

Factors Associated with Receipt of Mammogram among Caregivers: A Comparison with Non-Caregivers

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Abstract

Background: caregiving responsibilities significantly impact females' decisions on adhering to preventive mammography. The purpose of this study is to examine (1) the levels of mammogram receipt, (2) the role of caregiving factors on the receipt of mammogram in caregiving group, and (3) the role of cancer beliefs on mammogram screening in caregivers and non-caregivers.

Methods: the 2017 Health Information National Trends Survey (HINTS) provides samples of 1228 women aged 40 to 75 years old for this secondary analysis. By using Andersen's Behavioral Model of Health Services Use, a binomial logistic regression model was used to analyze associations between mammography and socioeconomic factors, caregiving factors, and cancer belief factors.

Results: caregivers who provided more caregiving hours per week ($OR=0.749$, 95% CI=0.564-0.94) and caregivers who had the belief of rather not knowing the likelihood of getting cancer ($OR=0.673$, 95% CI=0.496-0.914) were less likely to use mammogram. However, caregivers who believed cancer is more common than heart disease ($OR=1.490$, 95% CI=1.302- 2.151) were more likely to use a mammogram. Non-caregivers who worried about getting cancer ($OR=1.158$, 95% CI=0.793-1.691) were more likely to use mammogram, but non-caregivers who had the belief of rather not know the likelihood of getting cancer ($OR=0.825$, 95% CI=0.713-0.955) were less likely to use mammogram.

Conclusions: to support caregivers' breast cancer prevention, caregiving-related policies based on caregiving hours should be developed. Particularly, effort to promote breast cancer screening education and care support among older primary caregivers will likely increase their adherence to preventive mammography uptake. The development of targeted cancer prevention interventions on specific cancer beliefs held by both groups are also urgently needed to promote mammography.

Background

Breast cancer is the most common cancer and the second leading cause of cancer death among U.S. women [1]. In 2019, an estimated 268,600 new cases of invasive breast cancer and 62,930 new cases of non-invasive breast cancer were diagnosed in women in the U.S.; also, an estimated 41,760 women are expected to die from breast cancer [2]. Previous evidence suggested that the decrease in incidence and mortality rate was partially due to the extensive use of preventive mammograms, which offer early detection and treatment of breast cancer [3, 4]. However, getting recommended mammograms is one of the unmet health care among female caregivers [6]. Approximately 23.5% of female caregivers never received a mammogram, particularly [7, 8]. Notably, the difference in mammogram use behaviors between caregivers and non-caregivers is understudied.

Previous studies have reported relevant factors to mammogram use in both caregivers and non-caregiver. For example, age-related trends in mammogram use were observed in both caregivers and non-caregivers in previous studies [3, 9, 10, 11]. After 45 years of age, older women were more likely than younger women to have mammograms [9, 12]. Also, cancer beliefs played a critical role in using mammograms. Cancer-related fear was common, which significantly impacted women's mammograms use [15]. Caregivers tended to be more familiar with cancer than non-caregivers [13, 14, 15, 16, 17]. However, non-caregivers seemed to be more attentive to cancer-related self-care and perceive a higher risk of breast cancer than caregivers, which leads to mammograms use [16]. People who have family cancer history, and caregivers of cancer survivors have increased odds in receiving mammograms [18, 19]. In addition, depression is a risk factor for mammography underuse in general populations

[20]. Women who are depressed are less likely to receive screening, and female caregivers are at risk of depression due to the heavy caregiver burden [20, 21].

Regarding caregiver-specific factors to mammography screening, previous studies showed mixed or limited results. For example, caregiver burden was identified as one of the barriers to screening [22, 23]. The authors proposed that caregivers who have caregiver procrastination and high burden may lead to less frequent breast examinations [23]; however, another study found no significant association [2]. Also, caregivers of cancer patients generally had an increased likelihood of receiving cancer preventive screenings [23, 24]. An increase of likelihood may be due to the high supply of cancer information from medical professionals, leading to increased awareness of preventive screenings [24]. In addition, financial matter was an aspect impacting mammography recipients [15]. However, no income-related disparities in mammography use have been observed between caregivers and non-caregivers in previous literature.

By using the Andersen's Behavioral Model of Health Services Use [25], our study compared mammogram screening behaviors between caregivers and non-caregivers to examine (1) the levels of mammogram receipt, (2) the role of caregiving factors, and (3) the role of cancer beliefs on mammogram screening of caregivers and non-caregivers. The hypotheses were:

Methods

Research Design and Data Source

This study analyzed data from the 2017 Health Information National Trends Survey (HINTS). HINTS 5's Cycle 1 (2017) data were collected from January to May, and a single-mode mail survey was generated [26]. The sample was categorized into two subgroups: caregivers and non-caregivers. Overall, the sample consisted of 277 caregiving women and 951 non-caregiving women aged 40 to 75 years. More details about the development of HINTS have been reported elsewhere [26].

Measurement

Dependent Variable variable named mammogram screening measured whether a participant had received a mammogram within the past year (12 months). Participants' self-reported mammogram screening over the past 12 months was analyzed as a dichotomous variable (0 = did not have a recent mammogram screening; 1 = had a recent mammogram screening).

Independent Variables. Predisposing factors were age (40 to 75), education (1 = Less than eight years to 7 = Postgraduate), and beliefs about cancer. To assess cancer beliefs, the HINTS included eight items. Six items were assessed by asking respondents to rate on a 4 likert scale (1 = strongly disagree; 2 = somewhat disagree; 3 = somewhat agree; 4 = strongly agree) their cancer beliefs (it seems like everything causes cancer; there's not much you can do to lower your chances of getting cancer; there are so many different recommendations about preventing cancer, it's hard to know which ones to follow; cancer is more common than heart disease in adults; when I think about cancer, I automatically think about death; I'd rather not know my chance of getting cancer). Other items (how likely are you to get cancer in your lifetime; how worried are you about getting cancer?) were assessed by asking respondents to rate on a five-point scale (1 = very unlikely; 2 = unlikely; 3=neither unlikely nor likely; 4 = likely; 5 = very likely, 1= not at all; 2 = slightly; 3 = somewhat; 4 = moderately; 5 = extremely).

Enabling factors were income (1 = \$0–9,999 to 9 = \geq \$200,000) and confidence about health information (1 = Not confident at all; 2 = A little confident; 3 = Somewhat confident; 4 = Very confident; 5 = Completely confident). We included four additional items that are related to the caregiving characteristic for the caregiver group. The continuous variables included the number of people under their care, and the categorical variables included the caregiving hours per week (1 = <5 hours per week; 2 = 5–14 hours per week; 3 = 15–20 hours per week, 4 = 21–34 hours per week; 5 = 35 or more hours per week), care receiver's cancer (1 = yes; 0 = no), and care receiver's chronic illness (1 = yes; 0 = no).

Need factors included four items (general health, depression, ever had cancer, and family ever had cancer). For self-rated health status, participants reported their general health status using a five-point Likert scale (1 = Poor; 2 = Fair; 3 = Good; 4 = Very Good; 5 = Excellent). HINTS contained four items related to depressive symptoms (little interest or pleasure in doing things; feeling down, depressed, or hopeless; feeling nervous, anxious, or on edge; not being able to stop or control worrying). We constructed a depression score by adding a value for the four items that ranged from "not at all" (1) to "nearly every day" (4). We also categorized caregiver's "Ever had cancer" and "family ever had cancer" to "yes" (1) or "no" (0).

Data Analysis

General characteristics of caregivers and non-caregivers were described by calculating the frequencies, percentages, averages, and standard deviations. We examined the association between independent variables and mammogram screening behavior by conducting a cross-tabulation analysis. Finally, we estimated a binomial logistic regression model that included predisposing, enabling, and need factors as independent variables and dichotomous indicators of mammogram screening behavior as the dependent variable. All analyses incorporated replicated sampling weights provided by HINTS to generate unbiased estimates and were conducted using the Stata 12.0 software package.

Results

Characteristics of the Sample and Rates of Mammography

First describes the characteristics of our study sample. Of the 277 in the caregiver group, 176(63.5%) received mammogram screenings. Of the 951 in the non-caregiver group, 601(63.3%) received mammogram screening. Caregivers were younger (56.3 years old, SD = 9.315) than non-caregivers (58.6, SD = 9.222). About 72.4% of the caregiver group had completed some college and higher education, while 33.4% of the non-caregiver group had a high school diploma or less. The majority of both groups reported their health as more than good and not ever having had cancer. The average depression level was higher among the caregiver group (6.291, SD = 3.192) than the non-caregiver group (6.008, SD = 2.959). Two-fifths of participants in both groups reported that their family members have had cancer. More than two-thirds were caring for more than two persons, and most of the caregivers (92.8%) were providing care for less than 20 hours per week. Of the caregiver group, 18.8% have provided care for cancer patients, and 38.5% have provided care for patients who have chronic conditions.

About 18.5% of the caregiver group thought that they were unlikely or very unlikely to get cancer in their lifetime, and about 68.4% agreed that it seemed like everything could cause cancer. Moreover, nearly 26% of participants reported that there was not much they could do to lower their likelihood of getting cancer, and 75% agreed that there were so many different recommendations about cancer prevention that it was difficult to know which to follow. Nearly half of participants reported that cancer is more common than heart disease (43.8% of caregivers and 46.6% of non-

caregivers), and when they think about cancer, they automatically think about death (55.5% of caregivers and 57.0% of non-caregivers). About 33% of caregivers and 37.4% of non-caregivers agreed that they would rather not know their likelihood of getting cancer. Most (91.9% of caregivers and 93.9% of non-caregivers) participants in both groups reported that they were not extremely worried about getting cancer. About 67.1% of the caregiver group and 65.9% of the non-caregiver group members earned <\$75,000 per year. About 60% of both groups reported that they felt confident about getting health information.

As can be seen by the cross-tabulated frequencies in Table 1, there were significant relationships between perceiving cancer as more common than heart cancer ($\chi^2 = 4.4746, p < 0.05$), worries about cancer ($\chi^2 = 7.2583, p < 0.01$), confidence about getting health information ($\chi^2 = 5.2092, p < 0.05$), and getting mammogram screenings in the caregiver group. Moreover, there were significant relationships between education ($\chi^2 = 4.0276, p < 0.05$), rather not know the likelihood ($\chi^2 = 13.5159, p < 0.001$), income ($\chi^2 = 5.0811, p < 0.05$), general health ($\chi^2 = 9.4769, p < 0.01$), ever had cancer ($\chi^2 = 4.5869, p < 0.05$), family ever had cancer ($\chi^2 = 5.4602, p < 0.05$), and taking mammogram screenings in the non-caregiver group.

Multivariate analysis

Binomial Logistic Regression

Estimates from the binomial logistic regression model presented in Table 1 show that mammogram screening was positively associated with age (OR = 1.058, 95% CI=1.022-1.095, OR = 1.029, 95% CI=1.013-1.046) and negatively with "rather not know my likelihood of getting cancer" (OR = .673, 95% CI=0.496-0.914, OR = .825, 95% CI=0.713-0.955) for both groups. However, among the caregiving group, the dependent variable was positively associated with confidence in getting health information (OR = 1.432, 95% CI=1.049-1.955) and "cancer is more common than heart disease" (OR = 1.490, 95% CI=1.032-2.151) and negatively associated with caregiving hours per week (OR = .749, 95% CI=0.564-0.994). For the non-caregiver group, the dependent variable was positively associated with how worried they were about getting cancer (OR = 1.156, 95% CI=1.000-1.337) and negatively associated with depression (OR = .919, 95% CI=0.871-0.969).

Discussion

Our study results revealed similar mammogram screening rates for caregivers and non-caregivers (63.5% vs. 63.3%). Women caregivers within our sample did not neglect their breast cancer screening needs, which is consistent with the previous findings [27]. The findings of this study partially support our hypotheses. Regarding predisposing factors, caregivers and non-caregivers identified different cancer belief factors associated with the utilization of mammograms. Among non-caregivers, the worry of getting cancer was a significant predictor of using mammograms. A recent study reported that women who worry about getting breast cancer were more willing to adhere to mammograms [30]. However, our study suggested that this knowledge could not be applied to caregiver populations.

In turn, caregivers identified the belief that cancer is more common than heart disease as a significant predictor in the utilization of mammograms. Also, access to health-related knowledge was positively associated with mammogram use among caregivers. The heightened level of health-related knowledge due to caregiving experience and easier access to medical professionals may help caregivers receive mammograms [23].

In addition, unwilling to know their possibility of getting cancer was a significant predictor of using mammograms for both caregivers and non-caregivers. The majority of the respondents did not want to know their likelihood of getting cancer and associated cancer-related death. These findings add to evidence that fear of having cancer is a significant predictor of not receiving a mammogram, which is supported by a previous study [31].

For enabling factors, mammogram screening behavior was negatively associated with hours of caregiving among caregivers. Finally, regarding need factors, non-caregivers, who showed symptoms of depression, exhibited lower odds of having mammograms. Depression is a risk factor for the underuse of mammography because depression generally leads to self-care neglect, including using mammograms [32, 33]. In this analysis, no other need factor associated with mammogram use among caregivers at a significant level.

Limitation

Our study had several limitations. First, as a secondary analysis, we were unable to examine the impact of details regarding the caregiving situation on mammogram screening behaviors. However, our study is also strengthened by the high quality of the HINTS, its sampling procedures, and nationally representative samples. Second, the effects of caregiving by race were unable to be examined. in mammography have been well documented for both caregivers and general women [34,35]. Our study focused on comparing mammogram screening behaviors between caregivers and non-caregivers.

Declarations

Ethics approval and consent to participate

This secondary analysis used public use data that does not require ethics approval.

Consent for publication

Not applicable

Availability of data and material

Health Information National Trends Survey is a public use dataset.

Competing interests

None declared.

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Authors' contributions

SK, YG, and HYL contributed to conceptualization. SK, YG, and HYL contributed to methodology. SK, YG, and HYL contributed to validation. SK performed formal analysis. SK and YG wrote the original paper. SK, YG, HYL, and CW reviewed, and edited the paper. HYL supervised and contributed to funding acquisition.

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Not applicable

Abbreviations

HINTS = Health Information National Trends Survey

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Tables

Table 1. Demographic Characteristics of Caregiver Samples and Non-Caregiver Samples

Variables	Caregiver (n= 277)				Non-Caregiver (n = 951)			
	Frequency (%)	Screening		Frequency (%)	Screening		Frequency (%)	Screening
		No (%)	Yes (%)		No (%)	Yes (%)		
Dependent Variable								
Mammogram Screening		176(63.5)				601(63.3)		
Predisposing factor								
Age								
Education	High-school diploma or less	56.25(9.315) 75(27.6)	40.00 60.00	.8494	58.61(9.222) 313(33.4)	41.21 58.79	4.0276*	
	Some college and higher	197(72.4)	34.01 65.99		623(66.6)	34.51 65.49		
Beliefs about cancer								
Likelihood of getting cancer	Very unlikely and Unlikely	49(18.5)	38.78 61.22	.8543	180(19.8)	37.78 62.22	0.0439	
	Neither unlikely nor likely	121(45.7)	32.23 67.77		417(45.8)	36.93 63.07		
	Likely and Very likely	95(35.8)	36.84 63.16		314(34.5)	36.94 63.06		
Everything causes cancer	Agree	186(68.4)	34.95 65.05	.1313	626(67.6)	36.42 63.58	0.0725	
	Disagree	86(31.6)	37.21 62.79		300(32.4)	37.33 62.67		
Prevention is not possible	Agree	70(26.2)	38.57 61.43	.2820	245(26.5)	35.10 64.90	0.3740	
	Disagree	197(73.8)	35.03 64.97		681(73.5)	37.30 62.70		
Too many recommendations	Agree	202(75.4)	34.16 65.84	.5959	691(74.7)	35.60 64.40	1.5707	
	Disagree	66(24.6)	39.39 60.61		234(25.3)	40.17 59.83		
Cancer more common	Agree	117(43.8)	28.21 71.79	4.4746*	421(46.6)	35.39 64.61	.2300	
	Disagree	150(56.2)	40.67 59.33		482(53.4)	36.93 63.07		
Cancer fatal	Agree	151(55.5)	35.76 64.24	.0015	524(57.0)	38.36 61.64	1.9121	
	Disagree	121(44.5)	35.54 64.46		395(43.0)	33.92 66.08		
Rather not know the likelihood	Agree	89(33.0)	39.33 60.67	.8818	348(37.4)	44.25 55.75	13.5159***	
	Disagree	181(67.0)	33.52 66.48		583(2.6)			
Worried about cancer	Not extremely	249(91.9)	37.75 62.25	7.2583**	875(93.9)	37.37 62.63	2.8157	
	Extremely	22(8.1)	9.09 90.91		57(6.1)	26.32 73.68		
Enabling Factors								
Income	\$0-74,999	171(67.1)	37.43 62.57	.0066	557(65.9)	40.57 59.43	5.0811*	
	≥\$75,000	84(32.9)	36.90 63.10		288(34.1)	32.64 67.36		
Confident about getting health information	Very confident	155(58.3)	29.68 70.32	5.2092*	561(61.6)	34.76 65.24	1.7880	
	Not very confident	111(41.7)	43.24 56.76		350(38.4)	39.14 60.86		
Caregiving Characteristic								
Number of people under their care	One More than two or more	82(33.7) 161(66.3)	39.02 32.92	.8903	-	-	-	-
Caregiving hours per week	<20 hours per week	180(92.8)	33.89 66.11	.4621	-	-	-	-

	21-34 hours per week	14(7.2)	42.86	57.14		-	-	-	-
Caregiving	Yes	55(18.8)	34.29	65.71	.0272	-	-	-	-
Cancer	No	238(81.2)	35.71	64.29		-	-	-	-
(Ref = the others)									
Caregiving	Yes	105(38.5)	39.05	60.95	.9211	-	-	-	-
Chronic	No	168(61.5)	33.33	66.67		-	-	-	-
(Ref = the others)									
Need factors									
General Health	More than Good	221(81.5)	37.10	62.90	1.4774	752(80.3)	34.31	65.69	9.4769**
Depression	Less than Fair	50(18.5)	28.00	72.00		185(19.7)	46.49	53.51	
		6.291(3.192)				6.008(2.959)			
Ever had cancer	Yes	34(12.5)	32.35	67.65	.1713	172(18.3)	29.65	70.35	4.5869*
	No	239(87.5)	35.98	64.02		769(81.7)	38.36	61.64	
Family ever had cancer	Yes	210(78.4)	33.33	66.67	1.2920	696(77.3)	34.20	65.80	5.4602*
	No	58(21.6)	41.38	58.62		204(22.7)	43.14	56.86	

Note: * $p<.05$; ** $p<.01$, *** $p<.001$

Table 2. Logistic Regression on Receipt of Mammogram Screening by Caregiving and Non-Caregiving Group

Factors	Predictors	Caregiver		Non-Caregiver		
		OR	95% CI	OR	95%CI	
Predisposing factors	Age	1.058***	1.022, 1.095	1.029***	1.013, 1.046	
	Education	1.096	0.887, 1.355	1.093	0.980, 1.218	
	Beliefs about cancer	Likelihood of getting cancer	1.019	0.895, 1.160	.932	0.866, 1.003
		Everything causes cancer	.971	0.681, 1.384	1.183	0.983, 1.423
		Prevention is not possible	.777	0.550, 1.099	.989	0.823, 1.188
		Too many recommendations	1.158	0.793, 1.691	1.060	0.876, 1.282
		Cancer more common	1.490*	1.032, 2.151	1.126	0.939, 1.349
		Cancer fatal	1.200	0.854, 1.685	.916	0.773, 1.085
		Rather not know the likelihood	.673*	0.496, 0.914	.825**	0.713, 0.955
		Worried about cancer	1.213	0.916, 1.606	1.156*	1.000, 1.337
Enabling Factors	Income	1.074	0.927, 1.243	1.035	0.962, 1.113	
	Confident about getting health information	1.432*	1.049, 1.955	1.021	0.868, 1.201	
	Number of people under their care	1.523	0.889, 2.609	-	-	
	Caregiving Hours per week	.749*	0.564, 0.994	-	-	
	Caregiving Cancer (ref = others)	.735	0.306, 1.769	-	-	
	Caregiving Chronic (ref = others)	.657	0.370, 1.166	-	-	
Need factors	General Health	.803	0.571, 1.128	1.138	0.952, 1.359	
	Depression	0.937	0.849, 1.034	.919**	0.871, 0.969	
	Ever had cancer	0.696	0.281, 1.723	1.351	0.899, 2.030	
	Family ever had cancer	1.404	0.695, 2.837	1.344	0.956, 1.891	
Number of observations		277		951		
Pseudo R ²		0.124		0.057		
Log Likelihood Rate Test		43.05		67.51		

Note: ORs, odds ratios, * p<.05; **p<.01, ***p<.001