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Do Social Network Characteristics Predict Mammography Screening Practices?

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Abstract

Background—Many breast cancer screening programs are based on the assumption that dissemination of information through social networks and the provision of social support are effective strategies for promoting mammography use. This paper examines the prospective relationship between social network characteristics and breast cancer screening practices among employed women.

Methods—Women age 40 and over employed in 26 worksites participating in a randomized intervention trial completed baseline and two-year follow-up assessments. These analyses include women in the embedded cohort ($n = 1,475$). Measures included social network characteristics (size, social influences and support), breast cancer screening practices, and socio-demographic characteristics. Adherence to screening guidelines at follow-up (mammogram within the past two years) was modeled as a function of social network characteristics at baseline.

Results—The majority of women in this sample were adherent with mammography screening guidelines at baseline. Baseline adherence explained the vast majority of variation in screening practices at follow-up. Only after removing the effects of previous mammography screening did we find statistically significant relationships between network characteristics and screening status. Specifically, among women age 40–51, subjective norms and encouragement by family/friends to have a mammogram at baseline were each significantly associated with screening adherence at follow-up ($OR = 2.20$ and 1.18 , respectively). For women age 52+, the perception that screening was normative among one's peers was associated with increased likelihood of recent mammography at follow-up ($OR = 1.46$).

Conclusions—Previous mammography use is strongly predictive of future screening. Among employed women with high baseline screening rates, the impact of social network characteristics was modest. As previous use of screening is highly associated with future use, programs should focus on reaching those who have underutilized mammography in the past. In addition, further exploration of the prospective relationships between social network characteristics and mammography within more at-risk and disadvantaged populations is warranted.

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INTRODUCTION

Social network interventions, which draw upon the influence of naturally occurring social systems, are increasingly used to promote breast cancer screening.^{1, 2} [OMIT CURBOW ET AL., 2004; OMIT LEGLER ET AL., 2002; INSERT LEWIN ET AL 2005] These include interventions that employ “peer advisors,” “lay health workers” or “natural helpers,” and are based on the premise individuals within one’s social network, are uniquely situated to provide information, role modeling and social support in order to reduce emotional and/or logistical barriers to screening participation.^{3–5} [OMIT BROWNSTEIN ET AL 1992; EARP ET AL., 1997; ENG & PARKER 2002]

Despite the intuitive appeal of this approach, relatively few studies have systematically examined the relationship between social network characteristics and breast cancer screening practices. Published studies have produced mixed results, with some finding evidence supporting^{6–16} [OMIT MONTANO 1991; GLANZ 1992; CHAMPION 1994; ADD SUAREZ 2000 (currently ref #5); ADD PASKETT et al., 2006] and not supporting^{21–23} [OMIT LERMAN 1990] a relationship between social network characteristics and mammography screening. With notable exceptions of intervention trials [ANDERSEN ET AL., 2000; DUAN ET AL., 2000; HOARE ET AL., 1994; SUNG ET AL., 1997; PASKETT et al 2006], existing studies are cross-sectional and can only establish a concurrent relationship between network characteristics and screening; they cannot rule out the possibility that the experience of being screened actually alters one’s perceptions regarding social network members’ support for and attitudes about this behavior. Moreover, most studies have explored singular features of social networks, either structural aspects (i.e., quantitative aspects or number of network members),¹¹ also referred to as “social integration”^{24, 25} or functional characteristics (e.g., emotional or instrumental support).^{6,11, 26} Simultaneous examination of multiple features of social networks is necessary to assess their relative salience and to elucidate their mechanisms of effect.

During the last decade, there has been a proliferation of social network interventions designed to promote breast cancer screening.¹ Reports of the efficacy of some of these interventions have been disappointing.^{27–31} Reviews of this subject^{2, 17, 32, 33} have found that, in comparison to other types of interventions (i.e., access-enhancing; systems-directed), social network interventions produce modest effects. This has led some researchers to question whether social network interventions are sufficiently effective to justify their use without incorporating other types of strategies.³⁴ The limited success of social network approaches may be due to insufficient intervention “dose”, ineffective “targeting” of the intervention, or inappropriate format or content of intervention strategies.^{27, 35} Unfortunately, empirical data regarding these issues is virtually absent. Indeed, there has been a call throughout the field of community interventions for more systematic and rigorous research on the mechanisms by which interventions do or do not exert the intended impact on health behaviors.^{35–37}

Previously, we assessed the relationship between social network characteristics (including social network size, social support and social influences) and mammography screening using baseline data collected as part of a worksite intervention study. In cross-sectional analyses, we found that social norms regarding screening (the perception that screening is normative among one’s peers) was associated with screening among women age 52+, after controlling for important socio-demographic and health care characteristics.³⁸ Here, we extend these analyses by using longitudinal data from the baseline and two-year follow-up assessments to evaluate the prospective relationship between social network characteristics and mammography screening practices among women aged 40 years and older.

Tenets from social cognitive theory^{39, 40}, Theory of Reasoned Action^{43, 44} and the Health Belief Model^{41, 42} form the conceptual framework for this study. Taken together, these theories suggest at least three mechanisms by which social network characteristics may influence breast cancer screening behaviors. First, social network size is likely related to exposure to individuals who have had breast cancer or who have been screened for the disease. It is plausible to assume that this exposure influences an individual's *awareness* about the disease, *perceived susceptibility*, as well as *perceived benefits* of early detection. Second, social support from network members, in the form of emotional support (nurturance, empathy), instrumental support (tangible aid or services) or informational support (advice, instruction) may influence an individual's sense of *self-efficacy* in overcoming emotional, logistical or financial barriers (*perceived barriers*) to mammography screening. Finally, social influence, meaning social network members' attitudes and practices related to breast cancer screening, and the individual's desire to gain social approval, may affect *perceived benefits* of screening, serve as *cues to action*, and provide *positive reinforcement* screening behaviors. Based on this framework, we hypothesized that: (1) social support and social influences were each independently predictive of breast cancer screening practices; and (2) a multifaceted peer-led intervention would result in an increase in perceived social support and positive social influences regarding screening.

METHODS

Data for this study were collected as part of the *Woman to Woman Study*, a four-year randomized controlled trial designed to evaluate the impact of a worksite-based breast and cervical cancer education project. Study methods have been described in detail elsewhere.^{38, 45} Briefly, 26 Massachusetts worksites, ranging in size from 250 to 2,800 employees, were recruited and randomly assigned to intervention or comparison groups. Eligible sites were those with more than 60 women employees age 40 or over, union representation among some segment of the workforce, and those within 90 minutes of the study center. Sites in the intervention group received a 16-month intervention designed to increase utilization of mammography, clinical breast examinations, and Pap tests.²⁷ Interventions were led by peer health advisors--women employees recruited and trained to conduct small group education sessions and one-to-one outreach among their co-workers. Participating worksites included health care facilities, state agencies and state universities. The study was conducted in partnership with the Service Employees International Union. Study protocols were reviewed and approved by the Institutional Review Board at the Dana-Farber Cancer Institute. Baseline and follow-up data were collected in 1996 and 1998, respectively.

Sample

A stratified random sample of eligible employees was selected from employee rosters. The sample was stratified by age, since mammography screening recommendations current at the time of baseline data collection^{46, 47} varied by age (40–49 vs. 50+). Stratum 1 included women age 40–51, while Stratum 2 included those 52 and above. Strata were defined in this way so as to allow retrospective examination of a two-year screening history among the older age group. Eligible women were those who met the age criteria and who worked on a permanent basis for more than 15 hours per week. In sites with more than 100 eligible women, a random sample was taken within stratum. In sites with less than 100 eligible women, a survey was conducted of a census of women employed in these worksites.

Two independent cross-sectional samples were taken, one at baseline (n = 2,943, mean worksite response rate = 72%) and one two years later (n = 2,747, mean worksite response rate = 66%), following completion of the intervention program. Analyses for this report include the embedded cohort; the 1475 women who completed both baseline and follow-up assessments. This cohort represents 50% (1475 out of 2943) of the original baseline sample,

due mainly to the relatively low sampling fraction in participating sites (i.e., the high percentage of eligible participants, relative to the number of participants sampled).

Data Collection

Data collection methods have been described previously.^{38, 45} Self-administered surveys, which were distributed through inter-office mail or in a small group setting, were completed on work-time. Survey respondents were eligible to win monetary incentives. The baseline survey was conducted prior to initiation of the intervention; the follow-up survey was conducted at the conclusion of the intervention.

Measures

The primary intervention objective of the larger randomized trial was to increase adherence to breast cancer screening guidelines of major medical organizations^{46, 47} current at the time of data collection. Therefore, the primary outcome variable for the trial was defined as having a mammogram within the previous two years by the time of the follow-up assessment. This definition included women who: (1) had not had a recent mammogram at baseline, but had one by follow-up; and (2) were in adherence with screening guidelines at baseline and remained in adherence at follow-up. Mammography history was assessed by asking year of most recent screening mammogram.

Social network measures have been described elsewhere.³⁸ Briefly, network size was assessed using a sub-set of items that were adapted from Berkman's Social Network Index.²⁴ Respondents were asked to report the number of friends, family members or co-workers with whom they felt close, could talk to, or call on for help. Midpoints of response categories (none, 1–2, 3–5, 6–9, 10+) were summed to create a continuous social network size index, with scores ranging from 0 to 30 (higher scores indicating greater network size).

Social support items were taken from the MacArthur Successful Aging Study survey.⁴⁸ Perceived availability of general emotional, instrumental and informational support was assessed (e.g., "How often do persons close to you make you feel loved and cared for?"). Three additional items were created to assess perceived availability of support specifically related to breast cancer screening. The first item measured emotional support ("How often are persons close to you willing to listen to you when you need to talk about specific health problems or concerns, such as breast symptoms or mammography?"). The second measured instrumental support ("How often can you count on persons close to you to help you make and keep medical appointments (such as appointments for mammograms), by doing things such as giving you a ride, or by taking care of other family members while you are away?"). The third measured informational support ("How often do persons close to you give you advice or information about health problems, such as breast cancer?"). Perceptions regarding support were rated using a four-point scale (never or no need=0, rarely=1, sometimes=2, frequently=3). Responses were summed and divided by the total number of items completed to form a composite measure of social support. Possible scores ranged from 0 to 3, with higher scores indicating greater perceived availability of social support (Cronbach's alpha = 0.70).

Social influences included the following components: (a) subjective norms, defined as the extent to which social network members approved of mammography (5-point Likert scale ranging from strongly approve to strongly disapprove), multiplied by degree of influence these attitudes had on screening behaviors (5-point Likert scale ranging from very much to not at all) (total scores could range from 8 to –8 with higher scores indicating strong positive norms); (b) encouragement of mammography, defined as the recommendation by network member to have a mammogram (y/n); and (c) social norms, beliefs about the

proportion of age-peers who undergo regular mammography screening (ranging from 0 = “don’t know”; 3 = “most”).^{9, 49}

Additional survey items measured health care access, personal and family history of breast cancer, and selected socio-demographic characteristics.

Analysis—Analyses included women in the embedded cohort (n=1475). Descriptive statistics were used to characterize the socio-demographic characteristics of the study cohort. Bivariate associations between socio-demographic characteristics, social network characteristics, and mammography screening practices were examined using t-tests and chi-square statistics. Multiple logistic regression analyses were then undertaken to evaluate the impact of social network characteristics on mammography screening, while controlling for important covariates. Covariates included in the multivariate modeling were those that demonstrated statistically significant relationships with mammography in bivariate analyses ($p < 0.05$), and those relevant to the study’s conceptual framework. All analyses include worksite cluster (as an example of “natural social groupings”) as a random effect, since the worksite was the unit of recruitment, randomization and intervention. In addition, intervention arm was also controlled in each of the analyses.

RESULTS

Socio-Demographic Characteristics

Table 1 presents selected characteristics of the cohort. Women in the sample were predominantly white, had at least a high-school education, reported household incomes greater than \$50,000, and were married. The vast majority of women (99%) reporting having health insurance (data not shown). Women in age Stratum 1 (< 52 years) had significantly higher levels of income and education, were more likely to have professional jobs, and were more often married than women in age Stratum 2. There were no significant socio-demographic differences between women in intervention and comparison worksites at baseline, nor were there significant differences between women in the cross-sectional sample at baseline (n = 2,943) and women in the cohort (data not shown).

Adherence to Screening Guidelines

At baseline, 84% of the cohort had received a mammogram within the previous two years. Women age 52 and over were more likely to have been screened than women between the ages of 40 and 51 (90% vs. 78% respectively). Of the women who reported a recent mammogram at baseline, 96% remained in adherence with guidelines at the two-year follow-up. Among the 219 women who were not in adherence with screening guidelines at baseline, 122 (56%) underwent mammography screening by follow-up (57% in the intervention group; 55% in the comparison group; $p > 0.05$).

Associations between adherence to mammography guidelines at final and selected characteristics at baseline are presented in Table 2. Having a recent mammogram at baseline was by far the strongest predictor of having a recent mammogram at follow-up; the odds of having had a recent mammogram at follow-up were 17 times greater in age Stratum 1 and 37 times greater in Stratum 2, when comparing women who had a prior recent mammogram with those who had not. Having a physician recommend a mammogram was also strongly associated with screening participation. For women in Stratum 2, being married was associated with a decreased likelihood of having a recent mammogram.

Social Network Measures

Table 3 shows associations between baseline social network measures and adherence with mammography screening guidelines at final. Among women in both strata, subjective norms and social norms were associated with recent screening. For women in Stratum 1, being encouraged to have a mammogram by a member of one's social network was associated with an increased likelihood of recent screening. Among older women, social support was related to recent screening.

Multivariate Analyses

Logistic regression odds ratios and 95% confidence intervals of adherence to mammography guidelines at follow-up by the age stratum are presented in Table 4. The first model for each age stratum includes all of the variables that were significant in bivariate analyses, except recent mammogram at baseline. This variable was omitted as previous mammogram experience was so highly predictive of subsequent mammography, that controlling for it left no variability to be explained by other variables. Since our primary analytic goal was to assess the importance of the social network variables on screening, we elected to continue modeling without this variable. In the first model for Stratum 1, the odds ratio for social norms was attenuated (1.29 to 1.11) with confidence intervals that overlapped the null. After eliminating the social norm variable from the model, associations between subjective norms and encouragement norms remained significant, controlling for age and provider recommendation. In Stratum 2, the odds ratios for social support and subjective norms were diminished with adjustment for other variables. Removing these social network variables from the model resulted in a modest increase in the association between social norms and screening adherence (1.38 to 1.46), controlling for marital status and provider recommendation.

Changes in Social Network Measures Between Baseline and Final

Table 5 shows social network measures at baseline and final, by age stratum. There were no changes in social network size. Social support, subjective norms and social norms increased significantly between baseline and final in both age groups. There was also a small increase in encouragement norms among women in the younger age group. However, these increases were not significantly different between treatment conditions.

DISCUSSION

Understanding the relationship between social network characteristics and mammography screening practices is vital to improving the efficacy of social network interventions. Although studies exploring associations between social network variables and screening exist in the literature, these are largely cross-sectional and limited to the examination of either structural or functional aspects of social networks. The goal of this analysis was to explore the prospective relationships between both structural (size) and functional (support, norms) social network characteristics, to better elucidate their mechanisms of effect. In addition, we sought to examine the extent to which our peer-led interventions actually produced changes in social network characteristics, as intended.

In these analyses, the strongest predictor of mammography utilization at follow-up was mammography utilization at baseline. Previous mammography use was so highly correlated with subsequent screening that little to no variability was left to be explained by other variables. As our objective was to assess the impact of social network characteristics on screening, we computed additional multivariate models to examine their relationship after removing the impact of baseline screening status. We found that after controlling for significant demographic and health care factors, social influence variables predicted

adherence to screening guidelines, but their effect was relatively modest. For women ages 40–51, the perception that family and friends approved of mammography (positive subjective norms) was associated with a doubling in odds of having a recent mammogram, as compared with women who did not perceive such approval. Women in this age group who reported explicit encouragement from family or friends to undergo mammography were also more likely to have had a recent mammogram, though this relationship was modest. For women age 52+, the perception that screening is normative among one's age group was associated with nearly a 50% increase in the likelihood of recent mammography. Neither social support nor social network size was associated with screening practices in either age group, after controlling for other important factors.

Though measures of social network size remained relatively stable, we found that perceived social support and positive social influences were higher at follow-up than at baseline among women in both age groups. These changes were observed in *both* intervention and comparison conditions, however, with no significant differences by treatment arm (data not shown). As previously reported,²⁷ the Woman to Woman intervention did not result in significant increases in adherence to breast cancer screening guidelines beyond the secular trend. Other factors that may have contributed to the limited impact of Woman to Woman interventions include the high level of screening participation at baseline and ineffective targeting of the intervention to those most in need.

Prior to a discussion of implications of study findings, limitations of these data must be noted. First, this was a relatively homogeneous sample of women which limits the generalizability of findings. This sample was predominantly white, insured, educated, had high levels of income, most were employed in professional jobs, and had health insurance. Therefore, it seems reasonable to assume that they had relatively good financial access to mammography services.

Despite our efforts to target those most in need of intervention, it is evident that we were not as successful as we had hoped. Second, we relied on women's self-reported mammography dates. Available evidence suggests that women tend to underestimate the time since last mammogram,^{50–53} resulting in the potential for over-reporting of screening adherence. Since these data were collected during the height of the controversy regarding appropriate screening intervals, it is possible that expanded media coverage of the debate may have prompted increased or decreased reporting of screening behaviors. Third, we did not assess the source of social support or influence. It may be that support and influence from family members has a different impact on health behaviors than that supplied by co-workers or peer advisors. It is assumed that peer health advisors provide emotional support, provide tangible aid to reduce logistical barriers to access of care, and disseminate information to those who might not otherwise have access. Studies of lay/peer health advisors have employed myriad strategies for identification and recruitment of these individuals. Some have used formal mechanisms, such as social network analysis to identify those at the 'center' of existing social circles [REFS]. However, the majority of published studies have used informal strategies to identify individuals to serve in this capacity. For example, peers or key informants are asked to identify individuals who are highly respected, credible, influential, and have the ability to reach within and across networks to provide information and support [REFS]. In the latter situation, it is not entirely clear that these individuals are actually proximal links within social networks of the intended audience. If this is the case, it is possible that the modest (or absent) intervention effects found in social network intervention studies for mammography reflect the 'looseness' of the ties, and that future research should aim to ensure that advisors are more tightly linked with the networks targeted by the intervention. Finally, due to the nature of sampling and in this study, it is possible that adherence to mammography guidelines for women age 40 has been underestimated. A

woman age 40 at baseline may not have had an opportunity to obtain a mammogram. In our algorithm for ‘adherence to guidelines’, she would have been classified as ‘non-adherent.’ Such misclassification would bias the hypothesis toward the null; that is, the impact of social network characteristics for this age group would have been underestimated.

Despite these limitations, our findings can provide information for the development of future interventions based on a social network model. Clearly, these data suggest that targeting interventions to those who have underused mammography services in the past is of paramount importance. That being said, our findings suggest that family members and friends might play an important role in promoting screening behaviors among women between 40 and 51. For women in this age range, mammography is presumably a relatively new behavior, given that medical guidelines call for initiation of screening at age 40. Interventions that prompt family or friends to encourage mammography, for example by sending “mammo-grams” or annual birthday reminders, may serve as cues to action. Strategies that encourage family members or friends to express explicit approval for the behavior, by providing encouragement to have regular mammograms, may provide necessary positive reinforcement. For women age 52 and over, fostering a belief that most women undergo annual mammography might be accomplished through testimonials from influential network members, scheduling mammography appointments on a mobile mammography van at the worksite, or creating public service announcements that feature women talking about how they have made mammography a “habit.” One published study found that such community activities designed to promote social norms supportive of screening prevented “relapse” (discontinuation of annual screening) among women age 50 and over who had had previous mammograms.²⁸ The strong association between a provider recommendation of mammography and subsequent screening behavior, which has been consistently demonstrated in the literature,^{26, 54–57} also suggests that interventions be directed at providers, or include prompts for women to discuss mammography with their providers.

Our findings are preliminary and additional research to better understand the impact of social network characteristics on screening practices is certainly warranted. In particular, exploration of these relationships among more diverse populations and those with lower utilization of screening is needed. It has been suggested that social support may be less important for individuals with higher levels of income, because these individuals experience fewer barriers to access of services and have greater means to overcome them without the assistance of others.²⁰ It is also possible that these relationships are influenced by cultural contexts. For example, larger social networks and more frequent social contacts have been associated with higher breast cancer screening rates among African American^{12, 13} and Hispanic¹⁵ women. Our data also suggest that the impact of social forces may differ by age.

It should be noted that an understanding of the social network factors that are prospectively related to screening does not translate directly to knowledge of how to intervene effectively. The changes we observed in social network characteristics over a 16-month period were relatively minor, despite the intensive intervention efforts of peer health advisors. Moreover it was clear that previous mammography experience was by far the strongest predictor of screening in this sample. Future interventions will benefit from additional formative research and process evaluations to identify more effective strategies to target those who have underutilized mammography, and subsequently, to impact their screening behaviors through social networks. In addition, given the modest impact of social network interventions in general, combined intervention approaches should be explored.^{1, 2, 32}

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Table 1

Baseline Characteristics of Imbedded Cohort By Age Stratum and Intervention Arm, Woman to Woman Study
(n = 1475)

	Stratum 1 (Ages 40–51)		Stratum 2 (Ages 52+)	
	Intervention (n = 385)	Comparison (n = 377)	Intervention (n = 363)	Comparison (n = 350)
	%	%	%	%
Education	(n = 374)	(n = 366)	(n = 344)	(n = 337)
HS or Less	16	17	28	32
Post HS/Some College	28	26	33	29
College	29	27	13	18
Graduate School	27	30	26	21
Job Category	(n = 377)	(n = 368)	(n = 350)	(n = 334)
Craft, labor, maintenance, service	2	5	5	6
Clerical, administrative support, sales	20	15	30	31
Technical, paraprofessional	8	6	8	4
Professional, clinical, managerial or administrative	68	71	54	52
Other	2	2	4	7
Household Income	(n = 360)	(n = 353)	(n = 338)	(n = 326)
< \$29,999	13	16	21	22
\$30,000–\$49,999	31	31	31	38
> \$50,000	57	53	48	40
Marital Status	(n = 380)	(n = 373)	(n = 359)	(n = 343)
Married/Living as married	62	61	52	58
Other	38	39	48	42
Race/Ethnicity	(n = 379)	(n = 371)	(n = 352)	(n = 340)
White/Anglo	85	87	87	90
Other/Hispanic	15	13	13	10

* Column n's vary due to missing data

** Columns may not sum to 100% due to rounding

Table 2

Frequency of Recent Mammogram at Final and Odds Ratios* by Baseline Characteristics and Sample Stratum, Woman to Woman Study

	Recent Mammogram (within past 2 years)				
	Total	n	%	p-value	OR CI
Stratum 1 (ages 40–51)					
Study Arm				0.82	
Intervention	380	329	87		0.94 (0.58, 1.55)
Comparison	367	321	88		1.00
Recent Mammogram at Baseline				<0.0001	
Yes	547	523	96		17.1 (10.4, 28.2)
No	154	87	57		1.00
Education				0.24	
HS or Less	119	97	82		0.55 (0.29, 1.03)
Post HS/Some College	197	169	86		0.77 (0.43, 1.39)
College	201	177	88		0.94 (0.51, 1.72)
Graduate School	209	186	89		1.00
Job Category				0.29	
Professional, clinical, managerial or administrative	508	446	88		1.27 (0.81, 2.00)
Other	222	189	85		1.00
Household Income				0.19	
< \$29,999	101	89	88		0.91 (0.46, 1.79)
\$30,000–\$49,999	214	180	84		0.64 (0.40, 1.04)
> \$50,000	384	342	89		1.00
Marital Status				0.78	
Married/Living as married	456	394	86		0.94 (0.60, 1.46)
Other	282	247	88		1.00
Race/Ethnicity				0.90	
White/Anglo	635	552	87		1.00
Other/Hispanic	101	89	88		1.04 (0.55, 1.98)
Self-Rated Health Status				0.96	
Excellent	213	185	87		1.04 (0.61, 1.78)

	Recent Mammogram (within past 2 years)				
	n	n	%	p-value	OR CI
Very Good	293	256	87		1.07 (0.65, 1.77)
Good/Fair/Poor	239	207	87		1.00
Family History of Breast Cancer				0.16	
Yes	94	86	92		1.70 (0.81, 3.57)
No	650	563	87		1.00
Provider Recommendation				<0.0001	
Yes	609	559	92		5.66 (3.57, 8.99)
No	130	86	66		1.00
Stratum 2 (ages 52+)					
Study Arm				0.46	
Intervention	351	323	92		0.74 (0.34, 1.62)
Comparison	346	325	94		1.00
Recent Mammogram at Baseline				<0.0001	
Yes	565	552	98		37.1 (17.7, 77.8)
No	65	35	54		1.00
Education				0.44	
HS or Less	201	184	92		0.52 (0.22, 1.20)
Post HS/Some College	207	192	93		0.62 (0.26, .47)
College	102	96	94		0.81 (0.28, 2.28)
Graduate School	156	149	96		1.00
Job Category				0.69	
Professional, clinical, managerial or administrative	352	328	93		0.89 (0.49, 1.59)
Other	316	297	94		1.00
Household Income				0.77	
< \$29,999	138	126	91		0.77 (0.38, 1.58)
\$30,000–\$49,999	226	211	93		0.92 (0.47, 1.77)
> \$50,000	285	268	94		1.00
Marital Status					
Married/Living as married	376	361	96		2.66 (1.48, 4.79)

	Total		Recent Mammogram (within past 2 years)			
	n	n	%	p-value	OR	CI
Other	310	279	90		1.00	
Race/Ethnicity				0.56		
White/Anglo	598	554	93		1.00	
Other/Hispanic	78	73	94		1.31	(0.53, 3.22)
Family History of Breast Cancer				0.26		
Yes	98	94	96		1.74	(0.67, 4.56)
No	591	548	93		1.00	
Self-Rated Health Status				0.63		
Excellent	198	184	93		0.72	(0.35, 1.47)
Very Good	269	249	93		0.77	(0.40, 1.48)
Good/Fair/Poor	225	211	94		1.00	
Provider Recommendation				<0.0001		
Yes	610	580	95		5.28	(2.84, 9.81)
No	79	61	77		1.00	

* Controlled for intervention arm and worksite cluster

Table 3

Mean Social Network Measures at Baseline with Odds Ratios* for Association with Recent Mammography at Final, by Age Stratum

	Stratum 1 (40–51)				Stratum 2 (52+)			
	n	Mean	OR	p-value	n	Mean	OR	p-value
Network Size	740	10.50	1.01		687	11.20	1.03	
Social Support	739	1.97	1.26		683	1.90	1.94	+
Social Influences:								
Subjective Norms	741	2.93	1.16	+	690	3.45	1.18	+
Encouragement (% yes)	742	48	1.64	+	685	49	0.98	
Social Norms	743	1.67	1.29	+	695	2.04	1.50	+

* Controlled for intervention arm and worksite cluster

+ p < 0.05

Table 4

Odds Ratios* and 95% Confidence Intervals for Association Between Social Network Measures at Baseline with Recent Mammogram at Final: Multiple Logistic Regression Models*

Characteristic	Model 1		Model 2	
	OR	95% CI	OR	95% CI
Stratum 1 (40–51)	n = 727		n = 727	
Intervention Arm				
Intervention vs. control	1.06	0.63 1.78	1.06	0.63 1.79
Age Group				
50–51 vs 40–49	2.35	0.98 5.63	2.46	1.03 5.91
Provider Recommendation				
Yes vs. no	5.51	3.40 8.95	5.69	3.52 9.22
Subjective Norms				
+ 1 unit	1.16	1.05 1.29	1.18	1.06 1.30
Encouragement				
Yes vs. no	2.24	1.36 3.67	2.20	1.34 3.61
Social Norms				
+ 1 unit	1.11	0.91 1.36		
Stratum 2 (52+)	n = 665		n = 678	
Intervention Arm				
Intervention vs. control	0.72	0.35 1.47	0.79	0.37 1.69
Marital Status				
Married vs. not married	2.39	1.22 4.65	2.54	1.38 4.67
Provider Recommendation				
Yes vs. no	4.94	2.50 9.77	4.86	2.59 9.13
Social Support				
+ 1 unit	1.23	0.69 2.19		
Subjective Norms				
+ 1 unit	1.07	0.94 1.23		
Social Norms				

Characteristic	Model 1		Model 2	
	OR	95% CI	OR	95% CI
+ 1 unit	1.38	1.05 1.81	1.46	1.16 1.84

* Controlled for worksite cluster; analyses include all women with complete (non-missing) data on all variables in the model

Table 5

Adjusted* Mean Social Network Measures at Baseline and Final by Age Stratum

	Stratum 1 (40–51)			Stratum 2 (52+)		
	Baseline	Final	p-value	Baseline	Final	p-value
Network Size	10.6	10.3	0.09	11.3	11.0	0.17
Social Support	1.97	2.22	0.0001	1.90	2.25	0.0001
Social Influences						
Subjective Norms	2.95	3.21	0.005	3.44	3.65	0.05
Encouragement (% yes)	81	86	0.007	89	89	0.73
Social Norms	1.67	1.98	0.0001	2.04	2.17	0.003

* Adjusted for intervention arm and worksite cluster