African-American caregivers’ breast health behavior

Megumi Inoue*, Joseph G. Pickard, Patricia Welch-Saleeby and Sharon Johnson

Abstract
This study utilizes a stress and coping framework which includes cognitive appraisal, personal and environmental resources, coping and stress to examine factors related to African-American caregivers’ breast cancer screenings, including mammograms, clinical examinations and self-examinations. Using data from the Black Rural and Urban Caregivers Mental Health and Functioning Study, we performed separate logistic regressions for each type of breast cancer screening. Results reveal that having a regular doctor checkup (coping), care recipients having a cancer diagnosis (cognitive appraisal, and living in urban areas (environment resources) are associated with receiving a mammogram. Having greater income, having at least a high school degree (both personal resources) and having a regular doctor checkup (coping) are associated with receiving a clinical examination. Increased caregiver strain (stress), being 40 years old or older, social support (coping) and living in rural areas are associated with performing a self-examination. Targeting African-American caregivers, particularly in rural areas, for increased education on the importance of receiving breast cancer screenings is crucial to addressing health disparities. Making resources available, encouraging caregivers to get a clinical examination and a mammogram and directing public education toward caregivers are important points of intervention.

Introduction
While a significant number of studies have focused on African-American women’s utilization of preventive health services especially breast cancer screening [1–6], little research has examined early detection efforts among African-American females compounded with the burden of caregiving. As compared with their White counterparts, African-American women caregivers are more likely to face financial challenges and to manage multiple tasks while fulfilling their caregiving tasks [7]. The need to prioritize these factors may negatively contribute to breast health behaviors of these women.

The negative consequences of caregiving
A number of studies have reported the negative consequences of the caregiving experience on caregivers’ physical, mental and emotional well-being [8–12]. Caregivers often suffer from psychological stress that leads to depression and anxiety [8, 13], and Shultz and Beach [11] reported that the mortality rate of caregivers who experienced emotional and mental strain was significantly higher than that of other groups. Psychosocial distress, stressors and risky health habits affect physiological responses among caregivers, which in turn increases their risks for various health problems [14].

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In order to avoid serious consequences, it is important for caregivers to maintain their own health by engaging in preventive health behaviors. However, studies have indicated that caregivers are less likely to engage in preventative health behaviors [13]. In fact, it has been reported that the higher the level of care provided, the less likely the caregivers will receive enough rest, have time to exercise, will receive a mammogram and will be more likely to forget to take medications [15, 16]. In a recent study conducted by the National Alliance for Caregiving and Evercare [17], ~72% of caregivers reported that they had not seen a doctor as often as they should, 55% had missed their appointments and 21% of women surveyed reported having mammograms less often. Therefore, the demands of the caregiving role may keep female caregivers from engaging in preventive breast health activities or using breast health services.

Breast cancer among African-American women

Although breast cancer is the most frequently occurring type of cancer and the second most common cause of cancer death for women in the United States [18], significant differences exist in the incidence and mortality rates of breast cancer by race and ethnicity [18]. An estimated 19% of all cancer deaths among African-American women are attributed to breast cancer [19].

Factors contributing to breast health disparities among African-American women are both complex and interrelated. Lack of health insurance, insufficient knowledge or understanding about breast cancer and preventative behaviors and lack of physician recommendation and referral contribute to these differences [20]. African-American women frequently have less access to breast cancer screening, diagnostic and treatment services [21–23]. African-American women with lower incomes, especially those who live in rural areas, are vulnerable populations in terms of breast cancer risk [2, 24–26]. Furthermore, breast cancer is often in more advanced stages by the time African-American women are diagnosed [27]. Lower incomes, lower education levels, not having health insurance, not seeing a physician, higher levels of caregiving burden and residing in a rural area are all barriers to obtaining a mammogram [16, 20, 26]. Even after adjusting for economic standing, however, African-American women still have greater negative outcomes than other women [28].

Theoretical framework

Given the interplay between caregiving responsibilities and risky health behaviors, it appears intuitive that a theoretical framework such as stress and coping theory would offer insight for understanding caregivers’ breast health behavior. In stress and coping theory, cognitive appraisal, coping and personal/environmental resources are important factors affecting stress levels and individuals’ well-being [29–31]. Cognitive appraisal is the process of individual evaluation of whether a certain external event has an influence on one’s well-being, and coping refers to individuals’ behavioral response to managing stressors [29]. Personal/environmental resources exist when factors align to enhance availability and access to services or the provisions for services.

Factors affecting cognitive appraisal include person attributes (beliefs of control and learned helplessness) and the attributes related to the situation (controllability, predictability and immi-
nence). Caregivers’ locus of control regarding health, their age and the clinical health diagnosis of the recipient under their care are such factors. Social support from family, friends and others frequently helps individuals in coping with their situation, and having a regular doctor checkup is considered an active method of coping and caring for one’s health. How much time caregivers spend on their caregiving task load, how much strain they feel and an ability to participate in social activities often affect caregivers’ stress levels and overall well-being.

Stress and coping theory further explains that personal and environmental resources affect these cognitive appraisal and coping processes [29]. Substantial literature exists indicating that socioeconomic variables including income, insurance and
educational attainment are significantly associated with individuals’ health status and ability to access health services, including access to medical breast cancer screenings [20, 32–34]. Wood and Wan [35] have reported that living in a rural area is associated with a reduced availability of formal services and more objective needs. Therefore, residing in urban areas is considered an important personal/environmental resource, as it is a proxy for the availability of formal services.

**Hypotheses**

We hypothesize that higher cognitive appraisal (greater internal health locus of control, presence of a cancer diagnosis among care recipients and the age of the caregiver), greater personal and environmental resources (income, insurance, education and urban residence) and better coping mechanisms (more social support and doctor’s visits) are positively associated with African-American caregivers’ breast cancer screenings. We further hypothesize that stress factors such as perceived levels of caregiver strain, limitations in social participation, employment hours and hours of caregiving are negatively associated with caregivers’ breast health behaviors.

**Methods**

**Data and sample**

Data were from the Black Rural and Urban Caregivers Mental Health and Functioning Study [36] conducted between July 1999 and August 2002. This cross-sectional study included 521 mid-western urban (n = 256) and rural (n = 265) African-American female caregivers of dependent African-Americans who were 65 years and older. A list of enrollees from the Centers for Medicare and Medicaid Services (formerly Health Care Financing Administration) was utilized for sampling. A stratified random sampling method by zip code, age and gender was conducted for generating the caregiver study population. Enrollees aged 65 and older were contacted and asked if someone provided care to them. This generated the sample of caregivers. Inclusion criteria included being African-American, female, ≥18 years and unpaid for helping at least 5 hours per week with elders’ activities of daily living (bathing, dressing, walking, grooming, transferring, toileting, feeding and giving medication) and/or instrumental activities of daily living (shopping, preparing meals, paying bills, keeping records, making appointments, transporting and cleaning house). African-American women were hired as interviewers to try to improve the reliability of responses. Interviewers were trained on precise study protocols to follow. Interviewers conducted computer assisted, in-home interviews which lasted ~2.5 hours.

**Dependent measures**

Outcome variables in this study are mammograms, clinical examinations and self-examinations.

Mammogram acquisition was assessed by asking ‘A mammogram is an X-ray of each breast to look for breast cancer. How long has it been since you had your last mammogram?’ Original response categories were ‘never had mammogram’, ‘within the past year’, ‘within the past 2 years’, ‘within the past 3 years’, ‘within the past 5 years’ and ‘5 or more years ago’. Because the US Preventive Services Task Force [37] recommends having a mammogram every 1–2 years for women aged ≥40, we dichotomized this variable at 2 years. Within the past year and within the past 2 years were recoded as 1 and the other response categories into 0 since yearly clinical examinations are generally recommended.

Completion of a clinical examination was assessed by asking ‘A clinical breast exam is when a doctor, nurse, or other health professional feels the breast for lumps. How long has it been since your last clinical breast exam?’ Original response categories were ‘never had breast examination’, ‘within the past year’, ‘within the past 2 years’, ‘within the past 3 years’, ‘within the past 5 years’ and ‘5 or more years ago’. We dichotomized this variable by recoding within the past year into 1 and other response categories into 0 since yearly clinical examinations are generally recommended.

Self-examination was assessed by asking ‘A breast self exam is when you check your breasts
for lumps or other problems. How often do you do a breast self exam?’ Original response categories were ‘more than once a month’, ‘once a month’, ‘every few months’, ‘at least once a year’ and ‘never does self-examinations’. At the time of the survey, monthly self-examinations were recommended, so we recoded those who reported performing self-examinations at least once a month as 1 and those who reported performing less frequently than once a month as 0.

**Independent measures**

**Cognitive appraisal**

To assess cognitive appraisal, we examined locus of control for health matters, presence of a cancer diagnosis among care recipients and the age of the caregiver. The measure of locus of control for matters of health was a modified version of the internal health locus of control scale \((\alpha = 0.80)\) [38]. The modified version was a standardized six-item scale, representing individuals’ degree of belief that their health status is controlled by internal factors. The scale included such items as ‘If I get sick, I have the power to make myself well again’ and ‘I am directly responsible for my health’. Responses on individual items were 1 = strongly disagree, 2 = disagree, 3 = agree and 4 = strongly agree. We summed answers for items to create a continuous variable with a possible range of 6–24 where higher values indicated greater levels of belief that respondents had control over their health status.

Care recipients’ cancer diagnosis was a binary variable. Caregivers who were caring for a person with a cancer diagnosis were coded as 1 and others were coded as 0.

Age was originally a continuous variable, but since breast cancer screening is recommended more strongly for women aged 40 and over, we dichotomized the original variable so that those over age 40 were coded as 1 and those under age 40 were coded as 0.

**Coping**

Social support was a dichotomous variable derived from the following three items: In the past 6 months (i) have you gotten help from family members? (ii) friends and/or neighbors? and (iii) church members, not including help from clergy or your pastor? Caregivers who have support from at least one of the three resources were coded as 1 and those who do not have any support were coded as 0.

Having had a regular doctor checkup was derived from the following question: ‘Some people visit a doctor for a routine checkup, even though they are feeling well and have not been sick. About how long has it been since you last visited a doctor for a routine checkup?’ Original response categories were 0 = never visited doctor, 1 = within the past year, 2 = within the past 2 years, 3 = within the past 3 years, 4 = within the past 5 years and 5 = more than 5 years ago. We coded within the past year as 1 and the other categories as 0.

**Personal/environmental resources**

To assess personal and environment resources, we examined income, insurance, education and residence. Income was a continuous variable which was derived by dividing the total household income by the number of people in the household. Since the skew of this variable was 2.52, we utilized a natural log transformation which yielded a skew of \(-0.44\).

Insurance status was a binary variable; those with any type of coverage were coded as 1 and others were coded as 0.

Education was originally a continuous variable which ranged from 1 to 17 years of schooling a caregiver finished. We recoded education into a categorical variable with two categories: less than high school education (reference group) and having graduated high school or more than a high school education.

Residential status in an urban area was coded as 1, and those residing in rural areas were coded as 0. Eight Southeast Missouri counties (Butler, Dunklin, Cape Girardeau, New Madrid, Mississippi, Pemiscot, Scott and Stoddard Counties) were defined as rural areas where agriculture was their economic base, and the population was <10 000 [36]. Metropolitan St Louis, MO, was defined as an urban area.
Sources of stress
Assessment of stress included measures of caregiver strain, limitations in social participation, employment hours and hours of caregiving. Caregiver strain was measured using the impact subscale of the Caregiver Appraisal Scale [39]. Caregiver strain ($\alpha = 0.80$) included items such as ‘How often do you feel that an elder asks for more help than she/he needs?’ and ‘How often do you feel that because of the time you spend with an elder, you don’t have enough time for yourself?’ Responses on individual items were 1 = never, 2 = rarely, 3 = sometimes, 4 = quite frequently and 5 = nearly always. We scored across the items for a possible range of 9–45, where higher scores indicated greater caregiver strain.

Following Rozario et al. [40], we measured limitations in social participation [41] by asking ‘Compared to others your age, are your social activities more or less limited because of your physical health or emotional problems?’ Possible responses were 1 = much more limited, 2 = somewhat more limited, 3 = about the same as others your age, 4 = somewhat less limited than others and 5 = much less limited than others. Answer categories of ‘much more limited’ and ‘somewhat more limited’ were coded as 0 and ‘about the same as others your age’, ‘somewhat less limited than others’ and ‘much less limited than others’ were coded as 1.

Employment hours were measured by asking the number of hours per week that individuals worked outside the home. We dichotomized this variable so that those who worked <40 hours were coded as 0 and those working $\geq 40$ hours were coded as 1.

Hours of caregiving was originally a continuous variable which was derived from a question asking caregivers how many hours in the previous week they had helped the elder? We recoded this variable into two categories that had roughly the same proportions: $<$20 hours (reference group) and $\geq$20 hours.

Data analysis
Central tendencies and distributions of all study variables were examined, and, when needed, variables were transformed (e.g. income variable). Univariate analyses were conducted to describe the sample. Bivariate analyses were used to compare those who engaged in the different types of cancer screening (mammograms, clinical examinations and self-examinations) based on each of the study’s independent variables. Lastly, separate logistic regression models were employed to assess the relationship between the set of independent variables and African-American caregivers’ breast health behavior: mammograms, clinical examinations and self-examinations. In the mammogram model, caregivers who were $<$40 years old were not included for the analysis due to the recommended age for mammography being $\geq 40$. Missing values on dependent variables and on categorical variables necessitated dropping some observations from the analyses. The number of observations used for the analyses is 395 for mammograms, 497 for clinical examinations and 496 for self-examinations. Collinearity among independent variables was assessed for each model, and all tolerance values were at an acceptable level with the lowest being 0.81. Correlations of all study variables were examined and were also at acceptable levels with the highest being 0.36 between caregiving strain and weekly hours of caregiving.

Results
Of the caregivers aged $\geq 40$, 74.2% had a mammogram within the past 2 years. Including all age groups, 74.0% had a clinical examination within the past year and 59.9% reported performing a self-examination at least once a month.

Bivariate analysis
The relationships between each independent variable and the dependent variables were examined by a series of chi-square tests and $t$-tests. Results of bivariate analyses are shown in Tables I–III.

Mammograms
Income (natural log) ($t = -2.20, P < 0.05$), having insurance ($\chi^2 = 8.07, P < 0.01$) and receiving a regular checkup from a doctor ($\chi^2 = 47.74, P < 0.001$) were significantly associated with obtaining a
Table I. Bivariate analyses for mammogram (N = 395)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Had within Past 2 years, n = 293</th>
<th>More than two years ago, n = 102</th>
<th>( \chi^2 )</th>
<th>( t )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cognitive Appraisal</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Health locus of control</td>
<td>16.9 (2.7)</td>
<td>17.3 (2.8)</td>
<td>1.33</td>
<td></td>
</tr>
<tr>
<td>Care recipient has cancer diagnosis</td>
<td>29 (9.9)</td>
<td>17 (16.7)</td>
<td>3.37</td>
<td></td>
</tr>
<tr>
<td>( \geq 40 ) years</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Personal/environmental resources</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Income (natural log)</td>
<td>9.0 (0.9)</td>
<td>8.7 (1.0)</td>
<td>-2.20*</td>
<td></td>
</tr>
<tr>
<td>Insured</td>
<td>256 (87.4)</td>
<td>77 (75.5)</td>
<td>8.07**</td>
<td></td>
</tr>
<tr>
<td>High school education or more</td>
<td>202 (68.9)</td>
<td>63 (61.8)</td>
<td>1.77</td>
<td></td>
</tr>
<tr>
<td>Urban residence</td>
<td>157 (53.6)</td>
<td>45 (44.1)</td>
<td>2.71</td>
<td></td>
</tr>
<tr>
<td>Coping</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social support</td>
<td>162 (55.3)</td>
<td>60 (58.8)</td>
<td>0.38</td>
<td></td>
</tr>
<tr>
<td>Regular doctor checkup</td>
<td>282 (96.3)</td>
<td>74 (72.6)</td>
<td>47.74***</td>
<td></td>
</tr>
<tr>
<td>Stress factors</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caregiving strain</td>
<td>17.7 (6.4)</td>
<td>17.0 (6.6)</td>
<td>-0.93</td>
<td></td>
</tr>
<tr>
<td>Limitations in social participation</td>
<td>226 (77.1)</td>
<td>77 (75.5)</td>
<td>0.11</td>
<td></td>
</tr>
<tr>
<td>Employment hours (( \geq 40 ))</td>
<td>233 (79.5)</td>
<td>77 (75.5)</td>
<td>0.73</td>
<td></td>
</tr>
<tr>
<td>Caregiving hours (( \geq 20 ))</td>
<td>144 (49.2)</td>
<td>53 (52.0)</td>
<td>0.24</td>
<td></td>
</tr>
</tbody>
</table>

*\( P < 0.05 \), **\( P < 0.01 \), ***\( P < 0.001 \).
Highlighted figures indicate significant results.

Table II. Bivariate analyses for clinical exams (N = 497)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Had within past year, n = 368</th>
<th>More than a year ago, n = 129</th>
<th>( \chi^2 )</th>
<th>( t )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cognitive appraisal</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Health locus of control</td>
<td>17.2 (2.7)</td>
<td>17.0 (2.7)</td>
<td>-0.49</td>
<td></td>
</tr>
<tr>
<td>Care recipient has cancer diagnosis</td>
<td>42 (11.4)</td>
<td>21 (16.3)</td>
<td>2.04</td>
<td></td>
</tr>
<tr>
<td>( \geq 40 ) years</td>
<td>293 (79.6)</td>
<td>102 (79.1)</td>
<td>0.02</td>
<td></td>
</tr>
<tr>
<td>Personal/environmental Resources</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Income (natural log)</td>
<td>8.9 (0.9)</td>
<td>8.6 (1.0)</td>
<td>-3.13**</td>
<td></td>
</tr>
<tr>
<td>Insured</td>
<td>310 (84.2)</td>
<td>109 (84.5)</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>High school education or more</td>
<td>275 (74.7)</td>
<td>82 (63.6)</td>
<td>5.88*</td>
<td></td>
</tr>
<tr>
<td>Urban residence</td>
<td>183 (49.7)</td>
<td>56 (43.4)</td>
<td>1.53</td>
<td></td>
</tr>
<tr>
<td>Coping</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social support</td>
<td>206 (56.0)</td>
<td>73 (56.6)</td>
<td>0.01</td>
<td></td>
</tr>
<tr>
<td>Regular doctor checkup</td>
<td>358 (97.3)</td>
<td>88 (68.2)</td>
<td>87.6***</td>
<td></td>
</tr>
<tr>
<td>Stress factors</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caregiving strain</td>
<td>17.4 (6.2)</td>
<td>16.8 (6.9)</td>
<td>-0.91</td>
<td></td>
</tr>
<tr>
<td>Limitations in social participation</td>
<td>291 (79.1)</td>
<td>99 (76.7)</td>
<td>0.31</td>
<td></td>
</tr>
<tr>
<td>Employment hours (( \geq 40 ))</td>
<td>288 (78.3)</td>
<td>99 (76.7)</td>
<td>0.13</td>
<td></td>
</tr>
<tr>
<td>Caregiving hours (( \geq 20 ))</td>
<td>175 (47.6)</td>
<td>62 (48.1)</td>
<td>0.01</td>
<td></td>
</tr>
</tbody>
</table>

*\( P < 0.05 \), **\( P < 0.01 \), ***\( P < 0.001 \).
Highlighted figures indicate significant results.
mammogram. Of those who had completed a mammogram within the past 2 years, the mean income (natural log) was higher than for those caregivers who had not received a mammogram within the past 2 years [mean = 9.0, standard deviation (SD) = 0.9]. Of those who had received a mammogram in the past 2 years, 87.4% had insurance and 96.3% had seen a doctor for checkup within the past year.

Clinical examinations

One’s income (natural log) \((t = -3.13, P < 0.01)\), level of education \((\chi^2 = 5.88, P < 0.05)\) and receiving a regular checkup from a doctor \((\chi^2 = 87.6, P < 0.001)\) were related with having received a clinical examination. The mean income (natural log) was significantly higher for those caregivers who had received a clinical examination within the past year \((\text{mean} = 8.9, \text{SD} = 0.9)\) than for those caregivers who had not received a clinical examination. Among those caregivers receiving a clinical exam, 74.7% had high school or higher education. As with mammograms, most of the caregivers who had received a clinical examination in the past year (97.3%) had also seen a doctor within the past year for a regular checkup.

Self-examinations

Where respondents lived \((\chi^2 = 8.09, P < 0.01)\) and social support \((\chi^2 = 8.15, P < 0.01)\) were significantly associated with the frequency of self-examinations. Of those who had reported performing a self-examination at least once a month, 57.2% resided in urban areas. Interestingly, those who reported that they had not performed regular self-examinations were more likely to report having social support than those women who reported that they had performed regular self-exams.

Although caregiver strain, limitation in social participation, number of hours per week employed, number of hours per week providing care to elder, health locus of control, care recipients’ cancer diagnosis and age were not significantly associated with any type of breast cancer screening at the bivariate level of analysis, these variables were included into a regression analysis because of their theoretical importance to the stress and coping model.

### Table III. Bivariate analyses for self-exams (N = 496)

<table>
<thead>
<tr>
<th>Variables</th>
<th>At least once a month, n = 297</th>
<th>Less than once a month, n = 199</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n (%)  Mean (SD)</td>
<td>n (%)  Mean (SD)</td>
</tr>
<tr>
<td>Cognitive appraisal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Health locus of control</td>
<td>17.2 (2.7)</td>
<td>17.1 (2.7)</td>
</tr>
<tr>
<td>Care recipient has cancer diagnosis</td>
<td>38 (12.8)</td>
<td>25 (12.6)</td>
</tr>
<tr>
<td>(\geq 40) years</td>
<td>243 (81.8)</td>
<td>151 (75.9)</td>
</tr>
<tr>
<td>Personal/environmental resources</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Income (natural log)</td>
<td>8.8 (0.9)</td>
<td>8.8 (1.0)</td>
</tr>
<tr>
<td>Insured</td>
<td>245 (82.5)</td>
<td>173 (86.9)</td>
</tr>
<tr>
<td>High school education or more</td>
<td>210 (70.7)</td>
<td>147 (73.9)</td>
</tr>
<tr>
<td>Urban residence</td>
<td>170 (57.2)</td>
<td>88 (44.2)</td>
</tr>
<tr>
<td>Coping</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social support</td>
<td>151 (50.8)</td>
<td>127 (63.8)</td>
</tr>
<tr>
<td>Regular doctor checkup</td>
<td>272 (91.6)</td>
<td>173 (86.9)</td>
</tr>
<tr>
<td>Stress factors</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caregiving strain</td>
<td>17.6 (6.5)</td>
<td>16.8 (6.2)</td>
</tr>
<tr>
<td>Limitations in social participation</td>
<td>239 (80.4)</td>
<td>150 (75.4)</td>
</tr>
<tr>
<td>Employment hours ((\geq 40))</td>
<td>238 (80.1)</td>
<td>149 (74.9)</td>
</tr>
<tr>
<td>Caregiving hours ((&gt; 20))</td>
<td>141 (47.5)</td>
<td>95 (47.7)</td>
</tr>
</tbody>
</table>

*\(P < 0.05\), **\(P < 0.01\), ***\(P < 0.001\).*

Highlighted figures indicate significant results.
Logistic regression analyses

Separate logistic regression models were used to assess the probability of obtaining a mammogram, receiving a clinical examination and performing a self-exam. Results are reported in Table IV.

**Mammogram model**

The overall model was significant \( \chi^2 = 49.92 \), degrees of freedom (df) = 12, \( P < 0.001 \). The odds of obtaining a mammogram for caregivers whose care recipients had a cancer diagnosis were 59\% lower than those whose care recipients did not. Caregivers residing in urban areas were 1.75 times more likely to obtain a mammogram compared with those residing in rural areas, and caregivers who had seen a doctor within the past year for their regular health checkup were 11.76 times more likely to obtain a mammogram compared with those who had not seen a doctor.

**Clinical examination model**

The overall model was significant \( \chi^2 = 72.08 \), df = 13, \( P < 0.001 \). Caregivers with higher incomes are more likely to receive a clinical examination, and caregivers who have at least a high school degree are 1.75 times more likely to have a clinical examination compared with those who did not have a high school degree. Caregivers who had seen a doctor within the past year for their regular health checkup were 24.66 times more likely to receive a clinical examination compared with those who had not.

**Self-examination model**

The overall model was significant \( \chi^2 = 30.55 \), df = 13, \( P < 0.01 \). Caregivers residing in urban areas are 43\% less likely to report performing a self-examination at least once a month compared with those residing in rural areas, and the odds of performing a self-examination for caregivers who had...
social support were 44% lower than those who did not. The odds that a caregiver reports that she performs a monthly self-examination increased by 4% for every unit increase in caregiver strain scores.

Because results indicated that rural caregivers were more likely to report performing a self-examination at least once a month as compared with urban caregivers, we completed a post hoc analysis to determine if rural caregivers were more dependent on self-examinations than mammograms. Those who reported performing a self-examination at least once a month and did not have a mammogram within the past 2 years were considered as depending on self-examinations and were coded as 1, and other combinations (completed both, completed neither of them and completed only a mammogram) were coded as 0. In the analysis ($\chi^2 = 5.65, df = 1, P < 0.05$), which is not presented in a table, we found that caregivers residing in rural areas were 1.95 times more likely to depend on a self-examination compared with those residing in urban areas (odds ratio = 1.95, $P < 0.05$). This analysis included only caregivers aged 40 and over.

**Discussion**

This study utilized stress and coping framework to examine breast health behaviors among African-American caregivers assessing mammogram, clinical examination and self-breast exams in separate models. Based on a stress and coping model, we expected that factors representing cognitive appraisal, personal and environmental resources and coping mechanism would have a positive impact on breast health behaviors, while factors representing stress would have negative associations with such behaviors among the targeted population.

**Mammogram model**

When assessing the likelihood of mammogram receipt at the bivariate level, only factors representing personal and environmental resources (income and insurance) and factors representing coping (regular doctor checkup) had significant association with this type of breast cancer screening. On first glance, the plausible explanation seems to reflect the relative costs associated with receiving such an advanced procedure and the need for a doctor’s order for the mammography. Findings support prior research that receiving a doctor’s recommendation was a significant predictor of getting both a mammogram and a clinical examination [20]. However, logistic regression results indicate that when we consider other variables simultaneously, income and insurance possession no longer have significant impact on obtaining a mammogram, but urban residence and care recipient cancer diagnosis are significant.

The regression analyses findings contradicted prior research that reported the effect of income on mammography attainment [26, 32, 42]. The reason why income was not a significant predictor might be due to the efforts of a number of programs, such as the National Breast and Cervical Cancer Early Detection Program, which try to ensure that underserved women gain access to cancer screenings [43] and the availability of free screenings in the community. Financially disadvantaged status may not be as strong a negative predictor of accessing breast cancer screenings as it once was. Yet, the availability of such resources may be limited to larger metropolitan areas and this may explain why a person’s place of residence (urban versus rural) became a significant predictor of obtaining a mammogram in the multivariate model. As expected, rural caregivers are less likely to obtain mammograms compared with their urban counterparts. As many studies have reported [2, 24–26], living in a rural area is a barrier to accessing mammograms for caregivers due to possible issues of limited numbers of facilities that offer mammograms and limited transportation options for caregivers in rural areas.

Cognitive appraisal as measured by caregivers who are taking care of somebody with a cancer diagnosis became a significant factor when other variables were simultaneously assessed. Those who were taking care of someone with a cancer diagnosis are less likely to say that they obtained a mammogram within the past 2 years. While we do not know the exact reason for this, we can speculate that fear of cancer may be a reason for not obtaining a
mammogram [44]. Through the process of caring for a person with cancer, caregivers perceive how cancer gradually and sometimes drastically advances [45]. This experience may give caregivers fear that functions as a barrier rather than a facilitator.

**Clinical exam model**

Similar findings exist for the bivariate clinical exam model as was found in the mammogram model with the exception of education being associated instead of insurance status. The US Preventive Services Task Force [37] explains that the early detection effect of having a clinical examination alone is not well supported by evidence. Although there is a possibility that some of the caregivers might receive a clinical examination during their annual doctor’s visit, the American Cancer Society [46] recommends having a clinical examination as a complement to the mammogram. Substantial evidence shows that mammography is the single most effective screening method, and it substantially increase early detection, gives more treatment options and improves survival rates [46]. These facts may explain why the general public views mammography as more important than clinical examinations. Although increased efforts have been made to raise awareness of the importance of both mammography and clinical examination among all populations [43], people with higher education may become more aware of it compared with those without.

**Self-exam model**

Findings for the self-exam model deviated from the former models as associated factors included environmental resources as measured by urban residence and coping as measured by received social support in the bivariate model. The multivariate model for self-exam better reflected the hypothesized stress and coping framework, though not necessarily in the direction in which we predicted factors would impact. In terms of cognitive appraisal, female caregivers aged 40 and over were more likely to report that they performed monthly breast exams. Given the relatively well-known advice that women over the age of 40 should receive a mammogram every 1–2 years [37, 46, 47], it is possible that these caregivers are becoming more aware of the need for breast exams as they reach age 40, and they are increasing their self-exams to compensate for less frequent clinical exams and mammograms. Those caregivers who reported more frequent self-exams were less likely to live in urban areas than those who reported less frequent self-exams, and findings show that rural caregivers are more dependent on self-examinations. Lacking resources to access a mammogram may motivate a rural caregiver to perform a self-examination as a means of coping with the reality of what is actually available to them in a practical sense.

Coping as measured by received social support was also associated with reported self-examinations. Those who reported less frequent self-exams reported that they had more social support. Thus, social support predicted caregivers’ probability of performing a self-examination in the opposite direction than was hypothesized. Caregivers who have support from at least one of three resources, family members, friends or church members, are less likely to perform a self-examination. Having support may connect caregivers with other types of cancer screening, such as a mammogram and clinical examination [48] or lessen their perceived strain [49] which facilitates self-examination. Stronger and wider informal social support networks among African-Americans are well documented [50–52]. Because the type and degree of support were not examined in this study, exploring these may benefit further understanding of the relationship between having support and obtaining breast cancer screenings. For example, if the specific type of social support that is associated with breast cancer screening centers around information transmitted from one person to another, an implied point of intervention might be to educate women to talk to each other about these issues in a woman-to-woman format.

The stress associated with caregiving was assessed by caregivers’ perceived strain and was associated with performing a self-examination in the regression analysis, though it was in the opposite direction than was hypothesized. Findings
indicate that as caregivers’ perceived strain increases, they are more likely to say that they perform a self-examination at least once a month. Perceived strain which comes from caring for physically or psychologically impaired older adults may help caregivers realize the importance of maintaining their own health. Having a clinical examination or mammogram requires extra time, and caregivers may need to find others to fill in for what they do, which might help explain why perceived strain became significant only in the self-examination model but not in the mammogram and clinical examination models.

Limitations and strengths

There are several limitations to be noted. Selection of variables to represent the concepts of within the stress and coping model was limited by the availability of variables within the dataset. Due to the nature of this secondary dataset, limited measurement did not allow for the assessment of the impact of caregivers’ family history of breast cancer, which has been reported as a significant predictor of individuals’ breast health behavior and could represent an aspect of cognitive appraisal [53]. Also, exploration of how caregivers’ perspectives on cancer screenings would influence their cancer screening attainment was not possible. Because findings were based on cross-sectional data, it did not capture how a change in the caregiving role and tasks might affect caregivers’ breast cancer screening activities.

Though not overly generalizable outside of the population studied, there were several strengths that should be noted. This study is unique as it uses a sample composed exclusively of African-American women residing in rural and urban areas who are caregivers of older adults to examine factors that are related to their breast health behaviors, including self-examinations, mammograms and clinical examinations. The study offered baseline knowledge on African-American female caregivers’ (a vulnerable population in terms of high mortality rates from breast cancer and caregiving burden) breast health behavior. Prior studies have found that a doctor recommendation was a predictor of breast cancer screening, and this study supports that seeing a doctor is particularly critical in the context of African-American female caregivers. Lastly, the results offer new information that African-American caregivers residing in rural areas were more likely to rely on monthly self-examinations.

At the time of the interviews, self-examinations were ‘recommended’ by the American Cancer Society and the Susan G. Komen for the Cure Foundation, but now they are only ‘encouraged’ [47, 54]. Studies about breast health behavior often include only a mammogram and a clinical examination; however, the findings indicate that there is a population that does not access those screenings yet completes a self-examination.

Conclusion

Results imply that improving access to routine physician checkups will contribute to increasing the completion rates of mammograms and clinical examinations. Targeting African-American caregivers who do not receive a physician checkup and informing them of the importance of receiving a breast cancer screening is crucial. Providing information about free and reduced cost for mammogram and clinical examination is also essential. Findings also indicate that rural caregivers are less likely to obtain a mammogram and more likely to depend on a self-examination. Having resources available and encouraging people to receive a mammogram and clinical examination are important; however, education concerning the proper method of self-examination is urgent at the same time. This paper offers a fuller understanding of specific variables that are associated with African-American caregiver’s breast health behaviors, which is key for addressing health disparities surrounding breast cancer diagnosis and mortality.

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Conflict of interest statement

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References


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