Social networks and social support for healthy eating among Latina breast cancer survivors: Implications for social and behavioral interventions

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Abstract

Purpose—Little is known about Latina breast cancer survivors' social networks or their perceived social support to achieve and maintain a healthy diet. This paper describes the social networks and perceived support for healthy eating in a sample of breast cancer survivors of predominantly Dominican descent living in New York City.

Methods—Spanish-speaking Latina breast cancer survivors enrolled in a randomized controlled trial of a culturally-tailored dietary intervention. Social networks were assessed using Cohen's Social Network Index and a modified General Social Survey Social Networks Module that included assessments of shared health promoting behaviors. Perceived social support from family and friends for healthy, food-related behaviors was assessed.

Results—Participants' networks consisted predominantly of family and friends. Family members were more likely than other individuals to be identified as close network members. Participants were more likely to share food-related activities than exercise activities with close network members. Perceived social support for healthy eating was high, although perceived support from spouses and children was higher than support from friends. Despite high levels of perceived support, family was also identified as a barrier to eating healthy foods by nearly half of women.

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Conclusions—Although friends are part of Latina breast cancer survivors' social networks, spouses and children may provide greater support for healthy eating than friends.

Implications for Cancer Survivors—Involving family members in dietary interventions for Latina breast cancer survivors may tap into positive sources of support for women, which could facilitate uptake and maintenance of healthy eating behaviors.

Keywords

breast cancer; Latina; social support; social networks; nutrition; survivorship

Introduction

Breast cancer is the most commonly diagnosed cancer among Latinas [1]. With improvements in screening and treatment, five-year relative survival rates for women with all stages of breast cancer have improved significantly over the last 30 years to approximately 90% by 2009 [2]. Still, after accounting for differences in age, stage at diagnosis and tumor characteristics, mortality rates from breast cancer are higher among Latinas than among non-Latina whites [1]. In an effort to improve the health outcomes among the growing population of survivors, the American Cancer Society and the American Institute for Clinical Research recommend that cancer survivors adopt healthy eating behaviors to prevent or control co-morbidities and obesity [3, 4]. Obesity and increased BMI are significant risk factors for cancer recurrence [3, 5]. Rates of obesity among cancer survivors may be similar to obesity rates among individuals with no history of cancer; in the 1998-2001 National Health Interview Survey, approximately 22% of cancer survivors and 21% of individuals without a history of cancer were obese [6]. In the general U.S. population, Latinos have the second highest age-adjusted rate of obesity (42.5%), compared to non-Latino blacks (47.8%), non-Latino whites (32.6%) and Asians (10.8%) [7]. Even though decreased fat consumption and increased fruit and vegetable consumption are part of national recommendations to maintain a healthy weight [8], Latina breast cancer survivors may not meet these recommendations [9].

Social networks, defined as "the web of social relationships that surround an individual and the characteristics of those ties" [10], and social support, defined as "any process through which social relationships might promote health and well-being" [11], are two social mechanisms that have been linked to the adoption of healthy behaviors in the general population [10-12]. Social networks may influence health behaviors through social support, access to resources, social engagement, and the setting of social norms [10]. Among cancer survivors, social networks and social support have been associated with improved quality of life [13] and decreased mortality [14-16]. In a meta-analysis of 87 papers, larger social networks were found to be significantly associated with lower cancer mortality [16]. In other studies, larger networks were associated with increased quality of life [13] and decreased breast cancer-specific mortality among predominantly white breast cancer survivors [14-16]. As with social networks, social support can affect how individuals access the health care system or health information [10, 11, 17] and can influence perceptions of normative health behaviors [11]. Prior studies have shown that social norms of eating [18], social network

members' eating habits [19], and perceived general social support from family and friends [20] can influence an individual's food choices.

The influence of social networks and social support on quality of life or achieving and maintaining dietary recommendations has not been well characterized among Latina breast cancer survivors. To our knowledge there are no papers that report the social networks and healthy dietary behaviors among Latina breast cancer survivors. In a non-cancer related study of Mexican-American families, having at least one social network member who encouraged healthy eating was associated with greater motivation to eat more fruits and vegetables [21]. Perceived general social support has been shown to be positively correlated with quality of life [22], but often immigrant Latina breast cancer survivors report a lack of social support [23] and have poorer quality of life than other racial and ethnic groups [24-26]. Cultural emphasis on familism (strong attachment to nuclear and extended families [27]) may make social support from family particularly important for Latina breast cancer survivors. For example, in a New York City metro-area study, Latina breast cancer survivors had more, though not statistically significant, support of spouses and family than their white counterparts [26].

To fill a gap in the literature on Latina breast cancer survivors, we describe the social networks and social support for healthy eating among a sample of Latina breast cancer survivors of predominantly Dominican descent who participated in the *Cocinar Para su Salud!* (Cook for Your Life!) trial (NCT01414062). *Cocinar Para su Salud!* was a National Cancer Institute-funded randomized controlled trial of a dietary intervention aimed at assisting Latina breast cancer survivors to achieve and maintain healthy dietary behaviors [28]. Primary outcomes analyses, which have been reported elsewhere, showed that the intervention group had a significantly greater increase in daily consumption of targeted fruits and vegetables than the controls (+2.7 vs. +0.5 servings per day, $p = 0.0002$) at 6-month follow-up, but that there was no significant difference between groups in decrease of percent calories from fat (-7.5% vs. -4.4%, $p = 0.23$) [28]. The exploratory analyses reported here use baseline data from *Cocinar Para su Salud!* to examine associations between sociodemographic, medical, social network and social support data. We use these findings to enhance the understanding of the role key social network members have on dietary behaviors among this population.

Materials and Methods

Participants

Cocinar Para su Salud! enrolled 70 women (34 intervention, 36 control). To be eligible, women had to be 21 years of age or older, Latina and fluent in Spanish, diagnosed with stage 0-III breast cancer, have a minimum of three months since last chemotherapy treatment, have no uncontrolled comorbidities (e.g., diabetes), be a current non-smoker, and consume, on average, less than five servings of fruits and vegetables per day. Social network measures were added as pilot, hypothesis-generating measures after the *Cocinar Para su Salud!* baseline assessments had been collected. Social network data were collected for 34 (16 intervention, 18 control) of the 70 participants who were still enrolled in the study; no

women refused the assessment. Women completed the social network measures at their next scheduled assessment.

Program

Cocinar Para su Salud! was a National Cancer Institute-funded, randomized controlled trial of a culturally-tailored intervention designed to assist Latina breast cancer survivors achieve and maintain dietary behaviors and meet national nutrition guidelines [3, 4, 28]. A bilingual chef and a registered dietician provided nutrition education classes, hands-on cooking lessons and food-shopping field trips over nine sessions (24 hours over 12 weeks). All program materials, including all measures, were developed in or translated into Spanish. Focus groups and informal interviews were used to evaluate program materials and assessments for cultural relevance, with the exception of social network measures, which were added to the assessments after these focus groups had taken place.

Measures

Social Networks—Social network theory posits that an individual's behaviors are, in part, influenced by the structure of their social network, which may encompass a range of ties beyond traditional kinship ties[10]. Subsequent literature has demonstrated an association between social network ties and physical health [29, 10, 12]. Based on this work, participants' social networks were assessed using two measures of social networks, Cohen's Social Network Index (SNI) [30] and a modified version of the General Social Survey (GSS) Social Networks Module [31]. Cohen's SNI is a self-administered measure that assesses the size and diversity of social networks [30]. The SNI captures the number of individuals with whom respondents have regular contact (defined as speaking with or seeing the individual at least once every two weeks). Twelve domains of relationships (children, parents, parents-in-law, spouse, other relatives, close friends, religious, education, employment, neighbors, volunteer, and other social groups) are assessed. We modified the index to replace spouse with care giving responsibilities because spousal status was collected as part of the social support measures. The SNI is summarized in two ways: 1) assigning one point for every network domain in which the respondent has regular contact with at least one individual and summing the domains to measure network diversity (maximum score = 12) (sum of network diversity); and 2) summing the number of individuals with whom the respondent has regular communication (number of network members) [30]. Participants were categorized by the median sum of network diversity score into low (below the median) and high (including the median and above). For a general overview of network diversity, the twelve domains of networks were collapsed into four domains: family, friends, community, and employment.

A modified version of the GSS Social Network Module was used to further characterize participants' close network members. Participants named up to three individuals with whom they talk about important matters, such as health. Participants were then asked to provide the following information on each named network member: sex, type of relationship, proximity of residence and frequency of interactions. The GSS Social Network Module is generally modified based on specific research questions. Given the interest in food preparation and dietary habits, participants were also asked whether network members engaged in activities

related to food. Engagement in physical activity and social activities with network members was also ascertained and was included in this analysis for comparison purposes. Participants could identify more than one activity per person.

Social Support for Healthy Eating—At baseline, participants completed a 13-item assessment of perceived social support from three domains of network members (spouse/partner, children, and friends). Analyses focused on a subset of items assessing support for seven food-related behaviors (e.g., eating more vegetables) and one general health behavior (doing things to improve health). Support was ranked using a four-point Likert scale (not supportive at all, somewhat supportive, mostly supportive, and very supportive), which was later dichotomized to 'not supportive at all'/'somewhat supportive' and 'mostly'/'very supportive'. Participants also completed a 34-item barrier and facilitator to healthy behaviors measure. Analyses focused on seven items related to social support and healthy eating (e.g., "My family likes it when I cook non-starchy-vegetables for them"). Statements were endorsed using a four-point Likert scale (strongly disagree, disagree, agree, and strongly agree) and were later dichotomized into disagree and agree.

Demographics—Sociodemographic and medical history characteristics were collected at baseline. Acculturation was assessed using the Short Acculturation for Scale for Hispanics [32]. Health literacy was assessed using the Newest Vital Sign [33]. The comorbidity index has been previously described [28].

Fruit and Vegetable Consumption—Twenty-four hour dietary recall assessments (2 weekdays, 1 weekend day) were collected at baseline, three, six and 12 months by a registered dietician using the Nutrition Data System for Research v. 2011 [34]. Targeted fruits and vegetables excluded legumes, potatoes, fried vegetables and juice.

Analysis

Bivariate analyses were conducted using two sample t-tests and chi-squared tests, with significance (two-tailed) assessed at an alpha of 0.05, unless otherwise noted. Analyses were conducted using SAS v. 9.3 (Cary, NC).

Results

Of the total sample of *Cocinar Para su Salud!* participants, 34 Latina breast cancer survivors had complete social network data. The social networks subsample was comparable to the *Cocinar Para su Salud!* sample for whom social network data were not available (data not shown). No differences in baseline characteristics were observed between groups (at α <0.1), with the exception of employment status and enrollment in food assistance programs. Participants included in the social network analysis were more likely to report being disabled compared to those not included in the analysis (41.2% vs. 8.3%) ($p = 0.01$). Participants included in the analysis were also more likely to be enrolled in a food assistance program than those not included (70.6% vs. 47.2%, $p = 0.047$).

Table 1 shows the social networks subsample's sociodemographic and medical history characteristics by network diversity (dichotomized as low vs. high by median score). Most

participants identified as Dominican (79.4%). The mean age was 56.9 years (SD = 9.5; range = 40-81 years) and 82.4% of women were post-menopausal. On average, this was a low acculturated, low educated and low income sample. Baseline consumption of targeted fruits and vegetables was, on average, 3.9 servings per day. Except for history of chemotherapy use, no significant differences (at $\alpha < 0.1$) were observed between breast cancer survivors in the control and intervention arms (data not shown).

Social Network Characteristics

Women's network diversity score ranged from one to nine network domains (of a possible 12 domains), with a mean sum of network diversity score of 4.8 (SD = 1.9) and a median score of 5.0. The number of network members ranged from 1 to 30 members, with a mean of 12.6 members (SD = 8.0). The sum of network diversity score and number of network members were linearly correlated ($r = 0.82$, $p < 0.0001$). Social network diversity and number of network members were not associated with study arm ($p = 0.32$) (data not shown).

In bivariate analysis, network diversity (low vs. high) was associated with women's age, level of acculturation, employment status, and enrollment in a food assistance program (Table 1). Women with high network diversity were younger than women with low network diversity (52.8 years vs. 61.9 years, p = 0.004). Age was also inversely related to the number of network members ($r = -0.51$, $p = 0.02$). Women with high network diversity had higher acculturation scores (1.7 vs. 1.2, p = 0.004), were more likely to be employed (52.6% vs. 6.7%, p = 0.0241), and were less likely to be enrolled in a food assistance program (52.5% vs. 93.3%, p = 0.02) than women with low network diversity. Most (80.0%) women with low network diversity had annual household incomes less than $15,000, compared to women with high network diversity (57.9%), although this association was not significant ($p = 0.08$). Social network diversity and number of network members were not associated with baseline fruit and vegetable consumption.

As seen in Table 2, most women's social networks consisted of three overall domains: family, friends and community. Most women did not report having employment networks. Other relatives and children networks were most commonly reported by women (88.2% and 79.4%, respectively). Friends and neighbors networks were reported by approximately three quarters of women. Nearly one third (32.4%) reported having religious group networks. In contrast, volunteering and education networks were reported by less than 10% of women.

Using the GSS Social Network Module, 23.5% of women identified three close network members with whom they could talk to about their health, 41.2% identified two people, 29.4% identified only one person and 5.9% did not identify anyone or were missing. As seen in Table 3, family members were most often identified as close network members; 38.2% of women named a sibling, 32.4% named a child, and 14.7% named a parent. Approximately 29% of women named individuals as an "other" type of relationship, but no additional information was provided to identify these types of relationships (i.e. other family vs. other non-family). Women with high network diversity reported having daily contact and close proximity (live within 20 blocks) to their close network members more often than women with low network diversity. Overall, women reported doing more food-related activities with

close network members than activities related to physical activity (e.g., 76.5% of participants reported eating a meal or snack with close network members, but only 17.7% reported exercising with members). Further, women with high network diversity reported sharing food-related activities with close network members more often than women with low network diversity (e.g., 89.5% vs. 60.0% of women with high and low network diversity, respectively, reported sharing a meal or snack).

Social support for healthy eating

As seen in Table 4, women had higher levels of support for healthy eating behaviors from their spouse/partner or children than from friends. Of the women with a spouse or partner (n=14; 41.2%), the vast majority (85.7% to 92.9%) reported their partner to be mostly or very supportive of cooking, trying and eating healthy foods (including fruits and vegetables). Of women with children living at home (n=12; 35.3%), most (75.0% to 91.7%) reported that their children were mostly or very supportive of the same activities. The support of friends for these activities was less than the support from spouses/partners and children, with 58.8% to 85.3% of all women reporting friends to be mostly or very supportive of healthy eating. Support for eating more vegetables was lowest across spouses/partners, children and friends. All women with spouses and children had very high support from these individuals to do general things to improve their health, but fewer women (82.4%) had friends who were just as supportive. No significant differences in social support for any individual items were observed between women with low and high network diversity.

In the barrier and facilitator assessment, most women identified family as facilitators, rather than barriers to healthy eating. Fewer than half of women reported that their families were barriers to healthy eating: 35.5% agreed with "My family doesn't like non-starchy vegetables", 41.2% felt that "I would cook vegetables more often, but my family doesn't like them", and 24.4% agreed that "If it weren't for my family, I would eat more vegetables". Less than a quarter of women (23.5%) agreed that "Eating with my family makes it more difficult to eat healthy foods". When asked about family as facilitators, most women (67.6%) agreed with "My family likes when I cook non-starchy vegetables" and even more (73.5%) agreed that "My family encourages me to eat more vegetables". Most women (94.1%) agreed that they had family and friends who thought it was important for them to eat healthy foods. There were no significant differences in social support barriers and facilitators by social network diversity.

Discussion

These exploratory analyses indicate that social network diversity is associated with baseline age, employment status, and acculturation level, but was not associated with baseline consumption of fruits and vegetables, in a sample of breast cancer survivors of predominantly Dominican descent enrolled in the *Cocinar Para su Salud!* randomized control trial. Family was the most commonly reported network domain (i.e., type of relationship) for participants; children, parents and siblings were often identified as close network members. Of all shared activities, participants were most likely to share a meal with

close network members, but many participants also shopped for food and prepared meals with close network members. Although our findings did not indicate an association between healthy eating and social network diversity, Pachucki and colleagues [19] found that greater motivation to eat fruits and vegetables was associated with having at least one social network member who encouraged healthy eating in a study of Mexican American, non-survivor families. Close network members with whom participants share food preparation and meals could be important sources of encouragement and could also shape social norms around healthy eating. A systematic review of social norms and dietary choices suggests social transmission, social approval, and informational influence as plausible mechanisms by which social network members might influence dietary behaviors [18]. Future studies are needed to explore these mechanisms among cancer survivors.

Evidence suggests that size of social networks is positively associated with higher levels of income and education [13]. National data finds that Latinos have lower education and income levels than their non-Latino white counterparts [35, 36]. Because our participants had low levels of income and education, it is plausible that the size and diversity of their networks may be lower than that of white breast cancer survivors. Even within our sample, we found that more women with low network diversity had household incomes of less than $15,000 per year compared to women with high network diversity, although this difference was not significant. Lack of significant findings may be due to low variability in income of this sample and future research in a more economically diverse sample of Latinas is needed to explore this further. General social support provided by immediate and extended family is valuable to Latina breast cancer survivors and can be helpful in making treatment choices and developing new attitudes toward self-care [37, 38]. Participants reported high levels of support from family to engage in healthy eating. Levels of support varied according to how support statements were framed. When inquired by social network domain, the majority of women (at least 83%) reported high levels of support from spouses and children for cooking, eating and preparing healthy foods such as fruits and vegetables. On the other hand, in the facilitator and barrier assessments, which were not separated by network domains, 24% to 41% of participants reported families as barriers to eating vegetables and other healthy foods. Differences in statement wording could explain differences in perceived support. Support from partners and children was assessed in domain-specific support statements (e.g., my spouse likes…), but facilitator/barrier items using the term "family" may have also captured support of extended family members (e.g., siblings or parents). Given that other family members, such as siblings, were identified as close network members in the GSS measure, spouse and children-specific measures of support may not be sufficient to capture influences of extended family on fruit and vegetable consumption. Future research on familial support for healthy eating could prompt respondents to identify family members with whom they reside, cook for, or speak with about diet as part of the assessment of family barriers and facilitators to obtain more specific information about the support these individuals provide. Framing of statements may have also touched on different constructs, such as family support of a participant's personal behavior change (e.g., support when I eat more vegetables) versus participant's attempt to change foods for the entire family (e.g., my family likes when I cook non-starchy vegetables). Validation of social support barrier and

facilitators to fruit and vegetable consumption items are needed in larger, future studies among this population to explore if multiple underlying constructs are being captured.

Friends and neighbors were commonly reported social network domains, but women were less likely to identify these individuals as close network members. Further, we observed that women received lower levels of support for healthy eating from their friends. Although support from friends can be important because they may influence normative behaviors, ultimately family influence may be most important for Latinas [39]. In contrast, higher social support from friends, as well as family and significant others, was associated with consuming five or more fruits and vegetables a day in a sample of predominantly white men and women with smoking-related cancer diagnoses[20]. In addition to family and friends, community networks were also a commonly reported general domain of relationships in the *Cocinar Para Su Salud!* sample. Of all community networks, religious networks were present for as many as a third of women, many of whom had high social network diversity. In some qualitative studies, the church has been identified as a source of health promotion among Latinas without cancer [40] and spirituality gained importance in the first few years after diagnosis among Latina breast cancer survivors [38]. Conducting interventions in church-based settings or involving fellow church members could be potential approaches for reaching some women.

Findings from this study can be used to inform which breast cancer survivors' social network members might be included in dietary interventions to improve uptake or maintenance of behavior changes. More than half of participants identified another woman (often a sister or daughter) as a close network member. Latinas have historically relied on female family members for support and information [37, 39, 40]. Since we observed that these close network members already engage in breast cancer survivors' food-related activities, involving breast cancer survivors' female family members in dietary interventions could help to reinforce healthier food preparation (both shopping and cooking). Secondly, spouses/ partners may also be valuable to involve in interventions because spousal engagement in healthy eating is strongly predictive of individual healthy eating among non-cancer Latino individuals [19] and because survivors in our study identified their spouses as a source of high support for healthy eating. Given that many of the women shared meals with close network members (many of whom were family), incorporating family and spouses in taste-testing activities might be a beneficial way to introduce healthy foods to the whole family and reduce familial barriers to healthy eating. Third, friends and neighbors often made up participants' social networks, but they were less often classified as close network members and friends, specifically, provided less support for healthy eating than family. Future work is needed to explore the impact of friends or other non-family individuals on shifting healthy eating behaviors among Latina breast cancer survivors and the feasibility and value, if any, of incorporating them into dietary interventions.

Two limitations of the study are noted. First, the social network questions were added to an existing protocol after the parent study began, and we were unable to measure networks of all 70 participants. We confirmed that the subset of women included in the analysis was representative of the larger study sample with regard to sociodemographic and medical characteristics, with the exception of employment status and enrollment in food assistance

programs, thus supporting the generalizability of the findings. Our results showed that participants in the social network analysis were more likely to be disabled compared to women not included in the social network analysis. Analyses not shown here showed that women who reported being disabled in the context of employment status were more likely to be retained for the full 12 months of the parent trial, compared to women who were not disabled (p = 0.074), and thus were available to complete the social network analysis questionnaire. We hypothesize that women who reported being disabled may not have had work conflicts that could have interfered with their participation in the parent trial. No association between enrollment in food assistance programs and study retention was observed. Even though social networks were not assessed at baseline, we do not believe that the intervention influenced the social networks reported by women because social networks tend to reflect relationships that have existed over a longer period of time. Kroenke and colleagues [14] found little difference between level of breast cancer survivors' social networks assessed before and after diagnosis, with four years between pre and post assessments. Second, the small size of the sample prevented us from conducting any other mediation and multivariable analyses to determine the effect of social networks and social support on fruit and vegetable consumption at time points beyond baseline.

Our study has several strengths. First, by using two distinct but complementary measures of social networks, we were able to capture size and diversity of participants' networks and food-related activities shared with close network members. Secondly, the majority of breast cancer survivorship literature focuses on general social support, but we specifically assessed social support for healthy eating behaviors. Third, we characterize the social networks and support of Latina breast cancer survivors, a relatively understudied population. In particular, our sample of women is predominantly Dominican, a population that is relatively underrepresented in the literature compared to Mexican-Americans. Latinos of different national origins have different health profiles and health advantages and disadvantages [41], and may also have different social networks and experiences of social support.

Our study expands the current literature by focusing on Latina breast cancer survivors' social networks and perceived social support for healthy eating. The networks of these Latina breast cancer survivors commonly included children, other close relatives, friends and neighbors. Women most frequently identified family (rather than friends) as close network individuals with whom they would discuss health. Although nearly half of women identified family as barriers to healthy eating, they perceived the support from children and spouses for healthy eating to be very high. Future dietary interventions aimed at capitalizing on the social support of Latina breast cancer survivors to improve adoption and maintenance of healthy eating behaviors would do well to include family members and spouses.

Acknowledgments

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Table 1

Baseline characteristics of the social network analysis subsample (N=34) of *Cocinar Para su Salud!* Latina breast cancer survivors by low and high social network diversity [a]

	Total (N=34)		Low (N=15)		High (N=19)		p-value
	N or mean(SD)	% [b]	N or mean(SD)	% [b]	N or mean(SD)	% [b]	
Age	56.9 (9.5)		61.9 (8.9)		52.8 (8.2)		0.004
Race							0.971
Black	10	29.4	5	33.3	5	26.3	
White	15	22.1	6	40.0	9	47.4	
Native American	1	2.9	0	0.0	1	5.3	
Mixed race	2	5.9	1	6.7	1	5.3	
Nationality							0.426
Dominican	27	79.4	13	86.7	14	73.7	
Other nationality	7	20.6	2	13.3	5	26.3	
Acculturation index (1-5)	1.5 (0.6)		1.2 (0.4)		1.7 (0.6)		0.004
Education							0.545
Less than HS	15	44.1	8	53.3	7	36.8	
HS or GED	9	26.5	4	26.7	5	26.3	
Some college	7	20.6	3	20.0	4	21.1	
College or higher	3	8.8	0	0.0	3	15.8	
Employment status							0.024
Full-time	8	23.5	0	0.0	8	42.1	
Part-time	3	8.8	1	6.7	2	10.5	
Retired	3	8.8	2	13.3	1	5.3	
Homemaker	6	17.7	4	26.7	2	10.5	
Unemployed	0	0.0	0	0.0	0	0.0	
Disabled	14	41.2	8	53.3	6	31.6	
Annual HH income							0.076
$0 - $15,000	23	67.7	12	80.0	11	57.9	
$15,001 - $30,000	7	20.6	1	6.7	6	31.6	
$30,001 - $60,000	2	5.9	0	0.0	2	10.5	

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	Total (N=34)		Low (N=15)		High (N=19)		p-value
	N or mean(SD)	% [b]	N or mean(SD)	% [b]	N or mean(SD)	% [b]	
$60,001+	0	0.0	0	0.0	0	0.0	
Enrolled in food assistance program	24	70.6	14	93.3	10	52.6	0.020
Health literacy score (0-6)	1.4 (1.7)		0.8 (1.4)		1.9 (1.8)		0.050
Baseline targeted F&V daily servings	3.9 (2.3)		4.2 (2.2)		3.6 (2.4)		0.421
Cancer stage							0.312
Ductal carcinoma in situ	6	17.7	1	6.7	5	31.3	
I	14	41.2	8	53.3	6	37.5	
II	7	20.6	3	20.0	4	25.0	
III	2	5.9	2	13.3	0	0.0	
Locally advanced	2	5.9	1	6.7	1	6.25	
Years since diagnosis	3.2 (2.6)		3.5 (2.8)		3.0 (2.5)		0.593
Post-menopausal	28	82.4	14	93.3	14	73.7	0.196
Treatment							
Mastectomy	13	41.9	8	53.3	5	31.3	0.285
Radiation	23	67.7	9	60.0	14	73.7	0.475
Chemotherapy	17	50.0	9	60.0	8	42.1	0.300
Hormonal therapy	27	79.4	12	80.0	15	79.0	0.238
Comorbidity index (0-20)	1.1 (1.1)		1.5 (1.2)		0.9 (0.9)		0.126

[a] Social network diversity was dichotomized by the median for the sample. Low = sumscore <5.0 and high = sumscore 5.0

[b] Percents may not sum to 100% due to missing values

Table 2

Frequencies of participants who had regular contact with members of each social network domain specified in the modified Cohen's Social Network Index and the mean number of members in each domain by low and high social network diversity[a]

	Total (N=34)		Low (N=15)		High (N=19)		
	N or mean(SD)	%	N or mean(SD)	%	N or mean(SD)	%	p-value
Family							
Number of children	2.2 (1.0)		2.2 (0.8)		2.1 (1.1)		0.763
Age of children	32.6 (12.3)		39.4 (12.4)		27.9 (9.9)		<0.0001
Communicate regularly with children [b]	27	79.4	10	66.7	17	89.5	0.199
Parents Living							0.051
Neither	20	58.8	13	86.7	7	36.8	
Mother only	5	14.7	1	6.7	4	21.1	
Father only	2	5.9	0	0.0	2	10.5	
Both	6	17.7	1	6.7	5	26.3	
Communicate regularly with parents [b]							0.051
Neither	0	0.0	0	0.0	0	0.0	
Mother only	5	14.7	1	6.7	4	21.1	
Father only	2	5.9	0	0.0	2	10.5	
Both	6	17.7	1	6.7	5	26.3	
In-laws living							0.005
Neither	11	32.4	7	46.7	4	21.1	
Mother only	2	5.9	0	0.0	2	10.5	
Father only	0	0.0	0	0.0	0	0.0	
Both	8	23.5	0	0.0	8	42.1	
Communicate regularly with in-laws [b]							0.004
Neither	1	2.9	0	0.0	1	5.3	
Mother only	2	5.9	0	0.0	2	10.5	
Father only	1	2.9	0	0.0	1	5.3	
Both	6	17.7	0	0.0	6	31.6	
Have care giving responsibilities (including parents, grandchildren) [b,c]	10	29.4	1	6.7	9	47.4	0.020

	Total (N=34)		Low (N=15)		High (N=19)		
	N or mean(SD)	%	N or mean(SD)	%	N or mean(SD)	%	p-value
Frequency of Care							0.009
Daily	6	17.7	0	0.0	6	31.6	
2 or 3 times a week	1	2.9	1	6.7	0	0.0	
Once a week	1	2.9	0	0.0	1	5.3	
Few times a month	0	0.0	0	0.0	0	0.0	
Once a month	1	2.9	0	0.0	1	5.3	
Once every few months	0	0.0	0	0.0	0	0.0	
Number of close relatives (excluding spouse, children and parents)	3.2 (2.4)		2.4 (2.4)		3.8 (2.4)		0.088
Communicate regularly with relatives [b]	30	88.2	11	73.3	19	100.0	0.029
Friends							
Number of close friends	3.0 (2.5)		2.3 (2.6)		3.5 (2.4)		0.168
Communicate regularly with friends [b]	27	79.4	10	66.7	17	89.5	0.199
Community							
Communicate regularly with religious group members [b]	11	32.4	1	6.7	10	52.6	0.008
Number of religious group members with regular communication	2.8 (2.9)		0.8 (1.8)		3.6 (3.0)		0.072
Communicate regularly with classmates [b]	3	8.8	1	6.7	2	10.5	1.000
Number of classmates with regular communication	5.3 (2.9)		2.0 (0)		7.0 (0)		<0.0001
Communicate regularly with neighbors [b]	25	73.5	11	73.3	14	73.7	1.000
Number of neighbors with regular communication	1.7 (1.6)		1.8 (1.7)		1.6 (1.5)		0.687
Communicate regularly with volunteers [b]	2	5.9	0	0.0	2	10.5	0.492
Number of volunteers with regular communication	3.0 (3.6)		0.0 (0.0)		3.0 (3.6)		-
Member of any other group [b]	0	0.0	0	0.0	0	0.0	-
Employment							
Employment status							
Not employed	24	70.6	15	100.0	9	47.4	
Self-employed	2	5.9	0	0.0	2	10.5	
Employed by others	8	23.5	0	0.0	8	42.1	
Communicate regularly with co-workers [b]	9	26.5	0	0.0	9	47.4	0.002

	Total (N=34)		Low (N=15)		High (N=19)		
	N or mean(SD)	%	N or mean(SD)	%	N or mean(SD)	%	p-value
Number of co-workers with regular communication	4.1 (2.4)		0.0 (0.0)		4.1 (2.4)		-

[a]Social network diversity was dichotomized by the median for the sample. Low = sumscore <5.0 and high = sumscore   5.0

[b]These 12 items were used to calculate the sum of network diversity score. The numbers presented in these rows are the frequencies and percentages of women who identified having regular communication with at least one individual within the domain.

[c]Caregiving responsibilities were included in the sum of network diversity and number of network members scores if care was at least as frequent as a few times a month

Table 3

Frequencies of participants who identified at least one close social network member with characteristics specified in the modified General Social Survey Social Network Module by low and high social network diversity [a]

	Total (N=34)		Low (N=15)		High (N=19)	
	N[b]	%[c]	N[b]	%[c]	N[b]	%[c]
Number of close network members, mean (SD)	1.8 (0.9)		2.0 (0.8)		1.6 (1.0)	
Sex						
Male	19	55.9	9	60.0	10	52.6
Female	25	73.5	10	66.7	15	79.0
Relationship of network member						
Spouse/partner	9	26.5	3	20.0	6	31.6
Boyfriend	0	0.0	0	0.0	0	0.0
Sibling	13	38.2	4	26.7	9	47.4
Parent	5	14.7	3	20.0	2	10.5
Friend	3	8.8	2	13.3	1	5.3
Co-worker	0	0.0	0	0.0	0	0.0
Neighbor	0	0.0	0	0.0	0	0.0
Children	11	32.4	4	26.7	7	37.8
Other	10	29.4	3	20.0	7	36.8
Person lives within 20 blocks of home						
Yes	25	73.5	9	60.0	16	84.2
No	19	55.9	8	53.3	11	57.9
Frequency of contact						
Daily	26	76.5	10	66.7	16	84.2
2-3 times a week	6	17.7	1	6.7	5	26.3
Once a week	3	8.8	2	13.3	1	5.3
2-3 times a month	1	2.9	1	6.7	0	0.0
Once a month	2	5.9	1	6.7	1	5.3
Once every few months	0	0.0	0	0.0	0	0.0
Shared activities						
Eat a meal or snack	26	76.5	9	60.0	17	89.5

	Total (N=34)		Low (N=15)		High (N=19)	
	N[b]	%[c]	N[b]	%[c]	N[b]	%[c]
Shop for food together	16	47.1	5	33.3	11	57.9
Cook or prepare meals together	15	44.1	5	33.3	10	52.6
Go for a walk, hike or bike rides	8	23.5	3	20.0	5	26.3
Exercise together	6	17.7	3	20.0	3	15.8
Watch TV or go to the movies	17	50.0	6	40.0	11	57.9
Other	16	47.1	7	46.7	9	47.4

[a]Social network diversity was dichotomized by the median for the sample. Low = sumscore <5.0 and high = sumscore 5.0

[b]N and percents refer to the number of women who identified at least one close network member with a particular characteristic.

[c]Percents do not sum to 100 because women could identify up to three close network members and may have identified more than one network member with similar or different characteristics.

Table 4

Frequencies and percents of participants expressing high levels of perceived support for healthy eating behaviors from spouse/partners, children and friends [a]

	Spouse/Partner Support (N = 14)		Children Support (N=12)		Friend Support (N=34)	
Have support of [spouse/partner, children, friend] when you…	**N**	**% [b]**	**N**	**% [b]**	**N**	**%**
Cook healthy meals	13	92.9	11	91.7	29	85.3
Try new recipes at home	13	92.9	10	83.3	25	73.5
Eat more vegetables	12	85.7	9	75.0	20	58.8
Eat more fruit	13	92.9	11	91.7	27	79.4
Shop for healthy food	13	92.9	11	91.7	27	79.4
Eat differently from them	13	92.9	11	91.7	25	73.5
Do things to improve your health	14	100.0	12	100.0	28	82.4

[a] High level of perceived support is defined as support of spouse/partner, children, or friends being 'mostly' or 'very supportive' of a health behavior (vs. 'not supportive at all'/'somewhat supportive')

[b] Percent only includes women who have a spouse/partner or children living at home