

Reaching Rural Women: Breast Cancer Prevention Information Seeking Behaviors and Interest in Internet, Cell Phone, and Text Use

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Abstract The purpose of this study was to examine the breast cancer prevention information seeking behaviors among rural women, the prevalence of Internet, cell, and text use, and interest to receive breast cancer prevention information cell and text messages. While growing literature for breast cancer information sources supports the use of the Internet, little is known about breast cancer prevention information seeking behaviors among rural women and mobile technology. Using a cross-sectional study design, data were collected using a survey. McGuire's Input-Output Model was used as the framework. Self-reported data were obtained from a convenience sample of 157 women with a mean age of 60 (SD = 12.12) at a rural New Mexico imaging center. Common interpersonal information sources were doctors, nurses, and friends and common channel information sources were television, magazines, and Internet. Overall, 87 % used cell phones, 20 % had an interest to receive cell phone breast cancer prevention messages, 47 % used text messaging, 36 % had an interest to receive text breast cancer prevention messages, and 37 % had an interest to receive mammogram reminder text messages. Bivariate analysis revealed significant differences between age, income, and race/ethnicity and use of cell phones or text messaging. There were no differences between age and receiving text messages or text mammogram reminders. Assessment of health

information seeking behaviors is important for community health educators to target populations for program development. Future research may identify additional socio-cultural differences.

Keywords Internet · Text message · Health information · Breast cancer · Communication

Introduction

Breast cancer is the second leading cause of cancer death among women and the leading cause of cancer death for Hispanic women in the United States. Breast cancer diagnosis is usually at a later stage for Hispanic women compared to non-Hispanic women [1]. In New Mexico, the American Cancer Society estimates 1,310 new cases of breast cancer will be diagnosed and 240 deaths will occur in 2012 [1].

The decline in age-adjusted mortality rates in the United States since 1990 may be attributed to early detection through screening mammography [1]. However, mammography rates tend to be lower in rural populations compared to urban populations [2]. Lack of access to screening facilities and providers may be screening barriers [3]. Nearly 61 % of the women in New Mexico live in primary care health professional shortage areas [4]. The ratio of New Mexico patients to primary care providers is higher compared to the national benchmark (832:1 vs. 631:1) [5]. The unavailability of primary care providers is crucial since a provider recommendation is a strong predictor for screening mammography adherence in urban and rural areas [6–8].

Accessible breast cancer prevention information sources are pertinent for rural women to learn about early detection

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and screening mammography. Interpersonal sources are senders of breast cancer prevention information such as family, friends, providers, or co-workers. Strong evidence exists to support traditional interpersonal sources such as family or physicians for breast cancer information and behavior changes [9–11]. Interestingly, a previous study showed fruit and vegetable consumption increased for cancer patients seeking information from family/friends [11]. In another study, 97 % of Hispanic and non-Hispanic breast cancer survivors sought information from their physicians as a trusted source [12].

Channel sources are ways to send breast cancer prevention information such as newspapers, television, magazines, or Internet [6, 9, 13]. For example, magazines were the preferred channel source for older women compared to younger women [14]. Studies show the Internet is becoming a preferred channel source since it offers a wealth of information for consumers and cancer survivors [9, 12, 15, 16]. According to Pew Internet research, eight out of ten adults seek online health information [17]. However, previous studies suggest that White breast cancer patients compared to non-White patients were still more likely to use the Internet to find information [12, 16]. A newer channel source is the use of cell phones with texting. Cell phone use has been associated with age, income, work status and marital status [18]. Text messaging expands into healthcare as a health communication tool for patient health prevention information source, reminders, motivation, and support. Text messaging shows promise in previous studies as a health information source in interventions [19].

Healthy People 2020, the national health initiative, includes the Health Communication and Information Technology objectives with Internet and mobile technology use to improve health outcomes [20]. According to Pew Internet and the American Life Project research, nearly 88 % of Americans own a cell phone and 73 % use text messaging [17]. However, patient populations may differ in the prevalence of technology use. For example, in an urban community health center setting, patients' use of the Internet and text messaging was 34 % [21]. Text messaging was more common for African American and younger patients [21]. In another study, primarily African American young urban clinic patients under 30 reported high use of cell phones (93 %), Internet (80 %), and text messaging (79 %) [22]. The patients also reported their willingness to receive health advice by text message (86 %) or cell phone (97 %) from their providers [22]. These studies also support the current trends showing minority populations as early adopters of mobile technologies [23].

While growing literature for breast cancer information sources supports the use of the Internet, little is known about breast cancer prevention information seeking

behaviors among rural women and mobile technology. Most research focuses on cancer survivors in urban areas and their preferred information sources. The development of information to reduce health disparities is needed to target rural populations. It is important, therefore, to examine the current information sources and preferences for mobile messages among women in rural populations. The purpose of this study was to examine breast cancer prevention information seeking behaviors among rural women, the prevalence of Internet, cell, and text use, and interest for breast cancer prevention information cell or text messages. The study was guided using a conceptual framework with McGuire's Input–Output Persuasion Model [24] as used in another study [9]. The aspects of inputs may include source variables such as interpersonal sources as trusted individuals, channel variables such as television, radio, Internet, or magazines, and receiver variables such as demographics. We hypothesized that more educated, higher income, and younger women would prefer to receive breast cancer prevention information with text or cell prevention messages and mammogram reminder text messages.

Materials and Methods

Study Design

The cross-sectional research design was chosen so that the preliminary findings in this study may be used in the development of other studies or areas.

Population and Setting

A convenience sample of women was recruited from an imaging center in rural New Mexico. The imaging center serves women primarily from two rural New Mexico counties. The counties have similar race distribution and socioeconomic variables. According to the 2010 Census, Otero County has 53 % white population, 85 % educational attainment of high school for adults 25 years of age and older, and 20 % below poverty level [25]. Lincoln County has 66 % white population, 87 % educational attainment of high school for adults 25 years of age and older, and 13 % below poverty level [25]. Low population density is 9.6 people per square mile in Otero County and 4.2 people per square mile in Lincoln County compared to 17.0 people per square mile in New Mexico [26]. The population of Otero County and Lincoln County represent a small percentage (3 and 1 % respectively) of the New Mexico population (2,060,971) [26].

A request to conduct the study and written consent was received from the imaging center. Prior to conducting the

study, the university Institutional Review Board approved the study in accordance with guidelines for conducting research with human subjects. Completion and return of the surveys indicated consent by participants. Confidentiality was assured with no identifiers on the surveys. The participants were able to decline at any time to be part of the study.

Data Collection

The researcher met with the office manager to explain the purpose of the study and the procedures for survey completion. Trained office staff recruited participants among the women at the imaging center reception area during their appointment wait time in June 2011. The inclusion criteria for participant selection included women ages 40 and older and the ability to read and write English or Spanish. The selection of the age group for this study was based on the American Cancer Society's recommendations for screening mammography.

Survey Instrument

A 26-item paper and pencil bilingual survey was developed for data collection. The 5.9 grade level readability level was determined using the Microsoft Flesch-Kincaid grade scale. The survey items were guided by the conceptual framework using McGuire's Input-Output Model and adapted based on literature review and items from the National Cancer Institute Health Information National Trends Survey. The Spanish survey was developed with back translation by a trained health professional. The self-administered survey included four sections with items for breast cancer prevention information sources, channel sources, mobile technology, and demographics. The advantage of using a written survey includes providing anonymity instead of information sharing during a focus group. Some women may consider breast cancer as a sensitive area for discussion [27]. A pilot was conducted and no items were refined. Two items for information sources were based on McGuire's Input-Output Model [24]. Participants were able to respond with possible multiple answers. Interpersonal sources included 11 items such as doctors, family, or clinic staff members and channel sources included 8 items such as magazines, radio, or television. Items for mobile use and mobile message preferences included use of cell phones or text messaging (Yes/No), interest in receiving breast cancer prevention information cell phone or text message (Yes/No), and interest in receiving text mammogram reminders (Yes/No). For women with no interest to receive cell or text prevention messages, open-ended items such as "If no, why not?" were used to elicit barriers for technology use. Demographics included age, race/ethnicity, city, level of

education, years in the US, household income, and health insurance. Race/ethnicity was collapsed to two groups (non-Hispanic and Hispanic) due to small numbers for some minority populations.

Data Analysis

Data analysis was computed using SPSS, Version 19. Descriptive statistics and frequency distributions were analyzed for variables. The survey allowed for multiple responses for interpersonal and channel sources. Chi-square tests were used to determine relationships between cell phone and text messaging use and demographics (age, income level, education level, and race). A $p < 0.05$ was used for statistical significance. Content analysis was conducted using the open-ended responses to identify the themes based on the barriers for using cell or text prevention messages [28]. The open-ended responses were coded individually by two trained researchers. Themes and categories were identified and consensus was reached for themes and categories by discussion.

Results

Table 1 shows the demographic characteristics for the convenience sample of 157 participants. No Spanish surveys were completed and returned for analysis. The ages ranged from 40 to 91 with the mean age of 60 (SD = 12.12). The majority of participants were White (68.4 %), had some college or higher (58 %), health insurance (99 %), and incomes \$20,000 or higher (68 %). Most participants lived in Alamogordo (71 %), Otero County seat, and had resided in the US 20 years or more (98 %). Of the 136 cell phone users, 20 % had an interest to receive a cell phone prevention message. Of the 73 text users, 36 % had an interest to receive a breast cancer prevention text message and 37 % had an interest to receive a mammogram reminder text reminder.

Interpersonal and Channel Sources

The interpersonal sources shown in Fig. 1 included doctors (82 %), hospital clinic staff (21 %), nurses (16 %), friends (10 %), other family members (8 %), co-workers (5 %), and daughter (4 %). The channel sources (Fig. 1) included television (58 %), magazines (46 %), Web sites (23 %), brochures (23 %), health fairs (22 %), newspapers (6 %), and radio (13 %).

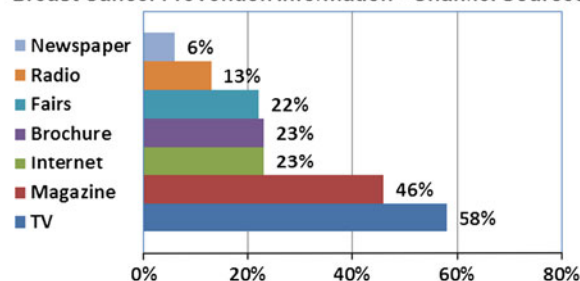
Table 2 shows the use of cell phones and interest to receive a cell phone breast cancer prevention prevention messages. Results showed some significant interactions between cell phone use and age ($\chi^2(1) = 5.735, p < 0.05$),

Table 1 Demographics and characteristics (n = 157)

Demographics and characteristics	Total	
	n	%
Race/ethnicity (n = 156)		
White	108	69.2
Hispanic	36	23.1
African American	7	4.5
American Indian	2	1.3
Other	3	1.9
Age (mean = 60.6, SD = 12.07) (n = 157)		
40–59	78	49.7
60+	79	50.3
City (n = 157)		
Alamogordo	112	71.3
Other towns	45	28.7
Education (n = 157)		
h.s. graduate/GED or less	64	40.3
Some college or higher	93	59.2
Income (n = 152)		
<\$20,000	45	29.6
\$20,000 or higher	107	70.4
Insurance (n = 155)		
No	1	.6
Yes	154	99.4
Years in U.S. (n = 156)		
<20 years	3	1.9
20 years or more	153	98.1
Use cell phone (n = 156)		
Yes	136	87.2
No	20	12.8
Use text messaging (n = 156)		
Yes	73	46.5
No	83	53.5
Prefer cell phone prevention message (n = 136)		
Yes	27	19.9
No	109	80.1
Prefer text prevention message (n = 73)		
Yes	26	35.6
No	47	64.4
Prefer mammogram text reminder (n = 73)		
Yes	27	37.0
No	46	63.0

income ($\chi^2(1) = 4.596, p < 0.05$), and race/ethnicity ($\chi^2(1) = 6.106, p < 0.05$). The prevalence of cell phone use was higher for younger women compared to older women (94 vs. 81 %), women with high incomes compared to women with low incomes (91 vs. 78 %), and non-Hispanics compared to Hispanics (91 vs. 75 %). Of the cell phone users, significant interactions were found between

Breast Cancer Prevention Information - Channel Sources



Breast Cancer Prevention Information - Interpersonal Sources

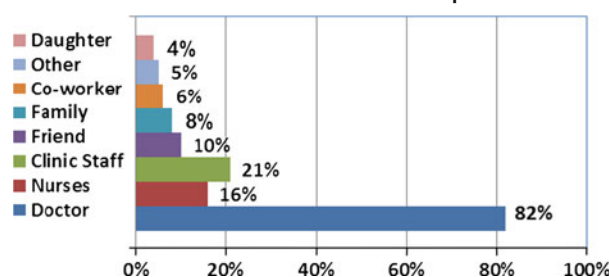


Fig. 1 Information sources of breast cancer prevention information

interest in receiving a cell phone prevention message and age ($\chi^2(1) = 10.475, p < 0.05$), income ($\chi^2(1) = 6.409, p < 0.05$), and race/ethnicity ($\chi^2(1) = 12.604, p < 0.05$). Interests were higher for younger women compared to older women (30 vs. 8 %), women with lower incomes compared to women with higher incomes (34 vs. 14 %), and Hispanic women compared to non-Hispanic women (44 vs. 14 %). No differences were found between the education groups and cell phone use.

Table 3 shows the use of text messaging, interest in text breast cancer prevention message, and interest in mammogram text reminder. A significant interaction was found between age and text messaging ($\chi^2(1) = 25.350, p < 0.05$). Text use was higher for younger women compared to older women (67 vs. 27 %). Significant interactions were found between receiving text breast cancer prevention messages and income ($\chi^2(1) = 4.317, p < 0.05$) and race/ethnicity ($\chi^2(1) = 9.993, p < 0.05$). Interests were higher for women with lower incomes compared to women with higher incomes (59 vs. 31 %) and Hispanic women compared to non-Hispanic women (67 vs. 27 %). No differences were found between the education groups and receiving text prevention messages. No differences were found between age, income, education, or race and receiving mammogram text reminders.

Using open-ended items, responses for barriers were elicited from participants with no interest in cell phone or text prevention messages (Table 4). The most common cell phone breast cancer prevention message barriers included perceived current breast cancer prevention knowledge, limited use of cell phone, and lack of interest. The most

Table 2 Cell phone use and interest for receiving cell phone messages

Demographics	Use cell phone (n = 157)				Prefer breast cancer cell phone message (n = 136)			
	Yes	%	No	%	Yes	%	No	%
Race/ethnicity (n = 155)								
Non-hispanic	108	90.8	11	9.2*	15	13.9	93	86.1***
Hispanic	27	75.0	9	25.0	12	44.4	15	55.6
Age (mean = 60.6, SD = 12.07) (n = 157)								
40–59	73	93.6	6	6.4**	22	30.1	51	69.9*
60+	63	80.8	15	19.2	5	7.9	58	92.1
Education (n = 157)								
h.s. graduate/GED or less	53	82.8	11	17.2	13	24.5	40	75.7
some college or higher	83	90.2	9	9.8	14	16.9	69	83.1
Income (n = 152)								
< \$20,000	35	77.8	10	22.2*	12	34.3	23	65.7*
\$20,000 or higher	97	90.7	10	9.3	14	14.4	83	85.6

* $p < 0.05$ for Chi-square tests; ** $p < 0.01$ for Chi-square tests; *** $p < 0.001$ Chi-square tests

Table 3 Text use and interest for receiving text messages

Demographics	Use texting (n = 157)				Prefer breast cancer Text message (n = 73)				Prefer mammogram Text reminder (n = 73)			
	Yes	%	No	%	Yes	%	No	%	Yes	%	No	%
Race/ethnicity (n = 156)												
Non-Hispanic	53	44.2	67	55.8	14	26.9	38	73.1	17	32.1	36	67.9
Hispanic	20	55.6	16	44.4	14	66.7	7	33.3**	10	50.0	10	50.0
Age (mean = 60.6, SD = 12.07)												
40–59	52	66.7	26	33.3**	20	40.0	30	60.0	21	40.4	31	59.6
60+	21	26.6	58	73.4	8	34.8	15	65.2	6	28.6	15	71.4
Education (n = 157)												
h.s. graduate/GED or less	32	50.0	32	50.0	14	40.0	21	60.0	15	46.9	17	53.1
some college or higher	41	44.1	52	55.9	14	36.8	24	63.2	12	29.3	29	70.7
Income (n = 152)												
<\$20,000	16	35.6	29	64.4	10	58.8	7	41.2*	8	50.0	8	50.0
\$20,000 or higher	56	52.3	51	47.7	17	30.9	38	69.1	18	32.1	38	67.9

* $p < 0.05$ for Chi-square tests; ** $p < 0.01$ for Chi-square tests

common text breast cancer prevention message barriers included perceived current breast cancer prevention knowledge and limited use of texting. Access barriers such as lack of cell phone coverage in the rural area were not commonly reported barriers.

Discussion

The study examined the breast cancer prevention information seeking behaviors among rural women, the prevalence of Internet, cell, and texting use, and the interest for mobile breast cancer prevention information messages. The findings contribute to the knowledge base of breast cancer

prevention research by identifying sources of information and technology use among rural women. Breast cancer prevention sources needed for health promotion targeting rural women may include the use of mobile messages as newer channel sources.

The results indicate the main types of interpersonal sources were traditional sources such as health professionals, family, and friends. The findings are similar in previous studies [9, 11]. This highlights the need to reinforce the important role of health professionals in conversations with patients about breast cancer prevention. Findings demonstrate the need to patients to be partners with their providers. However, many patients may not visit their providers in rural areas for preventive services due to

Table 4 Barriers to receiving breast cancer prevention mobile messages

Cell phone messages		Text messages	
Themes	Categories and comments	Themes	Categories and comments
Perceived knowledge level	“Already know about prevention” “Got all info” “Read and get from doctor”	Perceived knowledge level	“Can get info. from MD office” “I have a doctor” “Well informed”
Mobile technology	<i>Limited use or access</i> “Only for emergencies” “Cell phones don’t work in our area” “Don’t have cell service at home” “Business phone” <i>No interest</i> “Don’t like cell that much” “Not interested” “Bothersome” <i>Cost</i> “Cost of phone minutes” “Pre-paid phone” “Minutes usage”	Mobile technology	<i>Limited use or access</i> “I use my cell phone sparingly” “Rarely use cell phone” “Business phone” “Share phone” <i>No interest</i> “Not interested” “Don’t need it” “Not necessary” <i>Cost</i> “Cost more for my cell plan” “Prepaid phone”
Other sources	“Prefer internet” “I would rather email”	Other sources	“Rather read it but not on phone” “Prefer internet” “Prefer email”

the distance. They may need to actively seek breast cancer prevention information from other sources if the information is not provided by clinicians.

The three most common channel sources support the use of traditional media such as television, magazines, and the Internet as identified in previous studies [10, 29]. Previous findings show older women and American Indians preferred seeking health information from magazines and this source would benefit rural women [10, 13]. One important finding was that newspapers were not a common channel for rural women. This finding may reflect the challenge of newspaper home delivery in rural areas due to the distance. In contrast,

a study conducted in an urban area suggested newspapers as the most common source for health and wellness information ahead of providers, Internet, and television [30]. An interesting finding was that health fairs were reported by 22 % as a common channel. Reaching rural women at health fairs can be beneficial to increase awareness about breast cancer prevention awareness. Many health fairs use community members as volunteers and they may serve as trusted sources for breast cancer prevention information. The results are meaningful for community health workers or health educators in program planning.

Internet use is rapidly increasing as a source for breast cancer information and our findings support previous studies [9, 21, 30–32]. The findings showed 23 % used the Internet to seek breast cancer prevention information. It is possible the lower utilization may reflect the wording of the item specifically requesting a response for seeking breast cancer information. In two previous studies, Internet use for seeking health information among clinic patients varied from 33 to 80 % [21, 22]. In other studies, Internet use compared to providers was rated as a more common health information source [9, 30]. Cancer survivors are also seeking online information regarding various therapies, treatment, side effects, and disease stages [15, 32, 33]. Some patients are now sharing information with their providers about Internet breast cancer information [10, 15].

The findings indicate the prevalence of cell phone use and text messaging among rural women is similar to the national average. This important finding also suggests digital divide is becoming less narrow with mobile technology between rural and urban populations. For example, lack of access to cell phone coverage in their rural areas was reported by only two participants in the study as a barrier to receiving mobile prevention messages. Rural women using smartphones with wireless Internet also have the potential to access the Internet even though they may not have Internet access at home. Mobile technologies may help close the gap for access to online health information for some rural populations and minority groups. Few significant differences were found between age, income, and race among cell phone and text messaging use. Our finding was supported in other studies [21, 22]. Pew Internet research suggests the use of mobile technology will continue to grow and more people in different age groups will be using cell phones and text messaging [17]. In contrast to our hypothesis, there were no differences between education and cell phone, text messaging, and text reminder use. This finding was supported in another study of breast cancer survivors [22]. It is quite possible that technology crosses educational levels currently compared to the early adoption of cell phone and text messaging use.

The findings suggest there is a higher interest to receive a breast cancer prevention text message than cell phone

message (36 vs. 20 %). The findings are important since no previous studies in the literature addressed breast cancer prevention text messages as a resource. Also, an interesting finding shows no significant difference between age and interest to receive breast cancer prevention text message. One possible explanation is that all women using texting may be familiar with the potential of this mobile messaging capacity. Cost was not mentioned as a major barrier for an interest in receiving a breast cancer prevention text message. However, health educators may need to take caution that some plans may have monthly charges for a limited number of texts. The most common barriers to receiving a breast cancer prevention text message were limited use of cell phone and lack of interest in text messaging. The findings suggest that low income women and Hispanic women were more likely to have an interest in prevention text messages. Health educators may be encouraged to reach low income and minority women using text messages for breast cancer prevention information.

This study provides initial findings in an understudied population regarding the potential for the use of text mammogram reminders. Overall, 37 % of the text users had interest in receiving a text mammogram reminder. Patient demographic information sheets at a rural community program or at a physician's office may include the participant's address, email address, cell phone number, and capabilities of text messaging. Thus, health educators may take into account multitude of factors involved when planning an awareness campaign or health prevention program. Text messaging may provide cues to action for mammography adherence. Providers may also find potential benefits by using mammogram reminders as improved provider-patient relationships. However, despite the increase in text messaging, some women may prefer appointment reminders using Internet access as in one previous study [34].

The few limitations of this study include the use of the convenience sample of women at the imaging center. The findings may be generalized with caution to similar populations in rural or urban areas, ethnic identity, and size. This cross-sectional study did not look at behavior changes for increased cell phone or text use in a longitudinal study over time. Annual trends show an increased use of cell phone and texting. The survey did not include an item regarding the willingness of participants to learn new technology tool such as text messaging. Women may be interested in texting if they had some training and were able to evaluate the ease of the mobile capabilities.

Conclusion

The findings have important implications for health educators and health professionals working with rural women

and developing breast cancer prevention information. The findings confirm traditional sources will continue to be used by women seeking breast cancer prevention information. However, using multiple channels including Internet, text messages, text message reminders, and cell phone messages may become part of common breast cancer prevention sources. There is great potential using mobile technologies to reach rural populations. Trends continue to show the increased use of cell phones and texting by all adult age groups. Providers may also benefit to address communication with their patients. Lastly, the findings provide a clear direction for an opportunity to reach rural minority populations with culturally sensitive materials. Future research is needed to confirm our findings and identify possible cultural differences for breast cancer prevention information for various populations.

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