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Reducing Muslim Mammography Disparities: Outcomes From a Religiously Tailored Mosque-Based Intervention

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Abstract

Objective.—To describe the design of, and participant-level outcomes related to, a religiously tailored, peer-led group education program aimed at enhancing Muslim women’s mammography intention.

Method.—Using a community-engaged approach and mixed methods, we identified and addressed barrier beliefs impeding mammography screening among Muslim American women. Our religiously tailored, mosque-based, peer-led intervention involved facilitated discussions and expert-led didactics conveying health-related religious teachings, and information about the benefits and process of mammography. Barrier beliefs were addressed through reframing, reprioritizing, or reforming such beliefs. Participant surveys were collected preintervention, postintervention, 6 months postintervention, and 1 year postintervention. These measured changes in mammography intention, likelihood, confidence, and resonance with barrier and facilitator beliefs.

Results.—A total of 58 Muslim women (mean age = 50 years) that had not had a mammogram in the past 2 years participated in the two-session program. Self-reported likelihood of obtaining a mammogram increased significantly ($p = .01$) and coincided with a positive trend in confidence ($p = .08$). Individuals with higher agreement with barrier beliefs preintervention had lower odds for positive change in likelihood (odds ratio = 0.80, $p = .03$), while those who were married had higher odds for positive change in likelihood (odds ratio = 37.69, $p = .02$). At 1-year follow-up, 22 participants had obtained a mammogram.

Conclusion.—Our pilot mosque-based intervention demonstrated efficacy in improving Muslim women’s self-reported likelihood of obtaining mammograms, and increased their mammography utilization, with nearly 40% obtaining a mammogram within 12 months of the intervention.

Impact.—Our conceptual model for religiously tailoring messages, along with its implementation curriculum, proved effective in enhancing the likelihood and receipt of mammograms among Muslim American women. Accordingly, our work advances both the theory and practice of faith-

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based interventions and provides a model for addressing Muslim women's cancer screening disparities.

Keywords

community-based participatory research; health education; health promotion; religion and health; religious tailoring

Although decreasing, breast cancer death rates for women in the United States remain second only to lung cancer (Breastcancer.org, 2017). As the 5-year survival rate at early stages is better than at later stages, the health benefits of routine mammography are largely attributable to increased early-stage detection (Brawley, 2012; DeSantis, Siegel, Bandi, & Jemal, 2011; Freedman et al., 2003; Maurer Foundation, 2017). Certainly, breast cancers detected at an earlier stage have a reduced morbidity and mortality (Fuller, Lee, & Elmore, 2015; Leung, 2005). Consequently, the Centers for Disease Control and Prevention (CDC) has set a goal that 81% of U.S. women aged 50 to 74 receive guideline-appropriate mammograms by 2020 (Healthy People 2020, 2012). To reach this aim, racial/ethnic minority communities have been targeted for behavioral interventions because mammography rates remain disproportionately low in these populations (American Cancer Society, 2017a, 2017b; Komen, 2017; U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, & National Center for Health Statistics, 2016).

American Muslims, a racially and ethnically diverse group, have rates of mammography utilization lower than the national average and the CDC's target (Boxwala, Bridgemohan, Griffith, & Soliman, 2010; Hasnain, Menon, Ferrans, & Szalacha, 2014; Kobeissi, Samari, Telesca, Esfandiari, & Galal, 2014; Salman, 2012; Schwartz, Fakhouri, Bartoces, Monsur, & Younis, 2008; Shirazi, Bloom, Shirazi, & Popal, 2013). For example, a survey of 207 immigrant Muslim women in Chicago found 52% to have had a mammogram in past 2 years, but a third never had a mammogram (Hasnain et al., 2014). Our survey of 240 Muslim women in Chicagoland similarly revealed 37% having not obtained a mammogram within the prior 2 years (Padela et al., 2015). Likewise, a study of 50 Muslim Afghan American women reported 66% had mammograms (Shirazi et al., 2013), and a prevalence study among 319 Iranian immigrants in California found 74% to have had a mammo-gram in the past year (Kobeissi et al., 2014).

Studies examining mammography disparities note several different screening barriers in this population, including a range of access-related barriers, such as a lack of health insurance and/or primary care providers (Hasnain et al., 2014; Padela et al., 2016; Salman, 2012; Shirazi, Champeau, & Talebi, 2006), limited English proficiency (Al-Amoudi, Cañas, Hohl, Distelhorst, & Thompson, 2015; Shirazi et al., 2006), and limited health literacy (Ahmad & Stewart, 2004; Hasnain et al., 2014; Salman, 2012; Shirazi et al., 2006). These barriers make it difficult to obtain a mammogram even if individuals desire to, and can reduce perceived behavioral control and self-efficacy as described in behavioral theories such as the theory of planned behavior (TPB), the health belief model (HBM), and social cognitive theories of behavior change (Ajzen, 1991, 2011; Bandura, 2001; Janz & Becker, 1984).

Religion-related barriers to breast cancer screening are also varied. For example, the belief that worship-related practices are a viable means of disease prevention may lead some to forego mammograms and other health care-based methods of cancer screening (Al-Amoudi et al., 2015; Padela et al., 2016; Salman, 2012). Religious ideas that God controls disease, as noted by some Muslims, may serve to counter the benefits of mammography within the community (Bottorff et al., 1998; Padela et al., 2016). Conceptually, such beliefs can be viewed as mitigating an individual's perceived seriousness, susceptibility, and threat related to breast cancer (as in the HBM model). Religious values of, and responsibilities toward maintaining, modesty are widely reported to deter some Muslims from receiving mammograms, as they disapprove of uncovering their bodies in front of males, and also fear having male technicians (Al-Amoudi et al., 2015; Bottorff et al., 1998; Padela et al., 2016; Rajaram & Rashidi, 1999; Saadi, Bond, & Percac-Lima, 2011; Salman, 2012). Additionally, ideas of modesty might influence women's reluctance to discuss breast health and breast cancer, even with family or friends, as female anatomy might be considered a taboo topic (Al-Amoudi et al., 2015; Bottorff et al., 1998; Padela et al., 2016). These barriers are normative beliefs (in the TPB), and addressing them through faith-based messaging could lead to changes in attitudes and behavioral intentions.

Beliefs that mammograms are painful (Al-Amoudi et al., 2015; Saadi et al., 2011) and fear of an abnormal mammo-gram (Bottorff et al., 1998) can be additional barriers to breast cancer screening among Muslim women (Padela et al., 2016). These beliefs can inform individuals' attitudes toward breast cancer (as in TPB) and can be considered a psychological cost associated with mammography and thus a perceived barrier (as in HBM). Prioritizing the well-being of family members over one's own well-being is also a reported obstacle to screening that informs an individual's subjective norm (as in TBP; Bottorff et al., 1998; Padela et al., 2016; Shirazi et al., 2013). Behavioral beliefs about breast cancer can affect both perceived benefits of screening and perceived costs of not screening and can potentially enhance attitudes toward and likelihood of screening, especially when knowledge of breast cancer is linked with knowledge on health behaviors supported by Islam. Last, lack of sufficient knowledge about breast cancer is a known barrier to mammography (Al-Amoudi et al., 2015; Shirazi et al., 2006; Shirazi et al., 2013)

Subsequently, to address these barriers and develop interventions that improve mammography rates among Muslim Americans, it is essential to explore strategies that have been effective in other racial/ethnic minority groups, such as the use of culturally appropriate and easily accessible information and the utilization of peer educators (Brownstein, Cheal, Ackermann, Bassford, & Campos-Outcalt, 1992; Crawford, Frisina, Hack, & Parascandolo, 2015; Garza et al., 2005). Research among Muslims supports the acceptability of such strategies in mosque settings (Bader, Musshausser, Sahin, Bezirkan, & Hochleitner, 2006; Banerjee et al., 2017; Rashid et al., 2014). Additionally, faith-based messaging that highlights that Islam encourages cancer screening may also enhance mammography uptake (Pratt et al., 2017). Indeed, our formative work confirmed the acceptability of using religious messages and the utility of mosque-based health behavior interventions in this community (Padela, Malik, & Ahmed, 2017; Vu, Muhammad, Peek, & Padela, 2017). Our studies also identified group education classes and peer educators as the

preferred mode of discussing women's health in mosques (Vu et al., 2017). Thus, all these techniques were used in our intervention (described below).

We hypothesized that beliefs that were barriers to mammography could be addressed by a religiously tailored approach to message design (described in the Method section) that was both *faith-based* (i.e., authentically rooted in religious beliefs and values) and also *faith-placed* (i.e., located in mosques). This article presents participant-level outcomes from this religiously tailored, mosque-based, peer-led group education program.

Method

The present study was part of a larger community-engaged research program that involved the identification of barriers to mammography screening among Muslim women, the religious influences on their screening attitudes, and the design of a religiously tailored, group education intervention to address those barrier beliefs. A multisectoral and multidisciplinary community advisory board (CAB) comprising community leaders from mosques and community organizations oversaw the project. For the purposes of this article, it is important to note that CAB members and research staff collaboratively designed the religiously tailored messages as well as the intervention curriculum through which these messages would be deployed. Together, we also identified peer educators, guest lecturers, and mosque sites for implementation. The project was approved by the Institutional Review Board of the Biological Sciences Division at the University of Chicago.

Peer Educator Recruitment and Training

Potential peer educators were identified from mosques and CAB networks. Selection criteria included being English-speaking, Muslim, female, older than 40 years, and of either Arab or South Asian backgrounds to maximize identity concordance with the class participants. Candidates subsequently underwent a screening phone call to assess their eligibility and interest in participating. After informed consent was obtained, candidates were asked to attend a two-session training course, which focused on developing skills in group facilitation and discussion moderation. Additionally, potential peer educators learned about breast cancer screening disparities, relationships between religion and health, health care access, and research ethics.

Intervention Design

The intervention consisted of a two-class program led by peer educators and also incorporated expert-led didactics. Peer educators facilitated group discussions while guest lecturers taught about mammography, conveyed Islamic teachings about health, and provided resources for accessing mammography. The intervention was conducted over a period of 7 1/2 hours and held on Saturday mornings (see Table 1 for course details).

The TPB (Ajzen, 1991) informed data collection and the measurement of behavior change. Specifically, barrier and facilitator beliefs to mammography (elicited through focus groups and interviews with Muslim women with similar backgrounds to the target population in prior phases of research) were categorized according to the behavioral, normative, and control domains of TPB in previous phases of the project (Padela et al., 2016; see Table 2).

These belief structures were used in the design of tailored messages to address barrier beliefs (as noted below). Our primary behavioral target was also based on the TPB: improved perceived intention for obtaining a mammogram.

Barrier beliefs were addressed through the 3R model for developing tailored messages: (a) Reframing—introducing a new way of thinking about the belief that is consonant with the desired health behavior (mammography uptake) (b) Reprioritizing—introducing a new “facilitative” belief that coheres with the target behavioral outcome (increased intention for mammograms) and reinforcing this belief through repetition so that it comes to have higher valence among participants than the barrier belief, and (c) Reforming—confronting the barrier belief head on by pointing out theological misunderstandings or logical flaws within the belief (Padela, Malik, Vu, Quinn, & Peek, 2018).

Together with the CAB members, religiously tailored messages that addressed each of the barrier beliefs were developed and incorporated into the group education curriculum. Each message was delivered in multiple ways and in multiple sessions. For example, the barrier belief that mammograms are painful was addressed using the tailored strategies of reframing and reprioritizing. The reframing message communicated, “The pain incurred on the path to completing a good deed (e.g., caring for my body) is rewarded by God,” while the reprioritization strategy communicated one’s stewardship responsibility toward the body. Notably, we had previously found this belief to facilitate mammography screening among Muslims (Padela et al., 2018). The barrier belief that breast cancer screening is not important because God will decide who will get cancer was addressed by employing the reprioritizing and reforming techniques. The reprioritized message was, “While it is by God’s will that I am sick or cured, it is my responsibility to take care of my health, both physically and spiritually,” and the reform-based message was, “Human actions do have an effect upon ‘fate’ and they are judged irrespective of the ultimate outcome achieved.” These messages were delivered by a female religious scholar during a didactic session and reinforced in group discussions (Padela et al., 2018).

Group Education, Subject Recruitment, and Class Setting

Participants were recruited from mosques and community events through flyers and recruitment tables. The inclusion criteria were (a) self-identified Muslim women, (b) no history of breast cancer, (c) no mammogram in the past 2 years, (d) age between 40 and 74 years, and (e) English fluency. Classes were held at two mosque sites: one having a predominantly South Asian congregation and the other a predominantly Arab one. These mosques were selected because they catered to different ethnic populations; they were geographically distant from one another (greater than 40 miles) enabling us to ensure that participants did not interact with one another and received only a single “dose” of the intervention, and they had the requisite space to host classes.

Data Collection

Self-administered questionnaires collected participant data pre- and post-intervention. At 6 months and 1 year after the intervention, a phone call was placed to ascertain receipt of mammogram. The principal measures were as follows:

Primary Outcomes.—These included measures of intention, likelihood, and confidence in obtaining a mammogram. Question stems were, “I intend to get a mammogram within the next year,” “How likely is it that you will get a mammogram within the next year?” and “How confident are you that you will be able to get a mammogram within the next year?” Responses were recorded along a 5-point Likert-type scale that ranged from *very likely* to *not at all likely*. While TPB suggests that behavioral intention is the most proximate, and strongest predictor, of action (Ajzen, 1991, 2002), we also gathered data on behavioral likelihood and confidence because research suggests that these constructs take into account and measure external and physical barriers and self-efficacy more accurately (Armitage, Norman, Alganem, & Conner, 2015).

Secondary Outcome.—Mammography receipt at 6 months and 1 year postintervention.

Predictor Variables.—These included changes in level of agreement with barrier and facilitator beliefs, breast cancer screening knowledge, as well measures of fatalism, modesty, religiosity, and sociodemographic characteristics.

Barrier beliefs.—Using prior data from Muslim women respondents, barrier belief question stems were constructed to reflect salient ideas that problematized mammography intention (Padela et al., 2016). Question stems are noted in Table 2. Responses were recorded along a 4-point Likert-type agreement scale from *completely disagree* to *completely agree*.

Facilitator beliefs.—Facilitator beliefs comprised either (a) beliefs positively associated with mammography utilization from the aforementioned prior data, or (b) the opposite of a barrier belief (e.g., my health takes precedence over my family’s needs), or (c) a belief target based on a tailored message (e.g., I will be rewarded by God for the hardship I undergo to get a mammogram). Response categories took the same format as for barrier beliefs (see Table 2).

Fatalism.—We adapted a fatalism measure, the Religious Health Fatalism Questionnaire, for use with Muslim groups (Franklin, Schlundt, & Wallston, 2008). In our preliminary studies, a version of this measure was somewhat correlated with mammography practices among Muslims (Padela et al., 2015). Items from the Divine Provision and Destined Plan subscales of the Religious Health Fatalism Questionnaire were rephrased to include the word “Allah.” The number and phraseology of items were also revised based on expert panel review and cognitive pretesting during focus group discussions with 58 Muslims. This process yielded a nine-item measure with high levels of internal consistency reliability (Cronbach’s $\alpha = .78$) and face validity.

Modesty.—Given that notions of modesty are known to affect Muslim women’s mammography behaviors, we included a modesty measure in our survey assessment. The 10-item measure assessed attitudinal and behavioral aspects of Islamic modesty and was a refined version of our previously piloted tool (Padela et al., 2015; Vu, Azmat, Radejko, & Padela, 2016). In this version, we incorporated several items from a Jewish modesty measure (Andrews, 2011) and conducted cognitive pretesting during 13 focus groups with 58 Muslim

women to refine phraseology and item number. Sample question stems included “I always look for a female doctor for myself” and “My clothing demonstrates a commitment to Islamic modesty.” Responses were recorded using a 4-point Likert-type agreement scale. The measure was found to have high levels of internal consistency reliability (Cronbach’s $\alpha = .83$).

Breast cancer/mammography knowledge.—We assessed mammography guideline knowledge with a subset of questions from the Breast Cancer Knowledge test (McCance, Mooney, Smith, & Field, 1990). Three questions related to breast cancer screening were used and updated to reflect the American Cancer Society’s 2016 guidelines (American Cancer Society, 2017a). Participants were given a score between 0 and 3 depending on how many questions they were able to answer correctly.

Religiosity measures.—The Duke University Religion Index measure was used with slight modifications to question stems, replacing references to the *Divine* with the word *Allah*, the word *Bible* with *Quran*, and the word *religion/religious* to *Islam/Islamic* (Koenig & Bussing, 2010).

Positive religious coping.—This aspect of religiosity was measured using the seven-item positive religious coping subscale of the Psychological Measure of Islamic Religiousness (PMIR; Raiya, Pargament, Mahoney, & Stein, 2008). We changed question stems such that they referred to facing “a health problem” instead of life stressor. For example, the original PMIR question of “When I face a problem in life, I look for a stronger connection with God (Allah)” was changed to “When facing a health problem, I look for a stronger connection with God (Allah).” A 4-point Likert-type agreement scale assessed responses. In our prior work, this measure was negatively associated with Muslim women’s utilization of mammograms (Padela et al., 2015). The measure was found to have high levels of internal consistency reliability (Cronbach’s $\alpha = .96$).

Negative religious coping.—This aspect of religiosity was measured using the three-item PMIR–Punishing Allah Reappraisal subscale, which assesses the belief that obstacles in life are a result of God’s punishment (Raiya et al., 2008). We previously found this measure to be negatively associated with lower cervical cancer screening rates among Muslims (Padela, Peek, Johnson-Agbakwu, Hosseinian, & Curlin, 2014). Question stems were rephrased to refer to facing a health problem. For example, the original question of “When I face a problem in life, I feel punished by Allah for my lack of devotion” was rephrased to “When I face a health problem, I feel punished by Allah for my lack of devotion.” Responses were collected along a 4-point Likert-type scale of agreement. The measure was found to have high levels of internal consistency reliability (Cronbach’s $\alpha = .90$).

Sociodemographic variables.—Conventional descriptors including marital status, income level, educational status, race/ethnicity, and insurance status were obtained.

Statistical Analyses

Data Transformation.—For ease of analysis, and to avoid statistical error, response categories were collapsed into an adjacent category when they contained less than 5% of total observations. For ease of interpretation, and due to small numbers of observations in certain categories, marital status was dichotomized to married versus “Other” and ethnicity was dichotomized to Arab versus “Other,” with “Other” predominantly comprising South Asians.

Aggregate level of agreement with barrier beliefs and facilitator beliefs (a belief score) were created by summing individual participant responses to question sets (6 and 8 items, respectively). Single imputation was used to impute missing responses where participants had answered at least 70% of the items in the question set. Changed barrier and facilitator belief scores were calculated by subtracting the baseline scores from postintervention scores. Changed mammography knowledge was calculated in the same fashion by subtracting participants’ baseline score from their postintervention score.

Statistical Models.—A three-tiered analytic approach was used. The first set of analyses aimed at determining whether there were significant changes in pre–post intention, likelihood, and confidence to obtain a mammogram. These changes were evaluated using paired *t* tests. Final multivariable models (as described below) were generated only when there was significant change in these outcomes.

The next analysis sought to identify *baseline* characteristics that predict intervention success, that is, potential positive change in mammography intention, likelihood, and confidence. In other words, we wanted to identify characteristics that “prime” individuals for positive behavioral change. Simple ordered logistic regression models were used to evaluate the associations between the predictor variables and primary outcomes. Final, adjusted, multivariable ordered logistic regression models of the outcome measures contained any *baseline* characteristic that had a *p* value of less than .10 in the simple regression models.

The final set of analyses sought to determine whether belief (barrier or facilitator) structure changes contributed to a positive change in intention, likelihood, or confidence in obtaining a mammogram, while controlling for other measured predictors of the outcome. Stepwise regression, which included all relevant baseline variables except those that changed from pre- to postintervention where changed score variables were available (barrier and facilitator belief scores and breast cancer screening knowledge), was used to identify potential predictors of a positive change in outcome measures. Changed barrier and changed facilitator variables were chosen a priori to remain in the final regression models, regardless of *p* value, to satisfy the primary research question. For all other variables, *p* value to enter was set at .10 and the *p* value to stay set at .15.

As a secondary analysis, predictors of mammography receipt were explored to determine if baseline characteristics associate with mammography receipt using Fisher’s exact test.

Results

Sociodemographic Characteristics

Fifty-eight individuals participated in the study of which most were either South Asian (56%) or Arab/Arab American (35%). The mean age was 50.4 years, and most were married (89%) and had health insurance (73%; see Table 3). The participant pool evenly split with half (50%) never having gotten a mammogram and half (47%) having not obtained a mammogram in the past 2 years.

Association Between Sociodemographic Characteristics and Mammography Receipt

Of the 58 participants, 20 obtained a mammogram by 6-months follow-up and an additional two at 1 year. Notably, 11 individuals were lost to follow-up at 6 months and an additional 9 at 1 year. No significant differences in demographic profile were found between those lost to follow-up and those retained. Being older ($p = .01$) and having higher levels of educational attainment ($p = .01$) were associated with mammography receipt at 1 year (Table 4).

Assessment of Changes in Intention, Likelihood, and Confidence for Obtaining a Mammogram

Analyses between preintervention and postintervention responses demonstrated a statistically significant increase in perceived likelihood to obtain a mammogram (0.29, $p = .01$). While the average likelihood of receiving a mammography significantly increased immediately after the intervention among all 58 participants, that increase was sustained at 6 months among the 38 women who received a mammogram within 1 year of the intervention (0.30, $p = .05$). At 6-month follow-up, a trend toward increased confidence was also observed (0.32, $p = .08$; Table 5).

Baseline Characteristics Associated With Changed Likelihood to Receive a Mammogram From Pre to Postintervention

In a single, multivariate ordered logistic regression model that included all predictor variables associated with changed likelihood at the $p < .10$, being married was a significant positive predictor of likelihood change (odds ratio [OR] = 37.69, $p = .02$), while having a higher baseline agreement with barrier beliefs was associated with lower odds of increased likelihood (OR = 0.80, $p = .03$; see Table 6).

Predictors of Positive Changes in Likelihood Postintervention

A single, multivariate, stepwise, ordered logistic regression model revealed that being married was positively associated with behavioral change (OR = 22.16, $p = .02$). A paradoxical associative trend toward increased odds for a positive change in likelihood with increased agreement with barrier beliefs was also observed (OR = 1.14, $p = .08$; Table 7).

Discussion

Tailoring health messages to incorporate, and be consistent with, cultural frameworks of patient populations can improve intervention efficacy and potentially decrease health disparities (Kreuter, Lukwago, Bucholtz, Clark, & Sanders-Thompson, 2003; Shirazi,

Shirazi, & Bloom, 2015). Such messages leverage belief structures and worldviews common to individuals and shared by communities, and thus may resonate more deeply and be more persuasive than generic messages used to motivate behavioral change (Kreuter et al., 2005). Moreover, when certain values and beliefs appear to conflict with, or otherwise appear as barriers to, health care-seeking confronting these ideas through tailored messaging might be a viable strategy leading to durable behavioral change.

While Muslim Americans suffer from health disparities (Padela & Curlin, 2013; Padela & Raza, 2015), and their health frameworks, beliefs, and behaviors are strongly informed by religion (Yosef, 2008), there is scant research on religiously tailored interventions for this community. Indeed, there are few models delineating how to design tailored messages that address religion-related barriers, and few projects that implement religiously tailored interventions across the diversity of the Muslim American community. Our article addresses this knowledge and literature gap by confronting mammography screening disparities among Muslim Americans through a religiously tailored, mosque-based, peer-led, educational intervention.

While there has been some preliminary work on faith-based interventions in mosques (Banerjee et al., 2017), our approach innovated by deeply engaging religious community members and leaders, as well as faith values and identity. We recruited a CAB across different sectors to facilitate community knowledge informing program design and to enhance community receptivity to the program. We further trained and deployed ethnically and religiously concordant peer educators to generate greater relatability and trust with the intervention population, and to help build community capacity. With respect to attending to religious values and identity, we implemented the project within mosques where religious identity is communicated and used the 3R model to design messages that were theologically accurate. Moreover, we used religious scholars to deliver lectures on Islam and health and to correct misinterpretations of theology, for example, fatalism, to further embed the project within a religious context. In these ways our intervention moved messages from being simply *faith placed* to being holistically *faith based*. Accordingly, our work advances intervention science and practice in this community because most disparity research among Muslim Americans ignores religion (Padela & Raza, 2015), and most breast cancer screening interventions among Muslims have focused on enhancing access and cancer screening knowledge, not on tackling barrier beliefs related to religion (Ahmad & Stewart, 2004; Donnelly & Hwang, 2015).

With respect to our primary outcome of changed intention, likelihood, and confidence in obtaining a mammogram, there was a significant increase in perceived likelihood (0.29, $p = .01$) from pre- to postintervention. While we expected positive change in all three measures, there may be conceptual reasons that likelihood and *not* intention or confidence significantly changed. Some social psychologists assert that perceived intention records perceptions of behavioral ability without consideration of external barriers, and that likelihood measures an individual's expectation based on both internal and external factors (Armitage et al., 2015). Thus, they argue that although the TPB construct of intention incorporates notions of perceived behavioral control, measuring likelihood more completely accounts for potential external barriers to action (Armitage et al., 2015). In this model, likelihood is downstream

from intention because a person can intend to do an action but nonetheless perceive herself unlikely to actually perform the action. Confidence is related to both intention and likelihood as it is a measure of self-efficacy, again somewhat downstream to intention. Therefore, although an individual may have the intention to change, he or she might not be confident in the ability to perform the action. Research on the relationships and measurement overlap between perceived intention, confidence, and likelihood is needed, as our data do not clarify the pathway from intention to likelihood. The observation that perceived likelihood improved, but intention and confidence did not, suggests that the constructs do not fully overlap. It may also be that our intervention might have more significantly improved perceptions of external or control-related barriers than normative or behavioral ones, although we are disinclined to advocate this interpretation because our tailoring largely focused on normative and behavioral barrier beliefs. Regardless, our religiously tailored intervention was effective in improving overall perceived likelihood for, and receipt of, mammograms, and greater research is needed to clarify relationships between intention, confidence, and likelihood.

Notably there was a trend where individuals who increased in their level of agreement with barrier beliefs from pre-to postintervention, paradoxically, had higher odds of increasing likelihood for mammography (OR = 1.14, $p = .08$). At the same time, participants with greater level of agreement with barrier beliefs at *baseline* had lower perceived likelihood of getting a mammogram (OR = 0.80, $p = .03$). These results could be explained in several ways. First, the trend in increasing agreement with barrier beliefs postintervention could be an artifact as it did not reach the $p < .05$ level. On the other hand, it could be that participants became more aware of the barrier beliefs postintervention because they were discussed during the classes. For example, the barrier belief that mammograms are painful was discussed and can indeed be true; thus participants might record greater agreement with this belief (the agreement with this belief did increase from pre-to postintervention, albeit nonsignificantly). The finding that individuals who have greater agreement with barrier beliefs at the outset have lower odds of positive changes in likelihood makes intuitive sense, as the more problematic one interprets mammography to be the greater the resistance to behavioral change.

As far mammography uptake, 38% of participants received a mammogram within 1 year of the intervention. Excluding the 20 individuals lost to follow-up, the percentage rises to 58%. Irrespective of the different approaches to calculating efficacy and effectiveness, 22 individuals obtaining a mammogram can be viewed as a success.

Although our findings are encouraging, they should be interpreted with caution given the modest sample size and particularities about the sample, that is, English-speaking, mosque-going women. Additionally, while selecting for highly religious people was purposeful (i.e., we wanted to leverage religion for behavior change), the approach limits generalizability because of variations in religiosity among Muslim Americans. Additional limitations relate to measurement. We used one-item measures of intention, confidence, and likelihood, and these measures may not comprehensively reflect the psychological and attitudinal changes antecedents to the target health behavior (obtaining a mammogram). Consequently, we recommend future research test the efficacy of our program with Muslims of different

ethnicities and of varying religiosity, and that measures from other theories of behavioral change also be incorporated.

In conclusion, our religiously tailored, mosque-based, peer-led intervention targeting barrier beliefs to mammography was effective in increasing participant likelihood to, and receipt of, mammograms. We believe there is immense potential for using religious ideas to promote health and health care seeking among Muslim Americans and suggest that our model provides the conceptual and evidentiary bases for developing such interventions.

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Table 1.

Caring for Body and Soul: A Workshop on Women’s Health, Workshop Agenda.

Course content	Course description	Educational objectives
At the end of the session, participants should be able to do the following:		
Class 1: Good health starts with you		
Study overview	Didactic session led by study staff and peer educators	<ol style="list-style-type: none"> 1. Identify underlying motivations for the project 2. Be able to describe the goals of the training program in improving women’s health knowledge and mammography intention 3. Become familiar with data from previous phases of the study 4. Describe barriers to and facilitators of preventive health (targeted beliefs)
Icebreaker	Interactive session led by peer educators	<ol style="list-style-type: none"> 1. Understand data from previous phases of the study
Women and health	Didactic session led by peer educators	<ol style="list-style-type: none"> 2. Identify and discuss personal barriers to and facilitators of preventive health 1. Know peer educators and understand their motivations for joining the project 2. Understand barriers to and facilitators of preventive health for women
Health and access	Didactic session led by representative from A Silver Lining Foundation, a local organization aiming to ensure dignified and equal access to quality cancer education and services for all	<ol style="list-style-type: none"> 1. Identify resources for setting up mammography screening appointments and possible follow-up visits
Religious dimensions of health	Didactic session led by female religious scholar	<ol style="list-style-type: none"> 1. Understand different religious dimensions of health
Class 2: Mammography experiences		
Cancer care story	Peer educator-led facilitated group discussion and debrief following the showing of a culturally appropriate elicitation video	<ol style="list-style-type: none"> 1. Identify and discuss beliefs related to mammography intention
Survivorship story	Didactic session led by breast cancer survivor	<ol style="list-style-type: none"> 1. Identify and discuss beliefs, barriers, and personal experience with mammography
Breast cancer screening guidelines and procedures	Didactic session led by a female physician	<ol style="list-style-type: none"> 1. Distinguish myths and facts of breast cancer 2. Understand the benefits and process of mammography

Table 2.

Barrier and Facilitator Beliefs to Breast Cancer Screening.

Theory of planned behavior constructs	Barrier beliefs
Behavioral beliefs	<p>Mammograms are painful.</p> <p>My fear of a positive result prevents me from getting a mammogram.</p> <p>I have not gotten a mammogram in the past 2 years because I worry about being serviced by a male technician.</p> <p>My family's needs and priorities are more important than my own.</p> <p>Insurance policies make getting a mammogram difficult.</p> <p>Breast cancer screening is not important because God will decide who will get cancer.</p>
Normative beliefs	
Control beliefs	
Behavioral beliefs	Facilitator beliefs
Normative beliefs	<p>Knowing my breast cancer status outweighs my fear of test results.</p> <p>Getting a mammogram is one way to meet my religious duty of caring for my body.</p> <p>Mammograms can help detect disease and facilitate opportunities for prevention and treatment.</p> <p>I will be rewarded by God for the hardship I undergo to get a mammogram.</p> <p>Although God controls disease and illness, it is my religious responsibility to care for my body and get cancer screening.</p> <p>My family supports my getting a mammogram.</p> <p>I am comfortable talking to my friends about mammography.</p> <p>My health takes precedence over my family's needs.</p>

Table 3.Sociodemographic Characteristics of Study Participants ($N = 58$).

Sociodemographic characteristic	<i>n</i> (%)
Age (years; $n = 44$), $M \pm SD = 50.4 \pm 8.4$	
<50	20 (45.5)
50	24 (54.6)
Race/ethnicity ($n = 52$)	
South Asian	29 (55.8)
Arab/Arab American	18 (34.6)
Marital status ($n = 55$)	
Married	49 (89.1)
Unmarried or widowed	6 (10.9)
Country of origin ($n = 54$)	
South Asian	30 (55.6)
Arab World	14 (25.9)
United States	5 (9.3)
Education ($n = 56$)	
<High school	7 (12.5)
High school diploma/GED	11 (19.6)
Associate's degree	11 (19.6)
Bachelor's level or equivalent	19 (33.9)
Advanced degree (postbaccalaureate, masters, doctoral)	8 (14.3)
Annual income ($n = 46$), \$	
<20,000	18 (40.0)
20,000–49,999	17 (37.0)
50,000–74,999	6 (13.0)
75,000	6 (13.0)
Health insurance ($n = 51$)	
Yes	37 (72.6)

Table 4. Association Between Baseline Demographic Characteristics and Mammography Receipt After 1 Year of Follow-Up.

Demographic characteristic	n (%)	Breast cancer screening		<i>p</i> ^{a*}
		No (N = 16), n (%)	Yes (N = 22), n (%)	
Age (n = 44), years				
<50	20 (45.45)	10 (62.5)	5 (22.7)	.01*
50	24 (54.55)	3 (18.8)	14 (63.6)	
Marital status (n = 55)				
Married	49 (89.1)	14 (87.5)	17 (77.3)	.13
Unmarried	6 (10.9)	0 (0)	4 (18.2)	
Ethnicity (n = 52)				
Arab/Arab American	18 (34.6)	6 (37.5)	5 (22.7)	.15
South Asian	34 (65.4)	6 (37.5)	16 (72.7)	
Education (n = 56)				
<High school	7 (12.5)	5 (31.3)	1 (4.5)	.01*
High school	11 (19.6)	4 (25.0)	4 (18.2)	
Associate's	11 (19.6)	1 (6.3)	6 (27.3)	
Bachelor's	19 (33.9)	1 (6.3)	9 (40.9)	
Advanced degree	8 (14.3)	4 (25.0)	2 (9.1)	
Income (n = 46), \$				
<20,000	17 (37.0)	4 (25.0)	8 (36.4)	1
20,000–49,000	17 (37.0)	4 (25.0)	6 (27.3)	
50,000–74,999	6 (13)	2 (12.5)	4 (18.2)	
75,000	6 (13)	2 (12.5)	3 (13.6)	
Health insurance (n = 51)				
Yes	37 (72.6)	10 (62.5)	16 (72.7)	1
No	14 (27.5)	2 (12.5)	4 (18.2)	

^a *p* values obtained from Fisher's exact test.

* Statistically significant at $\alpha = .05$.

Table 5.

Average Change in Intention to Receive a Mammogram and Its Proxy Measures (Likelihood and Confidence), Evaluated at Preintervention, Postintervention, and 6-Month Follow-Up.

Measure	Mean change (<i>p</i>)	
	Pre to post	Pre to 6-month follow-up
Intention	.19 (.15)	.04 (.74)
Likelihood	.29 (.01)*	.20 (.15)
Confidence	.18 (.25)	.32 (.08)

* Statistically significant at $\alpha = .05$.

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Table 6.

Ordered Logistic Regression Model for the Changed Mammography Likelihood From Pre-to Postintervention ($N = 40$).

Predictor	Odds ratio [95% confidence interval]		<i>p</i>
Barrier belief score	0.80	[0.66, 0.98]	.03*
Married	37.69	[2.04, 695.22]	.02*
Income	1.47	[0.70, 3.09]	.31

* Statistically significant at $\alpha = .05$.

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Table 7.

Ordered Logistic Regression Analysis of the Change in Likelihood to Receive a Mammogram From Pre-to Postintervention ($N= 48$).

Predictor	Odds ratio [95% Confidence Interval]	<i>p</i>
Change in barrier beliefs	1.14 [0.98, 1.32]	.08
Change in facilitator beliefs	1.09 [0.93, 1.26]	.29
Married	22.16 [1.77, 277.07]	.02*
Modesty	1.05 [0.90, 1.22]	.52
Fatalism	0.91 [0.76, 1.09]	.32

* Statistically significant at $\alpha = .05$.

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