urban Women

Terry C. Davis, Ph.D.,¹ Connie L. Arnold, Ph.D.,¹ Alfred Rademaker, Ph.D.,²
Stacy C. Bailey, Ph.D., M.P.H.,³ Daci J. Platt, B.A.,¹ Cristalyn Reynolds, M.A.,¹
Julie Esparza, M.L.S.,¹ Dachao Liu, M.S.,² and Michael S. Wolf, Ph.D., M.P.H.³

Abstract

Background: Few studies have examined differences between rural and urban women in mammography barriers, knowledge, and experiences. Exploring differences can help inform tailored interventions.

Methods: Women, aged ≥ 40 , who had not been screened in the past 2 years were recruited from eight federally qualified health centers across Louisiana. They were given a structured interview assessing mammography knowledge, beliefs, barriers, experiences, and literacy.

Results: Of the 1189 patients who participated, 65.0% were African American, 61.6% were rural, and 44.0% had low literacy. Contrary to guidelines, most believed mammography should be done annually (74.3%) before age 40 (70.5%). Compared to urban women, rural participants were more likely to believe mammography will find small breast lumps early (34.4% vs. 6.5%, $p < 0.0001$) and strongly disagree that mammography is embarrassing (14.6% vs. 8.4%, $p = 0.0002$) or that they are afraid of finding something wrong (21.2% vs. 12.3%, $p = 0.007$). Rural women were more likely to report a physician recommendation for mammography (84.3% vs. 76.5%, $p = 0.006$), but they were less likely to have received education (57.2% vs. 63.6%, $p = 0.06$) or to have ever had a mammogram (74.8% vs. 78.1%, $p = 0.007$). In multivariate analyses controlling for race, literacy, and age, all rural/urban differences remained significant, except for receipt of a mammogram.

Conclusions: Most participants were unclear about when they should begin mammography. Rural participants reported stronger positive beliefs, higher self-efficacy, fewer barriers, and having a physician recommendation for mammography but were less likely to receive education or screening.

Introduction

BREAST CANCER IS THE SECOND LEADING CAUSE of cancer-related death among women in the United States.¹ National efforts to reduce mortality have emphasized early detection and treatment through mammography.² Although mammography rates have increased dramatically over the last 30 years, they remain persistently lower among disadvantaged populations, including low-income women, those with no health insurance, women with fewer years of education, and racial/ethnic minorities.^{3–12}

Numerous studies have identified patient and system-level barriers that impact screening rates among disadvantaged populations. These include poorer knowledge about screening, fear of finding cancer, lack of motivation, embarrassment, inadequate transportation, lack of health insurance, lack of physician screening recommendation, and poor availability of screening facilities.^{2,4,13–19} Although it is known that mammography facilities are less available in rural areas and, therefore, fewer

women may receive mammography, no studies have focused on the differences between rural and urban women's knowledge, beliefs, barriers, and facilitators of mammography.^{7,20,21}

We examined the differences in screening mammography knowledge, beliefs, self-efficacy, mammography education, physician recommendation, and previous screening mammography between rural and urban Federally Qualified Health Center (FQHC) patients who had not had a mammography in the past 2 years. Results can be useful in developing strategies to help FQHCs in urban, inner-city, and rural areas better address mammography disparities.

Materials and Methods

Study design and sites

A randomized clinical trial, sponsored by the National Cancer Institute (NCI), was conducted among 1189 female patients to test the effectiveness of three distinct strategies to improve initial and repeat use of mammography (R01-CA115869).

¹Department of Medicine, Louisiana State University Health Sciences Center, Shreveport, Louisiana.

²Department of Preventive Medicine and ³Division of General Internal Medicine, Northwestern University, Chicago, Illinois.

This article focuses on baseline data collected as part of this trial before any intervention activities took place.

Eight FQHCs across seven parishes in North Louisiana served as study sites. These FQHCs were invited to participate in the study because of their high patient volume; all invited FQHCs agreed to serve as study clinics. FQHCs are government-supported clinics that are required to provide services to patients regardless of insurance status. They are strategically located in areas designated as medically underserved by the Department of Health and Human Services (DHHS). In North Louisiana, a large majority of the patients served by these FQHCs have no private health insurance, are African American, and are living at or below the poverty level. Six study clinics were located in rural towns, with populations ranging from 450 to 13,000. The two urban clinics were located in low-income areas of cities with populations of 63,000 and 199,000. The Index of Relative Rurality, which uses dimensions, such as population density, extent of urbanization, and distance to nearest metro area, to categorize counties, was used to classify clinics as either rural or urban.^{22–24}

Recruitment and study population

Patient enrollment took place between August 2008 and June 2011. To recruit patients, nurses' aides asked women aged ≥ 40 who had a scheduled clinic appointment if they would be willing to talk to a research assistant (RA) about a cancer screening study. RAs were college-educated adults who lived in the parish where the FQHC was located. Patients who agreed to participate were prescreened for eligibility by the clinic RA. Participants were eligible if they (1) were ≥ 40 years of age, (2) were English-speaking, (3) were enrolled as a patient in a study clinic, (4) did not have a previous history of cancer other than melanoma, (5) did not require screening at an earlier age according to American Cancer Society (ACS) guidelines (Fig. 1), (6) had not received a mammogram within the past 2 years, and (7) did not have any severe impairment or illness that precluded their participation. Research assistants engaged eligible patients in the informed consent process and then administered a structured survey in a private room to ensure privacy. Patients were assigned an identification number and data were entered electronically by ID number. To help ensure confidentiality, only study staff had access to the patient survey information and identification numbers. Patients were given \$10 to complete the baseline survey. The LSUHSC-S Institutional Review Board approved the study procedures.

FIG. 1. American Cancer Society breast cancer screening guidelines. MRI, magnetic resonance imaging.

Structured survey

The study interview included demographic and basic health status questions as well as 51 breast cancer and mammography-related questions designed using the Health Belief Model and Social Cognitive Theory. When necessary, validated breast and colon cancer screening questionnaires used in previous studies by the authors were modified to be specific to women's breast cancer knowledge and beliefs as well as mammography barriers and experience.^{11,25} We also modified the use of pronouns in Champion et al.'s Mammography Self-Efficacy Scale¹⁴ from "you" to "I" to be consistent with the wording of our belief and barrier questions after pilot testing the entire survey. Literacy was assessed using the Rapid Estimate of Adult Literacy in Medicine (REALM), a reading recognition test that uses words commonly seen in healthcare materials.^{26,27}

Specifically, items assessed participants' mammography awareness (e.g., Have you ever seen or heard an advertisement that encouraged you to get tested for breast cancer?), knowledge (e.g., At what age should a woman start getting mammograms?), beliefs about susceptibility to breast cancer (e.g., I feel I will get breast cancer sometime during my life.), beliefs about the benefits of mammography (e.g., Having a mammogram is the best way for me to find small breast lumps early.), perceived barriers (e.g., Having a mammogram is embarrassing.), self-efficacy of screening behavior (e.g., I know for sure I can get a mammogram if I really want to.), physician recommendation (e.g., Has a doctor ever recommended that you have a mammogram?), experience (e.g., Have you ever had a mammogram?), and facilitators (e.g., Is there one person in your life that if they told you to get a mammogram you would get one? If so who?). Response options for knowledge, awareness, beliefs, and experience and facilitator items were yes, no, don't know, or open ended. Beliefs and self-efficacy questions used a 5-point Likert scale to assess intensity of agreement. The self-efficacy scale ranged from 7 to 35, with higher number indicating greater self-efficacy.

Statistical analyses

Frequencies and percentages were calculated for all variables, and differences by rural/urban status were examined using chi-square tests. An independent sample *t* test was used to compare the means of the self-efficacy scores by rural/urban status. In multivariate analyses, logistic regression (for dichotomous measures) or cumulative logit link logistic regression for Likert scale measures were used to determine the relationship between rural/urban status and outcomes, adjusting for age, race, and literacy. Very small frequency or zero frequency categories were excluded in analyses. Statistical significance was indicated when $p < 0.05$. No adjustment for multiple testing was made, as actual *p* values are reported.

Results

In all, 1251 women were identified as eligible to participate, 62 refused (4.9%), and 1189 were enrolled in the study. Study participants ranged in age from 40 to 89, with a median age of 54; 65.0% were African American, 29.5% lacked a high school diploma, and 44.0% had low literacy (Table 1). There were 846 participants in rural FQHCs and 343 participants in urban

TABLE 1. DEMOGRAPHICS

Characteristic	Rural n = 846	Urban n = 343
Age ($p = 0.02$) ^a		
40–49	305 (36.1%)	133 (38.8%)
50–59	362 (42.8%)	119 (34.7)
60–69	139 (16.4%)	64 (18.7%)
70+	40 (4.7%)	27 (7.9%)
Race ($p < 0.0001$)		
African American	485 (57.3%)	288 (84.0%)
White	358 (42.3%)	55 (16.0%)
Hispanic	3 (0.4%)	0 (0.0%)
Marital status ($p = 0.005$)		
Single	243 (28.7%)	131 (38.2%)
Married	287 (33.9%)	84 (24.5%)
Separated	66 (7.8%)	27 (7.9%)
Divorced	153 (18.1%)	56 (16.3%)
Widowed	97 (11.5%)	45 (13.1%)
Last grade completed ($p = 0.52$)		
Less than high school	259 (30.6%)	92 (26.8%)
High school graduate	387 (45.7%)	159 (46.4%)
Some college	146 (17.3%)	68 (19.8%)
College graduate and above	54 (6.4%)	24 (7.0%)
Literacy level ($p < 0.0001$)		
<9th grade	282 (47.5%)	166 (61.9%)
9th grade and above	312 (52.5%)	102 (38.1%)
Have you seen a doctor in the last 12 months? ($p = 0.23$)		
Yes	751 (88.8%)	296 (89.3%)
No	95 (11.2%)	47 (13.7%)
Does any member of your family currently have any serious illness? ($p < 0.0001$)		
Yes	360 (42.6%)	135 (39.4%)
No	471 (55.7%)	180 (52.5%)
Don't know	15 (8.2%)	28 (8.2%)
Has any member of your family ever had cancer? ($p = 0.004$)		
Yes	627 (74.1%)	236 (68.9%)
No	203 (24.0%)	89 (26.0%)
Don't know	16 (1.9%)	18 (5.3%)

^a p values in parentheses are univariate p values by chi-square test.

FQHCs. The percentage of patients who were African American was higher in urban clinics compared to rural clinics (84.0% vs. 57.3%, $p < 0.0001$). Participants in urban clinics were also more likely to have low literacy (61.9% vs. 47.5%, $p < 0.0001$). Almost all participants (88.8% rural and 86.3% urban) had seen a doctor in the last 12 months. Rural participants were more likely to report currently having a family member with a serious illness (42.6% vs. 39.4%, $p < 0.0001$) and having a family member who has had cancer (74.1% vs. 68.8%, $p = 0.004$).

Knowledge and awareness

Awareness of breast cancer was high among participants (Table 2); almost all had heard of breast cancer (98.2%). The majority (84.4%) had seen or heard an advertisement that encouraged getting tested for breast cancer. Rural participants were more likely to report knowing someone who had experienced breast cancer (78.9% vs. 59.0%, $p < 0.0001$). Even

TABLE 2. KNOWLEDGE AND AWARENESS

Question	Rural n (%)	Urban n (%)
Have you ever heard of breast cancer? ($p = 0.2$) ^a		
Yes	808 (98.5%)	302 (97.4%)
No	12 (1.5%)	8 (2.6%)
Have you ever seen or heard an advertisement that encouraged you to get tested for breast cancer? ($p = 0.18$)		
Yes	702 (85.6%)	252 (81.3%)
No	112 (13.7%)	56 (18.1%)
Don't know	6 (0.7%)	2 (0.7%)
Do you know anyone who has had breast cancer? ($p < 0.0001$, multivariate $p < 0.0001$)		
Yes	647 (78.9%)	183 (59.0%)
No	173 (21.1%)	124 (40.0%)
Don't know	0 (0.0%)	3 (1.0%)
Have you ever heard of any tests to find breast cancer? ($p = 0.001$, multivariate $p = 0.007$)		
Yes	715 (87.2%)	243 (78.4%)
No	103 (12.6%)	65 (20.1%)
Don't Know	2 (0.2%)	2 (0.7%)
Do you know what a mammogram is? ($p = 0.24$, multivariate $p = 0.02$)		
Yes	757 (92.3%)	295 (95.2%)
No	58 (7.1%)	14 (4.5%)
Don't know	5 (0.6%)	1 (0.3%)
At what age do you think a person should start getting mammograms to look for breast cancer? ($p = 0.004$)		
0–19 years	124 (15.1%)	66 (21.3%)
20–29 years	245 (29.9%)	68 (21.9%)
30–39 years	221 (27.0%)	73 (23.6%)
40–49 years	212 (25.9%)	99 (31.9%)
50–59 years	18 (2.2%)	4 (1.3%)
Are women ever too old to get a mammogram? ($p = 0.63$)		
Yes	10 (1.2%)	5 (1.6%)
No	795 (97.0%)	297 (95.8%)
Don't know	15 (1.8%)	8 (2.6%)
How often do you think a person should get a mammogram? ($p = 0.41$)		
Once every year	607 (74.0%)	233 (75.2%)
Twice every year	69 (8.4%)	27 (8.7%)
Once every 2 years	115 (14.0%)	45 (14.5%)
Once every 5–10 years	29 (3.5%)	5 (1.6%)

^aUnivariate p values in parentheses are by chi-square test. Multivariate p values are by logistic regression and adjust for age, race, and literacy.

though awareness was high and participants had been asked about mammograms in eligibility interviews, 12.6% of rural participants and 20.1% of urban participants reported they had not heard of or did not know of any test to find breast cancer. When women were asked if they knew what a mammogram was, however, most (93.1%) said they knew and were able to

TABLE 3. BELIEFS

Question	Rural n (%)	Urban n (%)
If you had breast cancer, would you want to know about it? ($p=0.15$) ^a		
Yes	761 (92.8%)	279 (90.0%)
No	29 (3.5%)	19 (6.1%)
Don't know	30 (3.7%)	12 (3.9%)
How worried are you that if you get screening tests you might find out you have cancer? ($p<0.0001$, multivariate $p<0.0001$)		
Very worried	47 (5.8%)	15 (4.9%)
Somewhat worried	175 (21.7%)	34 (11.0%)
Not worried	299 (37.0%)	104 (33.8%)
Not worried at all	271 (33.5%)	151 (49.0%)
Don't know	16 (2.0%)	4 (1.3%)
How helpful do you think it is to find breast cancer early? ($p<0.0001$, multivariate $p<0.0001$)		
Very helpful	763 (93.1%)	214 (69.0%)
Helpful	49 (6.0%)	87 (28.1%)
Not too helpful	0 (0.0%)	1 (0.3%)
Not helpful at all	0 (0.0%)	0 (0.0%)
Don't know	8 (1.0%)	8 (2.6%)
If breast cancer is found and treated early, what do you think a person's chances of surviving are? Would you say... ($p=0.18$, multivariate $p=0.05$)		
Very good	569 (69.4%)	192 (62.3%)
Good	201 (24.5%)	95 (30.7%)
Fair	28 (3.4%)	11 (3.6%)
Not good at all	5 (0.6%)	4 (1.3%)
Don't know	17 (2.1%)	7 (2.3%)
I feel I will get breast cancer some time during my life. ($p=0.002$)		
Strongly agree	20 (2.4%)	1 (0.3%)
Agree	199 (24.3%)	81 (26.1%)
Disagree	364 (44.4%)	152 (49.0%)
Strongly disagree	112 (13.7%)	21 (6.8%)
Don't know	125 (15.4%)	55 (17.7%)
Having a mammogram will help me find small breast lumps early. ($p<0.0001$, multivariate $p<0.0001$)		
Strongly agree	282 (34.4%)	20 (6.5%)
Agree	531 (64.8%)	278 (89.7%)
Disagree	1 (0.1%)	7 (2.3%)
Strongly disagree	1 (0.1%)	1 (0.3%)
Don't know	5 (0.6%)	4 (1.3%)
If I find cancer through a mammogram, my cancer treatment might not be as bad. ($p<0.0001$, multivariate $p=0.0005$)		
Strongly agree	146 (17.8%)	12 (3.9%)
Agree	562 (68.5%)	259 (83.6%)

(continued)

TABLE 3. (CONTINUED)

Question	Rural n (%)	Urban n (%)
Disagree	56 (6.8%)	15 (4.8%)
Strongly disagree	5 (0.6%)	2 (0.7%)
Don't know	51 (6.2%)	22 (7.1%)
Having a mammogram will decrease my chances of dying from breast cancer. ($p<0.0001$, multivariate $p=0.038$)		
Strongly agree	178 (21.7%)	15 (4.8%)
Agree	492 (60.0%)	254 (81.9%)
Disagree	96 (11.7%)	25 (8.1%)
Strongly disagree	12 (1.5%)	3 (1.0%)
Don't know	42 (5.1%)	13 (4.2%)
Having a mammogram is the best way for me to find a very small breast lump. ($p<0.0001$, multivariate $p<0.0001$)		
Strongly agree	260 (31.7%)	22 (7.1%)
Agree	520 (63.4%)	271 (87.4%)
Disagree	26 (3.2%)	8 (2.6%)
Strongly disagree	3 (0.4%)	2 (0.7%)
Don't know	11 (1.3%)	7 (2.3%)

^aUnivariate p values in parentheses are by chi-square test. Multivariate p values are by logistic regression and adjust for age, race, and literacy.

give a correct description of a mammogram in their own words (e.g., an x-ray of the breast or test for breast cancer).

Participants were not clear about what age to begin mammography or how often they needed the test. Most (70.5%) thought women should start getting mammograms before age 40, with 45.0% of rural women and 43.2% of urban women indicating women should begin in their 20s or earlier. Urban women were more likely than rural women to indicate age 40–49 as the time to begin mammography (31.9% vs. 25.6%, $p=0.004$). There was no difference in participants' knowledge of how often an eligible woman should get a mammogram; most (74.3%) said once a year, 14.2% said every 2 years, and 8.5% said twice a year. Almost all women (96.6%) stated that a woman was never too old to have a mammogram.

In multivariate analysis controlling for age, race, and literacy, urban/rural differences were significant for knowing someone who has had breast cancer ($p<0.0001$), having heard of tests to find breast cancer ($p=0.007$), and believing they knew what a mammogram was ($p=0.02$). Rural/urban differences were not significant for having heard of breast cancer; having seen or heard advertising to encourage testing; knowing what a mammogram is, how often a woman should get a mammogram, or at what age to begin to get mammograms; or thinking women were never too old for mammography.

Beliefs

Most participants indicated they would want to know if they had breast cancer, with no significant difference between rural and urban participants (92.8% vs. 90.0%, $p=0.15$) (Table 3). Urban participants were more likely to report they were not very worried screening tests might find out they had cancer (49.0% vs. 33.5%, $p<0.0001$). Rural participants were

more likely to believe it was very helpful to find breast cancer early (93.1% vs. 69.0%, $p < 0.0001$). Believing that if breast cancer is found early and treated early, a person's chances of surviving would be very good was similar between groups (69.4% vs. 62.3%, $p = 0.18$). Rural participants had stronger positive beliefs about the benefits of mammography; they were more likely to strongly agree that having a mammogram will help find small breast lumps early (34.4% vs. 6.5%, $p < 0.0001$), to strongly agree that if cancer was found through a mammogram their cancer treatment might not be as bad (17.8% vs. 3.9%, $p < 0.0001$), and to strongly agree that a mammogram will decrease their chances of dying from breast cancer (21.7% vs. 4.8%, $p < 0.0001$).

In multivariate analysis adjusting for age, race, and literacy, urban participants were more likely to report that they were not very worried screening tests might find they had cancer ($p < 0.0001$). Rural participants were more likely to believe it is very helpful to find breast cancer early ($p < 0.0001$) and that if breast cancer is found and treated early, a person's chances of surviving are very good ($p = 0.0502$). Rural/urban differences also remained significant for strongly agreeing that having a mammogram will help find small breast lumps early ($p < 0.0001$), cancer treatment might not be as bad if the disease is found early through a mammogram ($p = 0.0005$), and having a mammogram will decrease their chances of dying from breast cancer ($p = 0.038$). No significant differences were found between rural and urban participants in multivariate analyses for being more likely to want to know if they had cancer or strongly agreeing that they would get breast cancer some time during their lives.

Self-efficacy

Participants felt fairly confident in their ability to obtain a mammogram. Rural participants had a higher mean score on the modified Self-Efficacy Scale compared to urban participants (28.3, standard deviation [SD] 2.6 vs. 27.8, SD 1.9, $p = 0.0001$). In multivariate analysis controlling for age, race, and literacy, rural/urban differences were significant ($p = 0.01$).

Barriers

Urban participants were more likely to report personal barriers to completing mammography (Table 4). Rural participants were more likely to strongly disagree that they were afraid to get a mammogram because they might find something wrong (21.2% vs. 12.3% urban, $p = 0.007$), strongly disagree that they were afraid to get a mammogram because they do not understand what will be done (19.3% vs. 9.7% urban, $p = 0.002$), or strongly disagree they did not know how to go about getting a mammogram (13.5% rural vs. 6.5% urban, $p = 0.001$). Rural women were also more likely to strongly disagree that having a mammogram would be embarrassing (14.6% and 8.4%, $p = 0.0002$), be a lot of trouble (12.4% vs. 6.8%, $p = 0.0005$), or expose them to too much radiation (6.3% vs. 2.3%, $p = 0.0004$). Rural women were more likely, however, to strongly agree that getting a mammogram would be uncomfortable (14.5% and 10.7%, $p < 0.0001$).

In multivariate analysis controlling for age, race, and literacy, the only significant urban/rural differences in barriers to mammography were fear of finding something wrong ($p = 0.01$) and believing that having a mammogram is uncomfortable ($p = 0.005$).

TABLE 4. BARRIERS

Question	Rural n (%)	Urban n (%)
I am afraid to get a mammogram because I am afraid of finding out that something is wrong. ($p = 0.007$, multivariate $p = 0.01$) ^a		
Strongly agree	25 (3.1%)	8 (2.6%)
Agree	123 (15.0%)	56 (18.1%)
Disagree	490 (59.8%)	203 (65.5%)
Strongly disagree	174 (21.2%)	38 (12.3%)
Don't know	8 (1.0%)	5 (1.6%)
I'm afraid to get a mammogram because I don't understand what will be done. ($p = 0.002$)		
Strongly agree	13 (1.6%)	2 (0.7%)
Agree	80 (9.8%)	33 (10.7%)
Disagree	565 (68.9%)	243 (78.4%)
Strongly disagree	158 (19.3%)	30 (9.7%)
Don't know	4 (0.5%)	2 (0.7%)
I don't know how to go about getting a mammogram ($p = 0.001$)		
Strongly agree	12 (1.5%)	1 (0.3%)
Agree	148 (18.1%)	49 (15.8%)
Disagree	537 (65.5%)	238 (76.8%)
Strongly disagree	111 (13.5%)	20 (6.5%)
Don't know	12 (1.5%)	2 (0.7%)
Having a mammogram is embarrassing. ($p = 0.0002$)		
Strongly agree	11 (1.3%)	1 (0.3%)
Agree	110 (13.4%)	22 (7.1%)
Disagree	568 (69.3%)	257 (82.9%)
Strongly disagree	120 (14.6%)	26 (8.4%)
Don't know	11 (1.3%)	4 (1.3%)
Having a mammogram is a lot of trouble. ($p = 0.0005$)		
Strongly agree	10 (1.2%)	0 (0.0%)
Agree	84 (10.2%)	18 (5.8%)
Disagree	605 (73.8%)	266 (85.8%)
Strongly disagree	102 (12.4%)	21 (6.8%)
Don't know	19 (2.3%)	5 (1.6%)
Having a mammogram exposes me to too much radiation. ($p = 0.0004$)		
Strongly agree	7 (0.9%)	0 (0.0%)
Agree	76 (9.3%)	20 (6.5%)
Disagree	562 (68.5%)	211 (68.1%)
Strongly disagree	52 (6.3%)	7 (2.3%)
Don't know	123 (15.0%)	72 (23.2%)
Having a mammogram is uncomfortable ($p < 0.0001$, multivariate $p = 0.005$)		
Strongly agree	119 (14.5%)	33 (10.7%)
Agree	400 (48.8%)	120 (38.7%)
Disagree	204 (24.9%)	115 (38.7%)
Strongly disagree	34 (4.2%)	7 (2.3%)
Don't know	63 (7.7%)	35 (11.3%)

^aUnivariate p values in parentheses are by chi-square test. Multivariate p values are by logistic regression and adjust for age, race and literacy.

TABLE 5. RECEIPT OF RECOMMENDATION/EDUCATION

Question	Rural n (%)	Urban n (%)
Has a doctor ever recommended that you have a mammogram? ($p=0.006$, multivariate $p=0.004$) ^a		
Yes	691 (84.3%)	237 (76.5%)
No	125 (15.2%)	69 (22.3%)
Don't know	4 (0.5%)	4 (1.3%)
Have you ever been given information or education on mammograms? ($p=0.06$)		
Yes	469 (57.2%)	197 (63.6%)
No	348 (42.4%)	110 (35.5%)
Don't know	3 (0.4)	3 (1.0%)
Has anyone or anything other than a physician encouraged you to get a mammogram? ($p=0.003$, multivariate $p=0.005$)		
Yes	432 (52.7%)	131 (42.3%)
No	384 (46.8%)	179 (57.7%)
Don't know	4 (0.5%)	0 (0.0%)
Is there one person in your life who if they told you to get a mammogram, you would get one? ($p=0.028$, multivariate $p=0.021$)		
Yes	753 (89.0%)	292 (85.1%)
No	82 (9.7%)	39 (11.4%)
Don't know	11 (1.3%)	12 (3.5%)
What relationship is that person to you? ($p=0.007$)		
Child	270 (37.5%)	105 (39.5%)
Mother	129 (17.9%)	58 (21.8%)
Sister	109 (15.1%)	32 (12.0%)
Husband	107 (14.9%)	22 (8.3%)
Have you ever had a mammogram? ($p=0.007$)		
Yes	613 (74.8%)	242 (78.1%)
No	207 (25.2%)	65 (21.0%)
Don't know	0 (0.0%)	3 (1.0%)
What are some reasons you haven't had a mammogram recently?		
Put it off ($p<0.01$)	330 (53.9%)	102 (44.0%)
Not needed/not necessary ($p<0.0001$)	75 (12.3%)	64 (27.6%)
Don't know	37 (6.1%)	16 (6.9%)
Haven't had any problems	47 (7.7%)	12 (5.2%)
Fear of finding out they had cancer	25 (4.1%)	16 (6.9%)
Didn't know they should	22 (3.6%)	13 (5.6%)
Painful procedure	23 (3.8%)	6 (2.6%)
Not recommended by a doctor	11 (1.8%)	2 (0.9%)
Too embarrassing	1 (0.2%)	0 (0.0%)

^aUnivariate p values in parentheses are by chi-square test. Multivariate p values are by logistic regression and adjust for age, race, and literacy.

Screening recommendation

The majority of participants (82.1%) reported receiving a physician recommendation for mammography. Rural participants were more likely than urban participants to have received a physician recommendation (84.3% vs. 76.5%, $p=0.006$) but were less likely to report ever having received any information or education on mammograms (57.2% vs. 63.6%, $p=0.06$) or ever having had a mammogram (74.8% vs. 78.1%, $p=0.007$). The top two reasons women reported they had not had a mammogram recently were that they had put it off (53.9% rural women vs. 44% urban women, $p<0.01$) and they did not feel it was needed (12.3% vs. 27.6%, $p<0.0001$) (Table 5).

Nearly half of participants (52.7% rural and 42.3% urban, $p=0.003$) had been encouraged to get a mammogram by a relative or friend. In response to the question: Is there someone in your life who, if they told you to get a mammogram, you would get one? 89.0% of rural participants and 85.1% of urban participants said yes. Asked who that person would be, 37.5% of rural and 39.5% of urban participants indicated their child. Other common answers were their mother (17.9% rural vs. 21.8% urban), sister (15.1% rural and 12.0% urban), or husband (14.9% rural vs. 8.3% urban) ($p=0.007$).

After controlling for age, race, and literacy, there was a significant difference in rural and urban participants having ever received a physician recommendation ($p=0.004$), having someone else encourage them to get a mammogram ($p=0.005$), but no significant difference for ever having ever been given mammography information or education and for ever having a mammogram.

Discussion

Our study of community clinic patients who were not up-to-date with mammography found distinct differences in rural and urban women's beliefs, self-efficacy, and barriers to mammography. We also found that although FQHC patients in both rural and urban areas had a high awareness of breast cancer and mammography, the majority thought mammography should begin before age 40. Understanding the factors related to screening beliefs, practices, and knowledge can guide public health messages and tailor clinical interventions to increase screening in low-income populations.

Almost all these low-income patients had heard of breast cancer, and the majority had seen or heard an advertisement encouraging testing. Rural women were more likely to have heard of tests to find breast cancer and to know someone who has had breast cancer even after controlling for age, race, and literacy. Unlike previous studies in safety net clinics where patients' basic knowledge of mammography was limited, almost all women in the current study said they knew what a mammogram was and were able to define it in their own words. However, most were unclear about when they should begin mammography screening; most believed before age 40, and only 2% said age 50.^{11,28} The majority believed they needed a mammogram once a year.

These findings extend previous research and may be an affirming indication of the effectiveness of the media and reach of public health campaigns in raising breast cancer awareness and informing women about the procedure. The findings also signal the need for clearer, more consistent public health and provider messages about screening guidelines, considering the

current conflicting information given by the American Cancer Society and the U.S. Preventive Services Task Force. However, given our eligibility criteria (not having a mammogram in the past 2 years), the majority of participants would perceive themselves as noncompliant for annual mammography.

In terms of attitudes and beliefs, almost all women reported wanting to know if they had breast cancer, had a positive attitude toward mammography, and fairly strong self-efficacy that they could obtain a mammogram. Rural participants were more likely to recognize the benefits and report fewer personal barriers to mammography. In fact, previously identified concerns over cost, fear of finding cancer, embarrassment, pain or discomfort, exposure to too much radiation, and transportation, were rarely reported as problems among these FQHC patients.^{2,10,11,13,17,29,30} Several plausible explanations for why our findings differed from those previously reported include (1) increased rates of advertising about the effectiveness of cancer treatment during the time of our study (2) a difference in data collection methods (i.e., in-person interviews vs. focus groups) and (3) a more racially diverse rural sample (57% African American, 42% white).^{2,10,11,17,30}

In regard to screening practices, almost 1 in 5 participants reported never receiving a physician recommendation for mammography or never having had a mammogram, and over a third had never been given education or information about mammograms. One quarter of the sample reported never having had a mammogram. In multivariate analyses, we found no differences in screening rates between rural and urban participants despite rural participants being more likely to have received physician recommendation. The rural findings are in contrast to previous studies that link physician recommendation to increased screening.^{4,13,31} It is possible that high physician turnover in our rural study clinics and long distances to the nearest mammography facility may have influenced patient follow-through with screening. Using data from the Behavioral Risk Factor Surveillance System (BRFSS) telephone interview, Casey et al.³² found rural residents at all income levels were significantly less likely than urban residents to obtain any cancer screening even after adjusting for demographics and insurance status.

Our study results offer potential targets for future breast cancer screening campaigns among rural and urban patients. Whereas O'Malley et al.¹⁹ found a high percentage of participants reporting that encouragement from family and friends would increase their likelihood for screening, our study highlights the specific importance of female relatives' endorsement for mammography. Most women in both rural and urban clinics reported that there was at least one person in their life, generally a close female relative, who could tell them to get a mammogram and they would do so. This is a strong indication that family support for mammography, particularly from close female relatives, is important for future screening campaigns.

Practice recommendations

Although most women in our study had received at least one mammogram, none were up-to-date, and approximately 1 in 5 did not recall ever receiving a physician recommendation for screening. This indicates clinics need to have a system to remind providers to recommend regular screening. Almost 40% of FQHC patients do not remember having ever been

given information or education on mammograms. This, coupled with the fact that the most common reasons for not having a mammogram were putting it off or not thinking it was needed, indicates clinics need to consider giving women patient-centered information about the benefits of regular screening. Our findings suggest that the educational materials need to reinforce women's positive beliefs and self-efficacy for mammography, clear up confusion about the age at which women need to start mammography, and ideally help patients identify and overcome barriers. Because women cared for in community clinics, particularly in rural clinics, usually must go to another location for mammography, these findings also suggest that FQHCs need to work with women to schedule a mammogram at a location and at a time that is convenient for them. They should also consider reminding patients to follow through with their appointment. Clinics could work with academic medical facilities to encourage the use of mobile units to provide mammograms at their clinics.

Limitations

The findings in this study may not be generalized to all patient populations of women who were not up-to-date with screening mammography. Study clinics were located in one state, and all patients were English speaking; therefore, results may not be generalizable to FQHCs serving Hispanic and other minority patients in other states. The majority of study patients were African American, and half had low literacy. However, this is representative of FQHC populations, particularly in the southern United States. Our study sample included women from a broad range of ages (40–89), including those aged 40–41, who only recently became eligible for mammography. However, we found no significant difference between women in this age group and the rest of the study sample in terms of having received a recommendation for mammography or having received education about mammography. Data on previous mammography education, physician recommendation, and mammography completion were self-reported and not confirmed using chart review.

Conclusions

Patients in both urban and rural community clinics have high awareness of breast cancer and positive beliefs about mammography, yet more than 1 in 3 reported that they had never been given information or education on mammograms, and most were unclear when screening should begin. Even though all study participants had a usual source of care and the majority reported having at least one mammogram, none of them had had a mammogram in the last 2 years, and 1 in 4 had never had a mammogram. Our findings suggest both rural and urban FQHC patients would be receptive to physician recommendation, mammography education, and encouragement from family. Strategies to increase screening in community clinics should continue to seek ways to ensure that clinicians discuss mammography with patients. Further studies are needed to evaluate strategies to effectively educate women about mammography, encourage family members to recommend screening, and empower women to be more proactive about mammography.

Acknowledgments

We thank Mr. Willie White, Mr. John Winston, Ms. Emma Tarver, Ms. Rosie Kye, Ms. Jeanetta Dean, and Dr. George

Henderson for their willingness to participate in clinical research to help improve colorectal cancer screening in their clinics and Cristalyn Reynolds, M.A., Ivory Davis, M.S.N., Cara Pugh, B.S.N., David Neal, and Annie Miller, B.S.W., for their skill in interviewing patients and collecting and entering data.

This research was supported by a grant from the National Cancer Institute, National Institutes of Health (R01-CA115869).

Disclosure Statement

No competing financial interests exist.

References

1. American Cancer Society. Cancer facts & figures 2011–2012. Atlanta, GA: ACS, 2012.
2. Alexandraki I, Mooradian AD. Barriers related to mammography use for breast cancer screening among minority women. *J Natl Med Assoc* 2010;102:206–218.
3. Kagawa-Singer M, Valdez Dadia A, Yu MC, Surbone A. Cancer, culture, and health disparities: Time to chart a new course? *CA Cancer J Clin* 2010;60:12–39.
4. Rayman KM, Edwards J. Rural primary care providers' perceptions of their role in the breast cancer care continuum. *J Rural Health* 2010;26:189–195.
5. Edwards JB, Tudiver F. Women's preventive screening in rural health clinics. *Womens Health Issues* 2008;18:155–166.
6. American Cancer Society. Breast cancer facts & figures 2009–2010. Atlanta: American Cancer Society, 2010.
7. Brown KC, Fitzhugh EC, Neutens JJ, Klein DA. Screening mammography utilization in Tennessee women: The association with residence. *J Rural Health* 2009;25:167–173.
8. Cummings DM, Whetstone LM, Earp JA, Mayne L. Disparities in mammography screening in rural areas: Analysis of county differences in North Carolina. *J Rural Health* 2002;18:77–83.
9. Harris DM, Miller JE, Davis DM. Racial differences in breast cancer screening, knowledge and compliance. *J Natl Med Assoc* 2003;95:693–701.
10. Cronan T, Villalta I, Gottfried E, Vaden Y, Ribas M, Conway T. Predictors of mammography screening among ethnically diverse low-income women. *J Womens Health* 2008;17:527–537.
11. Davis TC, Arnold C, Berkel HJ, Nandy I, Jackson RH, Glass J. Knowledge and attitude on screening mammography among low literate, low income women. *Cancer* 1996;78:1912–1920.
12. Ehemann C, Benard V, Blackman D, et al. Breast cancer screening among low-income or uninsured women: Results from the National Breast and Cervical Cancer Early Detection Program, July 1995 to March 2002 (United States). *Cancer Causes Control* 2006;17:29–38.
13. Lyttle NL, Stadelman K. Assessing awareness and knowledge of breast and cervical cancer among Appalachian women. *Prev Chronic Dis* 2006;3:A125.
14. Champion V, Skinner C, Menon U. Development of a self-efficacy scale for mammography. *Res Nurse Health* 2005;28:329–336.
15. Clark M, Rakowski W, Bonacore L. Repeat mammography: Prevalence estimates and considerations for assessment. *Ann Behav Med* 2003;26:201–211.
16. Elting LS, Cooksley CD, Bekele BN, et al. Mammography capacity: Impact on screening rates and breast cancer stage at diagnosis. *Am J Prev Med* 2009;37:102–108.
17. Ogedegbe G, Cassells AN, Robinson CM, et al. Perceptions of barriers and facilitators of cancer early detection among low-income minority women in community health centers. *J Natl Med Assoc* 2005;97:162–170.
18. Rauscher GH, Hawley ST, Earp JAL. Baseline predictors of initiation vs. maintenance of regular mammography use among rural women. *Prev Med* 2005;40:822–830.
19. O'Malley AS, Forrest CB, Mandelblatt J. Adherence of low-income women to cancer screening recommendations. *J Gen Intern Med* 2002;17:144–155.
20. Engelman KK, Ellerbeck EF, Perpich D, Nazir N, McCarter K, Ahluwalia JS. Office systems and their influence on mammography use in rural and urban primary care. *J Rural Health* 2004;20:36–42.
21. McDonald J, Sherman A. Determinants of mammography use in rural and urban regions of Canada. *Can J Rural Med* 2010;15:52–60.
22. Isserman AM. In the national interest: Defining rural and urban correctly in research and public policy. *Int Regional Sci Rev* 2005;28:465.
23. Waldorf BS. A continuous multi-dimensional measure of rurality: Moving beyond the threshold measures. Long Beach, CA: American Agricultural Economics Association 2006 Annual Meeting, 2006.
24. Indiana Office of Community and Rural Affairs. Breaking the boundaries: The Indiana Office of Community and Rural Affairs strategic plan for rural Indiana. Available at www.in.gov/ocra/files/Breaking_the_Boundaries.pdf
25. Wolf M, Rademaker A, Bennett C, et al. Development of a brief survey on colon cancer screening knowledge and attitudes among veterans. *Prev Chronic Dis* 2005;2:A11.
26. Davis T, Long S, Jackson R, et al. Rapid estimate of adult literacy in medicine: A shortened screening instrument. *Fam Med* 1993;25:391.
27. Davis T, Kennen E, Gazmararian J, Williams M. Literacy testing in health care research. In: Schwartzberg J, ed. *Understanding health literacy*. Chicago, IL: AMA Press, 2005: 157–179.
28. Lopez EDS, Khoury AJ, Dailey AB, Hall AG, Chisholm LR. Screening mammography: A cross-sectional study to compare characteristics of women aged 40 and older from the deep south who are current, overdue, and never screeners. *Womens Health Issues* 2009;19:434–445.
29. Tejeda S, Thompson B, Coronado GD, Martin DP, Heagerty PJ. Predisposing and enabling factors associated with mammography use among Hispanic and non-Hispanic white women living in a rural area. *J Rural Health* 2009;25:85–92.
30. McAlearney AS, Reeves K, Tatum C, Paskett E. Cost as a barrier to screening mammography among underserved women. *Ethnicity Health* 2007;12:189–203.
31. Ogedegbe G, Cassells A, Robinson C, et al. Perceptions of barriers and facilitators of cancer early detection among low-income minority women in community health centers. *J Natl Med Assoc* 2005;97:162.
32. Casey M, Thiede C, Klingner J. Are rural residents less likely to obtain recommended preventive healthcare services? *Am J Prev Med* 2001;21:182.

Address correspondence to:

Terry C. Davis, Ph.D.

Departments of Medicine and Pediatrics

Louisiana State University Health Sciences Center

1501 Kings Highway

Shreveport, LA 71130

E-mail: tdavis1@lsuhsc.edu