





Original Article

Development of neighborhood networks in suburban areas for persuading women to adhere to breast cancer screening programs

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Abstract

Introduction: The purpose of this study was to determine the effectiveness of the development of neighborhood networks in suburban areas for increasing adherence to breast cancer screening.

Methods: This community-based intervention study was conducted among Iranian urban women aged 30 to 65 in 2021. The samples were chosen using a multi-stage random sampling process. Women were randomly assigned to intervention group (n=271) and control group (n=155). Following a three-month intervention period, participants were asked about their breast cancer screening behaviors to gauge the program's success. Cognitive factors including perceived social support, perceived benefits and perceived barriers toward breast cancer screening, subjective norms, behavioral intention, and breast cancer screening behaviors were collected. The data were analyzed with SPSS statistical software version 21.

Results: After the intervention, the results showed an improvement in the intention of referring to mammography centers, perceived benefits of early diagnosis of breast cancer, receiving social support, breast cancer screening behaviors, and a decrease in barriers to early diagnosis of breast cancer compared to the control group ($P < 0.05$).

Conclusion: Harnessing the power of social networks alongside educational initiatives and strong community support can provide a safe, affordable, and effective means of boosting participation in Breast Cancer Screening (BCS).

Keywords: Breast cancer, Social support, Social networking, Women's health

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Introduction

It is predicted that the global incidence of breast cancer is expected to reach around 3.2 million new cases annually by 2050, highlighting the significant impact of breast cancer and the crucial need for early detection.¹ Therefore, screenings and early diagnoses should still be a point of focus, particularly in developing countries,² where lowering the rate of breast cancer mortality needs administrating comprehensive and high-quality prevention, early detection, and providing the relevant treatment services at the community level.^{3,4}

In Iran, according to the Iranian National Population-based Cancer Registry, recent surveys show that the age-specific incidence rate for breast cancer is approximately 34.53 per 100,000.⁵ Unfortunately, most cases are not diagnosed until advanced stages, which limits the success of curative treatments, leading to the provision of only palliative care.^{6,7} The Ministry of Health in Iran has a program for screening breast cancer. Firstly, the primary

health center (PHC) evaluates females aged 30 to 69, and individuals of any age with breast-related symptoms, with the help of expert midwives. Suspected cases are then sent to the Cancer Screening and Early Detection Center for further diagnostics.^{7,8}

Social support and neighborhood interaction can play an effective role in health screening behaviors^{9,10} by persuading women and their neighborhoods to enhance preventative activities such as early detection of breast cancer.¹¹ Women may be influenced by their extensive networks of family, peers, and communities^{12,13} which may intend them to adopt more preventative behaviors, especially in the women's health programs in the traditional context. People who have access to social support from their networks seem to have better access to useful health information and are more likely to adopt healthy behaviors, compared to those who don't feel supported or are less involved in social activities.¹⁴

Several recent studies have focused on social network



development as a social influence strategy affecting health behaviors,^{15,16} well-being, and quality of life at the community level.¹⁷ Social cohesion within a community and neighborhood can have a significant impact on the behaviors and health of nearby individuals in several ways. For instance, it can enhance collective efficacy, facilitate the sharing of health-related information, offer psychosocial support, and boost self-efficacy for healthy behaviors.¹⁸

Accordingly, utilization of a community-based participatory approach is essential for the development and dissemination of screening interventions among women. Therefore, this study aimed to determine the effectiveness of developing neighborhood networks in suburban areas for increasing adherence to breast cancer screening among this population.

Methods

Participants and procedures

This community-based intervention study was conducted among urban women in Ardabil, northwestern Iran, from June to January 2021. The samples were chosen using a multi-stage random sampling process. The city's outskirts were separated into four divisions based on a map generated from the city of Ardabil. After that, two Kalkhoran regions were chosen randomly as the intervention group and the Nyar region as the control group. Following the selection of the groups, the two areas were divided into four regions based on the created map, with one place from each being chosen at random for sampling. The information of qualified women was then taken from health records available in health service centers, and they were invited to participate in the study, which included 271 people in the intervention group and 155 people in the control group. Due to a lack of compliance, three people from the intervention group and nine people from the control group were excluded from the study. Residence in Sheikh Kalkhoran and Nyar areas, women aged 30 to 65 years, no relocation beyond Kalkhoran and Nyar in the next six months, and a history of breast cancer or other breast disorders were excluded factors.

Data collection tools

Demographic characteristics. Demographic characteristics included age, literacy level, occupation, income, marital status, domicile, number of children, and a first-degree family history of breast cancer (mother, sister, etc).

Breast Cancer Awareness and Screening Techniques. A researcher-made questionnaire with 15 items was used to test awareness, such as "The optimal period for breast self-examination is once a month." "Yes, no, and I don't know," was the response. The minimum and maximum scores were 0 and 15, respectively, with a Cronbach's alpha coefficient of 0.92, indicating structural validity.

Perceived Social Support. The standard questionnaire

of Aroian et al,¹⁹ which includes 12 items was used to measure perceived social support. Respondents rated each topic on a 5-point Likert scale (very high = 5; very low = 1). Cronbach's alpha coefficient was 0.84, indicating internal consistency.

Perceived Benefits toward Breast Cancer Screening. For measuring perceived benefits, we used an eight-item scale. Examples of items were "If I have a mammogram and no case is detected, I will continue to have another mammogram if needed." The rating of each item was a 5-point Likert scale (strongly agree = 5 to strongly disagree = 1). Cronbach's alpha was 0.89, indicating an internal consistency.

Subjective Norms. A self-designed six-item scale measured subjective norms (e.g., my spouse tries to influence my decisions and behaviors). This scale was scored using a 5-point Likert scale (very low = 1 to very high = 5), and Cronbach's alpha was calculated as 0.68.

Perceived Barriers to Breast Cancer Screening Behaviors. The perceived barriers to breast cancer screening were measured using a researcher-developed instrument containing six items. Example of items were "are you embarrassed to have a doctor or midwife inspect your breast?" and "are you embarrassed to have a doctor or midwife examine your breast?" Two responses of "yes" and "no" were used to determine perceived barriers to breast cancer screening. The estimated Cronbach's alpha coefficient was 0.60.

Perceived Self-efficacy. "I can examine my breasts monthly for early detection of breast cancer" was one of four items used to measure this variable. For scoring, we utilized a Likert scale with three options (agree = 3, I don't have an opinion = 2, disagree = 1). The estimated Cronbach's alpha was 0.87.

Behavioral Intention. To assess behavioral intention, five items were utilized, such as "I want to undergo a mammogram as soon as feasible to control breast cancer." The Likert scale was used to assign scores, and there were five options: I disagree entirely = 1, I agree entirely = 5, and everything in between. According to the research, the Cronbach's alpha coefficient of behavioral intention was calculated as 0.86.

Breast Cancer Screening Behaviors. Six items (such as: "I have had a mammogram within the last two months") were used to assess screening behavior, with a yes or no response option for each item.

Interventional procedure

Preliminary assessment of the problem and the identification of relevant factors for creating the intervention: Data on demographics and breast cancer-related screening behaviors, as well as the essential cognitive factors, were gathered to determine the regional health network's capacity to develop and extend a "local network for breast cancer screening program".

Development of a local women’s network: Initially, all health volunteers (there was one health volunteer for every ten households to transmit health messages to households in the health care system in Iran) were invited to attend a briefing session to join and collaborate on the “Local Network for Breast Cancer Screening in Women”. Next, the study goals were explained, and then willing participants were given the opportunity to develop a women’s neighborhood network to manage and help the rest of the group. Then, an intervention program was performed with the purpose of designing a program for the creation of a local women’s network for early detection of breast cancer. For creating the Women’s Local Network Program, several activities were planned and implemented, the specifics of which are provided in Table 1.

Impact evaluation: Following a three-month intervention period, participants were asked about their breast cancer screening behaviors to gauge the program’s success.

Data analysis

The data were analyzed with SPSS statistical software version 21 at a significance level of 0.05. If the variable was quantitative, an independent t-test was performed; otherwise, a chi-square test was used to compare the two groups’ demographics. A chi-square test was used to compare qualitative variables in the two groups before and after the intervention. The mean scores before and after the intervention in the ventricles of the two groups were compared using an independent t-test, and the groups were compared using a paired t-test. In order to make comparisons between groups, we employed covariance and rank analysis of variance. A symptom test was utilized to compare behavioral factors before and after.

Results

The demographic characteristics of the two groups are

presented in Table 2. Before the intervention, no significant differences were found between the demographic characteristics of the two groups, except for the literacy level of participants.

The results of the study also revealed a significant difference between the mean scores of the subjective norms, perceived benefits, and behavioral intention variables before the intervention, while there was no significant difference in the mean scores of the perceived barriers of mammography and social support before the intervention. However, the independent t-test showed a statistically significant difference between the two groups for mean scores of these cognitive factors. As shown in Table 3, the results showed an improvement in the intention of referring to mammography centers, perceived benefits of early diagnosis of breast cancer, and receiving social support compared to the control group ($P < 0.05$). Additionally, the results of the present study showed a significant improvement in women’s screening behaviors such as mammography, breast self-examination, and clinical exam by physicians and midwives in the intervention group compared to the control group (Table 4).

Table 5 compares the breast cancer screening in the two study groups before and after the intervention with significant results at $P < 0.05$. According to the results, the barriers of “lack of screening due to high cost,” “Not having insurance” and “Lack of access to screening facilities” significantly decreased in the intervention group compared to the control.

Discussion

The present study aimed to determine the effect of the intervention through the development of neighborhood networks in suburban areas for increasing adherence to Breast Cancer Screening (BCS) among these suburban areas’ women.

The study results showed after the intervention,

Table 1. Details of the development of a local women’s network program

Activities	Details of activities
Attract participation and empowerment of health volunteers	Holding virtual training sessions for health volunteers: Holding virtual training sessions through health volunteers, Basij base, and mosque centers for neighborhood women Providing face-to-face training for neighborhood women in accordance with health protocols for coronavirus prevention through health volunteers, the Basij base, and mosque centers
Development of existing local networks among women in the region with the aim of encouraging women to actively engage in breast cancer screening using existing potentials	Forming a local network through health volunteers Fostering a sense of network through the involvement of health care volunteers Activating the network of women’s social activities (such as activating women’s religious gatherings, gathering women in the neighborhood, and using the environment of hairdressers and saleswomen in local shops), - Creating a social media channel to communicate with women
Introduce women to the importance of breast cancer screening	Promotion of breast cancer screening through the creation and distribution of educational materials, such as brochures and posters. Producing educational video clips in the native tongue (Turkish) Share content designed in cyberspace
Involve the regional health centers	Involvement of comprehensive health service centers in designing and compiling the program Coordinating with the city health center and Nyar center to examine clients and record care. Encouragement of women by health ambassadors via the internet and telephone follow-up by medical professionals and health ambassadors Encouraging clinical examination by health volunteers of health centers in gynecological examination

women perceived more the supported normative beliefs, and they intended more to involve in BCS programs and consequently participate more in BSE, and mammography in the intervention group compared to the control group. Our success is rooted in the fact that many programs designed to promote health behaviors have adopted naturally occurring social networks as intervention strategies.²⁰⁻²² Therefore, encouraging social interactions within the community could help increase participation rates in population-based programs.²³

In a study to assess the effect of social networks development on the support of patients with type 2

Table 2. Demographic characteristics of the intervention (n=271) and the control groups (n=155)

Variables	Intervention	Control	P value
	No. (%)	No. (%)	
Age (y)			
30 to 34	72 (26.57)	32 (20.65)	0.397
35 to 39	51 (18.82)	33 (21.29)	
40 to 44	53 (19.56)	22 (14.19)	
45 to 49	35 (12.92)	27 (17.42)	
50 to 54	24 (8.86)	13 (8.39)	
55 to 59	22 (8.12)	17 (10.97)	
60 and higher	14 (5.17)	11 (7.10)	
Literacy level			
Illiterate	24 (8.9)	36 (23.2)	0.001
Primary	74 (27.3)	39 (25.2)	
Secondary	76 (28.0)	23 (14.8)	
Diploma	71 (26.2)	38 (24.5)	
College education	26 (9.6)	19 (12.3)	
Job status			
Housewife	247 (91.1)	147 (94.8)	0.185
Employed	24 (8.9)	8 (5.2)	
Marital status			
Married	250 (92.3)	140 (90.3)	0.621
Single	8 (3.0)	5 (3.2)	
Widow	13 (4.8)	9 (5.8)	
Divorced	0 (0.0)	1 (0.6)	
History of familial breast cancer			
Yes	10 (3.7)	2 (1.3)	0.225
No	261 (96.3)	153 (98.7)	

Table 3. Comparison of Cognitive factors before and after the Intervention in the Intervention (n=271) and the Control group (n=155)

Variables	Before			After		
	Intervention Mean (\pm SD)	Control Mean (\pm SD)	P value	Intervention Mean (\pm SD)	Control Mean (\pm SD)	P value
Subjective norms	18.66 (4.09)	16.65 (3.91)	0.001	19.69 (3.98)	15.93 (4.30)	0.001
Behavioral intention	12.40 (4.24)	14.55 (3.29)	0.001	15.5 (2.62)	13.94 (2.92)	0.001
Perceived benefits	51.80 (7.31)	49.92 (8.94)	0.019	55.54 (5.72)	51.06 (8.18)	0.001
Perceived barriers	3.06 (1.72)	3.03 (1.81)	0.875	2.39 (1.51)	2.69 (1.77)	0.038
social support	41.79 (7.24)	40.26 (7.92)	0.083	43.61 (7.23)	38.54 (8.17)	0.001

diabetes, clients in the intervention group had a lower level of HbA1c and fastened blood glucose. They also had more favorable outcomes for weight and quality of life compared to the control group that had received routine diabetes care.²⁴ Additionally, in another study based on neighborhood network development for women to increase physical activity among menopausal and premenopausal women, symptoms of hot flushes, sleep problems, and joint discomfort were reduced.¹⁶

Social network interventions can be a powerful approach to changing health behaviors by increasing awareness, shaping attitudes, and influencing social norms.²² The opinions of people in our social and personal circles can have a big impact on our behavior. This influence can be both positive and negative when it comes to our health. It's important to consider their impact when evaluating our own health-related behaviors.²⁵

About cognitive factors, our findings indicated that behavioral intention to engage in BCS programs and the relevant supportive subjective norms increased in the intervention group. In a study aimed to evaluate the effect of improving the supportive subjective norms on preventing cancer among African Americans compared to European Americans, the supportive subjective norms were significantly associated with behaviors for African Americans while not for European Americans.²⁶ Additionally, in the other fields of health-promoting behaviors, the supportive subjective norms were identified as the most influential variable in predicting health behavior intentions, and more robust individual norms created a correspondent group culture encouraging others to enact in line with the norms.²⁷

Furthermore, as social networks and social support are predictive factors for health status,²⁸ access to social networks may lead to more social activities and receiving or feeling more social support, and consequently, these social factors have been shown to impact health outcomes positively.²⁹ In a study that examined the relationship between social network characteristics and adherence to screening behaviors, the BCS rate was increased by encouragement by family and/or friends and subjective norms.³⁰

This study has several limitations. Firstly, the strategy relied heavily on social networks, which can vary significantly based on factors such as culture, rural or

urban location, income, social class, and other variables. To better understand the effectiveness of the educational-social strategy in promoting participation in breast cancer screening (BCS), it would be beneficial to test it in diverse cultural and demographic settings. Additionally, the data collection method involved self-reported questionnaires, which may be influenced by recall bias. However, the study also has several strengths. For example, it utilized neighborhood networks as a means of motivating participation in BCS. Furthermore, the study minimized the risk of bias by ensuring that the intervention and control groups were similar through random allocation concealment.

Conclusion

Social network interventions, when combined with an educational precursor and strong social reinforcement

Table 4. Frequency of screening practice in the intervention (n=271) and the control group (n=155)

Variables		Intervention	Control	P value
		No. (%)	No. (%)	
Mammography in the last two months	Yes	42 (15.6)	4 (2.7)	0.001
	No	226 (84.3)	142 (97.2)	
Breast self-examination in the last two months	Yes	200 (74.6)	29 (20.0)	0.001
	No	68 (25.3)	116 (80.0)	
Clinical exam in the last two months	Yes	166(61.9)	13(8.9)	0.001
	No	102(38)	132(91)	

through neighborhood networks, can be a safe, low-cost, effective, and accessible tool for increasing participation in breast cancer screening (BCS). These interventions are most effective when developed and implemented within an ecological framework that considers multiple levels of influence. This means that women’s participation in breast cancer screening programs can be influenced by multiple factors. Therefore, interventions based on social network programs are likely to be effective within an ecological framework. Interventions that improve individuals’ motivation and skills for healthy behaviors, while enhancing the health-promoting qualities of the social network, have great potential.

Authors’ Contribution

Conceptualization: Hamid Allahverdipour.

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Table 5. The perceived Barriers of breast cancer screening before and after intervention in control (n=155) and intervention (n=271) groups

Variables		Before			After		
		Intervention No. (%)	Control No. (%)	P value	Intervention No. (%)	Control No. (%)	P value
Are you embarrassed when your doctor or midwife examines your breasts?	Yes	70 (25.83)	41 (26.45)	0.909	75 (27.9)	40 (27.3)	0.909
	No	201 (74.1)	114 (73.54)		193 (72.0)	106 (72.6)	
Do you think people around you are looking at you differently now that you've been diagnosed with breast cancer?	Yes	124 (45.75)	63 (40.64)	0.306	96 (35.8)	52 (35.6)	0.967
	No	147 (52.24)	92 (59.35)		172 (64.2)	94 (64.4)	
Are you afraid of breast cancer?	Yes	222 (81.9)	125 (80.6)	0.745	210 (78.4)	108 (74)	0.312
	No	49 (18.1)	30 (19.4)		58 (21.64)	38 (26)	
Are you afraid of the doctor or the midwife?	Yes	37 (13.65)	17 (10.96)	0.423	23 (8.6)	11 (7.5)	0.717
	No	234 (86.34)	138 (89.03)		245 (91.4)	135 (92.5)	
Have you had a negative experience with breast cancer screening	Yes	70 (25.83)	20 (12.9)	0.001	19 (7.1)	4 (2.7)	0.065
	No	201 (74.16)	135 (87.09)		249 (92.9)	142 (97.3)	
Do you have faith in your doctor and midwife when it comes to cancer screening?	Yes	40 (14.76)	16 (10.32)	0.192	261 (97.4)	142 (97.3)	0.938
	No	231 (85.23)	139 (89.67)		7 (2.6)	4 (2.7)	
Because of the high cost of screening, do you avoid it?	Yes	139 (51.29)	81 (52.25)	0.848	91 (34.0)	65 (44.5)	0.034
	No	132 (48.7)	33 (47.74)		177 (66.0)	81 (55.5)	
Do you not do screening due to lack of insurance?	Yes	135 (49.81)	77 (49.67)	0.978	95 (35.4)	69 (47.2)	0.019
	No	136 (50.18)	78 (50.32)		173 (64.5)	77 (52.7)	
Do you not do cancer because you do not have access to cancer screening facilities?	Yes	104 (38.37)	67 (43.22)	0.326	52 (19.4)	49 (33.6)	0.001
	No	167 (61.62)	88 (56.77)		216 (80.5)	97 (66.4)	

Competing Interests

None.

Ethical Approval

The ethics committee of Tabriz University of Medical Sciences examined and approved the current study, which was given the code IR.TBZMED.REC.1397.315.

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References

1. Tao Z, Shi A, Lu C, Song T, Zhang Z, Zhao J. Breast cancer: epidemiology and etiology. *Cell Biochem Biophys*. 2015;72(2):333-8. doi: [10.1007/s12013-014-0459-6](https://doi.org/10.1007/s12013-014-0459-6).
2. Ahmad A. Breast cancer statistics: recent trends. *Adv Exp Med Biol*. 2019;1152:1-7. doi: [10.1007/978-3-030-20301-6_1](https://doi.org/10.1007/978-3-030-20301-6_1).
3. DeSantis CE, Ma J, Gaudet MM, Newman LA, Miller KD, Goding Sauer A, et al. Breast cancer statistics, 2019. *CA Cancer J Clin*. 2019;69(6):438-51. doi: [10.3322/caac.21583](https://doi.org/10.3322/caac.21583).
4. Niell BL, Freer PE, Weinfurter RJ, Arleo EK, Drukteinis JS. Screening for breast cancer. *Radiol Clin North Am*. 2017;55(6):1145-62. doi: [10.1016/j.rcl.2017.06.004](https://doi.org/10.1016/j.rcl.2017.06.004).
5. Roshandel G, Ghanbari-Motlagh A, Partovipour E, Salavati F, Hasanpour-Heidari S, Mohammadi G, et al. Cancer incidence in Iran in 2014: results of the Iranian National Population-based Cancer Registry. *Cancer Epidemiol*. 2019;61:50-8. doi: [10.1016/j.canep.2019.05.009](https://doi.org/10.1016/j.canep.2019.05.009).
6. Rivera-Franco MM, Leon-Rodriguez E. Delays in breast cancer detection and treatment in developing countries. *Breast Cancer (Auckl)*. 2018;12:1178223417752677. doi: [10.1177/1178223417752677](https://doi.org/10.1177/1178223417752677).
7. Ehsanpour A, Papan A, Kianpour S, Nazari P, Aref A, Ahangpour P. Lessons from monitoring, screening, evaluation and early detection of breast cancer in Iran. *J Prev Epidemiol*. 2022;7(1):e12. doi: [10.34172/jpe.2022.12](https://doi.org/10.34172/jpe.2022.12).
8. Shrivastava SR, Shrivastava PS, Ramasamy J. Implementing the World Health Organization's package of essential noncommunicable disease interventions in primary care settings. *Journal of the scientific society*. 2017;44(3):165-6. doi: [10.4103/jss.JSS_30_17](https://doi.org/10.4103/jss.JSS_30_17).
9. Jensen LF, Pedersen AF, Andersen B, Vedsted P. Social support and non-participation in breast cancer screening: a Danish cohort study. *J Public Health (Oxf)*. 2016;38(2):335-42. doi: [10.1093/pubmed/fdv051](https://doi.org/10.1093/pubmed/fdv051).
10. Khani Jaihooni A, Kashfi SM, Shokri A, Kashfi SH, Karimi S. Investigating factors associated with FOBT screening for colorectal cancer based on the components of health belief model and social support. *Asian Pac J Cancer Prev*. 2017;18(8):2163-9. doi: [10.22034/apjcp.2017.18.8.2163](https://doi.org/10.22034/apjcp.2017.18.8.2163).
11. Fattahi Ardakani M, Salehi-Abargouei A, Sotoudeh A, Esmaeildokht S, Bahrevar V. Do subjective norms predict the screening of cancer patients' first-degree relatives? A systematic review and meta-analysis. *Asian Pac J Cancer Prev*. 2020;21(6):1521-30. doi: [10.31557/apjcp.2020.21.6.1521](https://doi.org/10.31557/apjcp.2020.21.6.1521).
12. Dynes M, Stephenson R, Rubardt M, Bartel D. The influence of perceptions of community norms on current contraceptive use among men and women in Ethiopia and Kenya. *Health Place*. 2012;18(4):766-73. doi: [10.1016/j.healthplace.2012.04.006](https://doi.org/10.1016/j.healthplace.2012.04.006).
13. Bove RM, Vala-Haynes E, Valeggia CR. Women's health in urban Mali: social predictors and health itineraries. *Soc Sci Med*. 2012;75(8):1392-9. doi: [10.1016/j.socscimed.2012.06.012](https://doi.org/10.1016/j.socscimed.2012.06.012).
14. Kim W, Kreps GL, Shin CN. The role of social support and social networks in health information-seeking behavior among Korean Americans: a qualitative study. *Int J Equity Health*. 2015;14:40. doi: [10.1186/s12939-015-0169-8](https://doi.org/10.1186/s12939-015-0169-8).
15. Wu YH, Moore S, Dube L. Social capital and obesity among adults: longitudinal findings from the Montreal neighborhood networks and healthy aging panel. *Prev Med*. 2018;111:366-70. doi: [10.1016/j.ypmed.2017.11.028](https://doi.org/10.1016/j.ypmed.2017.11.028).
16. Javadivala Z, Allahverdipour H, Asghari Jafarabadi M, Emami A. An Interventional strategy of physical activity promotion for reduction of menopause symptoms. *Health Promot Perspect*. 2020;10(4):383-92. doi: [10.34172/hpp.2020.57](https://doi.org/10.34172/hpp.2020.57).
17. Gardner PJ. Natural neighborhood networks—important social networks in the lives of older adults aging in place. *J Aging Stud*. 2011;25(3):263-71. doi: [10.1016/j.jaging.2011.03.007](https://doi.org/10.1016/j.jaging.2011.03.007).
18. Rosenblatt AM, Crews DC, Powe NR, Zonderman AB, Evans MK, Tuot DS. Association between neighborhood social cohesion, awareness of chronic diseases, and participation in healthy behaviors in a community cohort. *BMC Public Health*. 2021;21(1):1611. doi: [10.1186/s12889-021-11633-8](https://doi.org/10.1186/s12889-021-11633-8).
19. Aroian K, Templin TN, Ramaswamy V. Adaptation and psychometric evaluation of the Multidimensional Scale of Perceived Social Support for Arab immigrant women. *Health Care Women Int*. 2010;31(2):153-69. doi: [10.1080/07399330903052145](https://doi.org/10.1080/07399330903052145).
20. Larkey LK, Herman PM, Roe DJ, Garcia F, Lopez AM, Gonzalez J, et al. A cancer screening intervention for underserved Latina women by lay educators. *J Womens Health (Larchmt)*. 2012;21(5):557-66. doi: [10.1089/jwh.2011.3087](https://doi.org/10.1089/jwh.2011.3087).
21. Franken SCM, Smit CR, Buijzen M. Promoting water consumption on a Caribbean island: an intervention using children's social networks at schools. *Int J Environ Res Public Health*. 2018;15(4):713. doi: [10.3390/ijerph15040713](https://doi.org/10.3390/ijerph15040713).
22. Latkin CA, Knowlton AR. Social network assessments and interventions for health behavior change: a critical review. *Behav Med*. 2015;41(3):90-7. doi: [10.1080/08964289.2015.1034645](https://doi.org/10.1080/08964289.2015.1034645).
23. Bender AM, Kawachi I, Jørgensen T, Pisinger C. Neighborhood social capital is associated with participation in health checks of a general population: a multilevel analysis of a population-based lifestyle intervention- the Inter99 study. *BMC Public Health*. 2015;15:694. doi: [10.1186/s12889-015-2042-5](https://doi.org/10.1186/s12889-015-2042-5).
24. Shaya FT, Chirikov VV, Howard D, Foster C, Costas J, Snitker S, et al. Effect of social networks intervention in type 2 diabetes: a partial randomised study. *J Epidemiol Community Health*. 2014;68(4):326-32. doi: [10.1136/jech-2013-203274](https://doi.org/10.1136/jech-2013-203274).
25. Glanz K, Rimer BK, Viswanath K. *Health Behavior and Health Education: Theory, Research, and Practice*. John Wiley & Sons; 2008.
26. Manning M, Lucas T, Davis SN, Valdimarsdottir HB, Thompson H. Editor's choice: deliberative and non-deliberative effects of descriptive and injunctive norms on cancer screening behaviors among African Americans. *Psychol Health*. 2020;35(7):774-94. doi: [10.1080/08870446.2019.1691725](https://doi.org/10.1080/08870446.2019.1691725).
27. Lin N, Roberts KR. Using the theory of planned behavior to predict food safety behavioral intention: a systematic review and meta-analysis. *Int J Hosp Manag*. 2020;90:102612. doi: [10.1016/j.ijhm.2020.102612](https://doi.org/10.1016/j.ijhm.2020.102612).
28. Wills TA, Ainette MC. Social networks and social support. In: Baum A, Revenson TA, Singer J, eds. *Handbook of Health Psychology*. 2nd ed. Psychology Press; 2012. p. 465-92.
29. Kelly ME, Duff H, Kelly S, McHugh Power JE, Brennan S, Lawlor BA, et al. The impact of social activities, social networks, social support and social relationships on the cognitive functioning of healthy older adults: a systematic review. *Syst Rev*. 2017;6(1):259. doi: [10.1186/s13643-017-0632-2](https://doi.org/10.1186/s13643-017-0632-2).
30. Allen JD, Stoddard AM, Sorensen G. Do social network characteristics predict mammography screening practices? *Health Educ Behav*. 2008;35(6):763-76. doi: [10.1177/1090198107303251](https://doi.org/10.1177/1090198107303251).