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Community-based Interventions to Improve Breast and Cervical Cancer Screening: Results of the Forsyth County Cancer Screening (FoCaS) Project¹

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Abstract

The FoCaS (Forsyth County Cancer Screening) Project was one of six projects funded by the National Cancer Institute "Public Health Approaches to Breast and Cervical Cancer" initiative. The goal of this project was to improve the use of breast and cervical cancer screening among low-income, predominately African-American, women age 40 and older. Strategies implemented in the intervention city included public health clinic in-reach strategies (chart reminders, exam room prompts, in-service meetings, and patient-directed literature) and community outreach strategies (educational sessions, literature distribution, community events, media, and church programs). Baseline and follow-up data from independent cross-sectional samples in both the intervention and comparison cities were used to evaluate the effects of the intervention program. A total of 248 women were surveyed at baseline, and 302 women were surveyed 3 years later at follow-up. The proportion of women reporting regular use of mammography increased (31 to 56%; $P < 0.001$) in the intervention city. In the comparison city, a nonsignificant (ns) increase in mammography utilization was observed (33 to 40%; $P = ns$). Pap smear screening rates also improved in the intervention city (73 to 87%; $P = 0.003$) but declined in the comparison city (67 to 60%; $P = ns$). These relationships hold in multivariate models. The results suggest that a multifaceted intervention can improve screening rates in low-income populations. These results have important implications for community-based research and efforts in underserved populations.

Introduction

Breast and cervical cancer account for one-third of new cancer cases and 18% of cancer deaths among women in the United States (1). The impact of these cancers, as for most cancers, is greater among older, low-income, and minority women (2). These women are less likely to be screened (3–8), which is believed to result in more late-stage cancers and poorer survival rates (9, 10). Underutilization occurs for several reasons. Some studies have found that physicians are less likely to recommend screening to older or minority women (5, 11). Limited access and referral to preventive and therapeutic services may also contribute to excess mortality in these populations (12, 13). Finally, fear and fatalistic views of breast cancer along with distrust of the medical community can influence health behaviors and the receipt of timely medical care (14–16).

Two general types of studies have tested interventions to improve breast and cervical cancer screening rates, community- and practice-based. Community studies have provided only moderate support for the notion that interventions improve screening rates. Many of these studies, however, had weak research designs (17–24) or reported significant but small intervention effects (25–32). The strongest effect for increasing mammography screening in a community-based study was reported by Rimer *et al.* (33) and seems to be largely due to the use of a mobile mammography van. Practice-based intervention studies, in contrast, were more likely to report significant and fairly large effects. These interventions can be classified into three types: (a) mailed letters/reminders to patients (34–39); (b) in-clinic physician reminders (38) or staff education of women (40); and (c) telephone counseling (37, 41–43). More recently, "stepped" interventions (*i.e.*, using progressively intensive and costly interventions for noncompliers) have shown positive effects as to their ability to promote mammography screening among patients (44–46). Few studies (33, 42), however, have focused on improving Pap smear and mammography utilization among older, lower-income, minority women.

To respond to this need, the National Cancer Institute initiated a research program entitled, "Public Health Approaches to Breast and Cervical Cancer Screening" with a focus on addressing barriers and developing clinic-based and community-focused interventions to improve the use of breast and cervical cancer screening exams (47). Three projects were funded in 1990 (in Minnesota, Rhode Island, and Texas), and three projects were funded in 1992 (in Wisconsin, West Virginia, and North Carolina). Each project was unique in its setting and types of clinic-based and community outreach interventions used, but all of the projects focused on improving the use of these screening exams among underserved women age 40 and older. This study reports the results of the North

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Carolina project, FoCaS.³ FoCaS was designed to improve beliefs, attitudes, and screening behaviors (Pap smear and mammography) of women age 40 and older who resided in low-income housing communities.

Methods

Overview. The objectives of the FoCaS Project were to: (a) identify barriers to breast and cervical cancer screening faced by low-income women and health care providers; and (b) address these barriers in a comprehensive program designed to improve participation in breast and cervical cancer screening among low-income women. The project was conducted in low-income housing communities located in two cities and was implemented in four phases over a 4-year period. One city received the intervention, and the other city served as the comparison city. In phase 1, surveys among providers from health facilities that serve the population in both cities and surveys among women in the housing communities were conducted to assess breast and cervical cancer screening knowledge, attitudes, and practices. A Community Advisory Board (CAB) was also formed in the first year of the project in the intervention city. In the second phase, the in-reach (community health center-based) and outreach (community-based) interventions for screening and follow-up of abnormalities were implemented over a 2½-year period in the housing communities located in the intervention city. Phase 3 began at the conclusion of the intervention delivery, approximately 2½ years after the baseline survey concluded, and involved a follow-up survey of women. Phase 4 included the transfer of successful interventions to the comparison city.

The FoCaS project also included a consortium of local community agencies including a community health center (RHC), a medical school located in the region, (WFUSM), the county health departments and public housing authorities in both cities, an historically African-American state university (Winston-Salem State University), community organizations that focus on cancer-related issues (e.g., American Cancer Society and Cancer Services Inc.), and The Winston-Salem Urban League. The purpose of this consortium was to provide access to resources such as educational material and referral services for FoCaS intervention activities and participants. This study was approved by the Clinical Research Practices Committee (Institutional Review Board) of WFUSM.

To avoid the methodological challenges in design and analysis of community intervention studies, it was decided to use a mixed cohort/cross-sectional design to evaluate the success of the intervention (48). Independent cross-sectional surveys conducted before and after the intervention were used to assess community trends in mammography and Pap smear screening over time. A cohort was also formed by randomly selecting one-half of the women who had participated in the baseline survey. These women were interviewed again in year 4 to assess the effects of the intervention on mammography and Pap smear screening rates over time on individual women. In addition, monthly monitoring of mammography exams was conducted at the community health center in the intervention city. For this paper, only data from the cross-sectional surveys will be presented. The results of the cohort surveys and the trend analyses of mammography exams will be published separately.

Setting. The FoCaS project was conducted in Winston-Salem and Greensboro, North Carolina. These cities were selected because of their proximity to the research team but were matched on the number of women in the housing communities. Winston-Salem was designated as the intervention city. The intended audience consisted of women age 40 and older, predominately African-American, residing in low-income housing communities. In Winston-Salem, 9 housing communities with 908 women formed the intervention group; and in Greensboro, 18 housing communities with 1021 women formed the comparison group. The baseline characteristics of this population have been reported elsewhere (47). The majority of residents in the communities were female, African-American, and over age 65.

The clinic-based strategies to improve screening rates were conducted in a community health center, RHC. RHC provides multispecialty clinics in Pediatrics, Adult Medicine, and Obstetrics and Gynecology for low-income residents of the county and provides in-house mammography as well as other medical care on a sliding-fee-scale basis. In Greensboro, the comparison clinics included a free community clinic, the Urban Ministries Clinic, and the outpatient clinic of Moses Cone Hospital. A total of 174 physicians (including residents) practicing at health care facilities in both cities participated in this project. The demographic and practice patterns in terms of breast and cervical cancer screening of these physicians are described elsewhere (49).

Surveys. The baseline survey of knowledge, attitudes, barriers, and the use of breast and cervical cancer screening among women in the study population was conducted in face-to-face interviews. Samples in each community were drawn by simple random selection within strata formed by age (*i.e.*, 40–64 years and ≥ 65 years) of the female residents. Lists of residents were provided to the study team by the Housing Authority of each city. The baseline survey began in November 1992, was completed in March 1993, and achieved a response rate of 78% overall—82% for the intervention city and 73% for the comparison city. A total of 125 surveys were completed in Winston-Salem and 123 in Greensboro. No significant differences were found in the race and age of women who did and did not agree to participate in the survey.

For the follow-up survey, a similar sampling technique was used; however, only women who resided in the communities during the intervention period were eligible for sampling. The follow-up survey began in October 1995 and concluded in June 1996. The response rate for the follow-up survey was 75% overall—84% in the intervention community and 68% in the comparison community. Again, no differences were noted in terms of race and age among responders and nonresponders. A total of 168 surveys were completed in Winston-Salem and 134 in Greensboro.

Intervention Design. To develop effective interventions, results from the baseline women's survey, the health care provider survey, additional focus groups, and input from the Community Advisory Board were used. These sources provided information on barriers, attitudes, current breast and cervical cancer screening practices, and optimum strategies for delivering health education messages. The development of the multi-component clinic-based and community-based interventions are described elsewhere (49, 50).

The theoretical framework for the community-based interventions included the PRECEDE/PROCEED model for planning (51), the health belief model (52, 53) for identifying and addressing barriers, social learning theory (53, 54) in terms

³ The abbreviations used are: FoCaS, Forsyth County Cancer Screening; RHC, Reynolds Health Center; WFUSM, Wake Forest University School of Medicine.

of using lay health educators to deliver education messages and develop a sense of self-efficacy in the women, and the PENIII model (55), which incorporates cultural appropriateness and sensitivity in program development. Interventions implemented in the housing communities in Winston-Salem during the 2-year intervention period included:

- (a) "Women's Fest," a free party held in the community that included food, educational classes, cholesterol, blood pressure and diabetes screening, prizes, and information booths;
- (b) a church program that included a ministers' luncheon and a lay health educator program, "Taking Care of Our Sisters," for female church members;
- (c) educational brochures especially designed to address identified barriers such as "Where to Get a Mammogram";
- (d) mass media techniques (public bus ads, newspaper and radio ads on African-American media);
- (e) monthly classes in each housing community conducted by a lay health educator;
- (f) birthday cards with the FoCaS logo;
- (g) targeted mailings and door knob hangers with invitations to events; and
- (h) one-on-one educational sessions in women's homes.

Clinic-focused interventions implemented at RHC were designed to address provider, system, and patient barriers to conducting breast and cervical cancer screening and included: (a) in-service and primary care conference training for providers on issues including clinical breast exam proficiency, cultural sensitivity, and techniques to integrate prevention in primary care; (b) visual prompts in the exam rooms, *e.g.*, "Have you screened today?"; (c) educational games, *e.g.*, "Find the Lump Game" to teach clinical breast exam techniques; (d) an abnormal test protocol that included alert stickers, a referral process for managing the care of women with abnormal test results, and a tracking system; (e) poster and literature distribution in the waiting rooms; and (f) one-on-one counseling sessions and personalized letters for follow-up testing for women who had abnormal test results. The delivery of the intervention components was monitored by the project manager through weekly reports, observations of classes, and process evaluation measures such as attendance rolls, number of classes taught, brochures distributed, and letters mailed.

Evaluation. Compliance with mammography and Pap smear screening guidelines were defined as follows. For mammography, women between 40 and 49 years of age were within guidelines if they reported that they had received a mammogram within the last 2 years, and women 50 and older were within guidelines if they had received a mammogram within the last year. For cervical cancer screening, women who reported that they had received a Pap smear within the last 3 years were defined as being in compliance with guidelines. Knowledge, attitude, and belief scores were calculated based on participants' responses to a series of questions for each cancer and screening test. These scales are described elsewhere in detail (56); however, for mammography/breast cancer, the belief scale consisted of 4 items and the knowledge and barrier scales each had 13 items. The knowledge, attitude, and belief scales for Pap smears/cervical cancer had 5, 14, and 5 items, respectively.

Descriptive statistics as shown in Table 1 were calculated for demographic and health care characteristics separately for each time (baseline and follow-up) and city. Differences between cities in these characteristics were assessed using *t* tests and unadjusted χ^2 tests. To compare the effect of the intervention on Pap smear and mammography screening rates, unad-

justed logistic regression models were used. The dependent variable for these models was the mammography (or Pap smear) screening status for a subject (0 = not within guidelines, 1 = within guidelines). Factors in the model(s) included TIME (baseline/follow-up), CITY (intervention/comparison), and a TIME \times CITY interaction term. This interaction term denoted the test of intervention effect.

To determine whether other factors, in addition to the intervention, were related to screening status, a series of logistic models were fitted for each outcome. For mammography (or Pap smear), a full model containing CITY, TIME, CITY \times TIME (the intervention variables), all of the subject characteristics listed in Table 1, plus all of the two- and three-way interactions of these variables with CITY, TIME, and CITY \times TIME was fitted. Next, a reduced model containing all of the variables except the 3-way interactions involving CITY, TIME, and the individual subject characteristics was fitted. A χ^2 test based on the difference in log-likelihoods between these two models was used to assess whether there were any subject characteristics that interacted jointly with the intervention to modify screening status. Additional models were fitted using backward stepwise logistic regression until the only remaining terms in the model were those significant at $\alpha = 0.05$ (note that any main effect involved in a significant interaction was not allowed to exit the model). Odds ratios and 95% confidence intervals are presented to display the results of final models (Table 2). To assess whether the intervention was related to a beneficial change in barriers, beliefs, and knowledge with respect to Pap smear and mammography screening, *t* tests were used (Table 3). Comparisons were made between cities separately at baseline and follow-up.

Results

Characteristics of the Sample. Demographic and health care characteristics of the women are shown in Table 1 by city and time period. On average, women were between 65 and 68 years old. About 60% of the women in both cities at both time periods were age 65 and older. The majority of women were African-American with significantly more African-American women surveyed in the intervention city at both time periods (78 *versus* 66%, $P = 0.02$ at baseline; 92 *versus* 64%, $P = 0.001$ at follow-up). The majority of women had health insurance, and women were evenly distributed by education levels (less than 8th grade, 9–11th grade, and high school graduate). Because this study was conducted within low-income housing communities, all of the women were in similar socio-economic levels (not shown), and a minority of women in either city under age 65 participated (22–30%). Less than 20% of the women were currently married, and the majority had been pregnant (82–86%). About 50% of the women had never smoked, and 79–90% had had a regular examination in the past 12 months. At baseline, more women in the intervention city had a chronic medical condition requiring regular treatment (77 *versus* 57%; $P < 0.05$).

Screening Rates. In the intervention city, 31% of women reported having had a mammogram within guidelines at baseline, and 56% reported having had one within guidelines at follow-up. The percentage of women reporting having had a mammogram within guidelines also increased in the comparison city, from 33 to 40%. Overall, mammography utilization increased 18 percentage points ($P = 0.04$, unadjusted Wald χ^2 test) in the intervention city compared with the comparison city (31 to 56% *versus* 33 to 40%).

Table 1 Demographics and health care characteristics by city and time period

Variable	Comparison		Intervention	
	Baseline (N = 123) n (%)	Follow-Up (N = 134) n (%)	Baseline (N = 125) n (%)	Follow-Up (N = 168) n (%)
Age (yr)				
40–64	54 (44)	53 (40)	54 (43)	59 (36)
≥65	69 (56)	81 (60)	71 (57)	104 (64)
Education				
≤8th grade	45 (37)	42 (32)	54 (43)	56 (34)
9–11th grade	41 (33)	44 (33)	41 (33)	59 (36)
High school graduate	37 (30)	47 (35)	30 (24)	48 (29)
Employed (<65 yr)	15 (28)	14 (30)	12 (22)	15 (25)
Smoking status				
Never	57 (46)	54 (46)	63 (50)	80 (49)
Ever	31 (25)	33 (28)	22 (18)	40 (24)
Current	35 (28)	31 (26)	40 (32)	44 (27)
Marital status				
Married	24 (20)	20 (15)	22 (18)	23 (14)
Ever married	88 (72)	98 (73)	89 (72)	118 (70)
Never married	10 (8)	16 (12)	13 (10)	27 (16)
Race - African-American ^{a,b}	81 (66)	86 (64)	98 (78)	151 (92)
Regular examinations (yes)	98 (90)	101 (85)	99 (79)	139 (83)
Parity (1+)	104 (85)	101 (85)	107 (86)	136 (82)
Medical condition (yes) ^a	70 (57)	75 (63)	95 (77)	116 (69)

^a $P < 0.05$ at baseline between cities.

^b $P < 0.05$ at follow-up between cities.

The results of the multivariate logistic models for predicting regular mammography and Pap smear use are presented in Table 2. No interactions between city and any predictors were found to be significant for either regular mammography or Pap smear screening, which indicated that the effect of predictors on screening behaviors were independent of the receipt of the intervention. Improvement in mammography screening rates were modest in the comparison city (33 to 40%; not significant), whereas in the intervention city, a larger difference was found (31 to 56%; $P = 0.049$, intervention *versus* comparison city). In addition to being exposed to the intervention, other significant predictors of regular mammography screening included the following. Those with regular examinations were more likely to get mammography screening within guidelines than those who did not get regular examinations (47 *versus* 17%; $P = 0.0001$). Ever- and never-smokers were less likely to be within screening guidelines than were current smokers (40 *versus* 47%; $P = .0334$). The more positive one's beliefs about mammography, the more likely one was to be within guidelines ($P = 0.0001$). Similarly, the fewer barriers to mammography screening reported, the more likely one was to be within guidelines ($P = 0.0001$). There was a modest difference in screening rates at baseline between women who reported they had been encouraged by their physician to get a mammogram as compared with women reporting no encouragement from their physician (38 *versus* 28%). However, at follow-up, the impact of a physician recommending mammography screening was much stronger: 60% of those encouraged were within guidelines, *versus* 31% of those not encouraged.

The proportion of women who received a Pap smear within the last 3 years increased in the intervention city from 73 to 87%. The proportion of women reporting a Pap smear in the last 3 years in the comparison city decreased over time, from 67 to 60%. Thus, the Pap smear usage rate increased by 14 percentage points in the intervention city and decreased by 7 percentage points in the comparison city for an overall net

Table 2 Logistic regression models for regular screening use odds ratios and 95% confidence intervals

Variable	Odds ratio	95% confidence interval
Mammography		
City (intervention <i>vs.</i> comparison)	2.3	(1.01–5.35)
Physician recommend mammogram		
Baseline	0.5	(0.2–1.0)
Follow-Up	1.2	(0.6–2.4)
Smoking status (current <i>vs.</i> other)	1.8	(1.1–2.8)
Regular examinations	3.8	(2.1–7.2)
Positive beliefs (1-unit increase)	1.3	(1.1–1.4)
Reduction in barriers (1-unit decrease)	1.2	(1.1–1.4)
Pap smear		
City (intervention <i>vs.</i> comparison)	3.8	(1.6–9.2)
Married (yes <i>vs.</i> no)		
Comparison	2.4	(1.0–5.6)
Intervention	0.5	(0.2–1.2)
Age (<65 yr <i>vs.</i> ≥65 yr)	1.9	(1.2–3.0)
Regular examinations	4.2	(2.5–7.2)
Correct knowledge (1-unit increase)	1.1	(1.1–1.2)
Reduction in barriers (1-unit decrease)	1.2	(1.1–1.4)

change of 21 percentage points in favor of the intervention city ($P = 0.004$, unadjusted Wald χ^2 test). Predictors of regular Pap smear screening are shown in Table 2. Older women (65 and over) were less likely than younger women to have had a Pap smear within guidelines (70 *versus* 78%; $P = 0.013$). Women who received regular examinations were more likely to have had a Pap smear within guidelines (79 *versus* 51%; $P < 0.001$). The more correct knowledge women had, the more likely they were to be within screening guidelines ($P = 0.001$), and women who reported a higher number of barriers were less likely to be compliant with guidelines ($P = 0.005$) than those reporting the least number of barriers. In the comparison city, married women were more likely than nonmarried women (including divorced, separated, widowed, and never married) to be within guidelines (79 *versus* 60%). However, in the intervention city, slightly more nonmarried women (82%) than married women (73%) were within guidelines.

Knowledge, Beliefs, and Barriers. Table 3 depicts the knowledge, belief, and barrier scales by city for both time periods. The proportion of women reporting few barriers to mammography screening (five or less) was significantly higher in the intervention city at follow-up compared with the comparison community (40 *versus* 10%; $P < 0.05$). At baseline, significantly more women in the intervention city had positive beliefs about mammography (two or more positive beliefs) than in the comparison city (30 *versus* 18%; $P < 0.05$); however, at follow-up, this trend was reversed (20 *versus* 32%, respectively; $P < 0.05$). No differences between cities in the proportion of women with good knowledge about mammography and breast cancer (three or more questions correct) were observed at either time period. For Pap smears, significantly more women in the intervention city reported no barriers to screening at follow-up compared with women in the comparison city (55 *versus* 29%; $P < 0.05$). No significant differences were noted between the two cities in either time period in the proportion of women reporting positive beliefs (two or more) about cervical cancer and screening or the proportion of women with good knowledge (five or more correct answers) about cervical cancer and screening.

Table 3 Barriers, beliefs, and knowledge by time and city

Variable	Comparison		Intervention	
	Baseline	Follow-Up	Baseline	Follow-Up
	N (%) (n = 123)	N (%) (n = 134)	N (%) (n = 125)	N (%) (n = 168)
Mammography				
Barriers (few) ^a	15 (12)	15 (10)	30 (24)	68 (40)
Beliefs (positive) ^{a,b}	22 (18)	38 (32)	38 (30)	33 (20)
Knowledge (good)	90 (63)	91 (60)	76 (61)	103 (61)
Pap smear				
Barriers (few) ^a	48 (39)	44 (29)	64 (51)	92 (55)
Beliefs (positive)	32 (26)	56 (47)	42 (34)	69 (41)
Knowledge (good)	87 (61)	62 (41)	85 (68)	70 (42)

^a $P < 0.05$ follow-up between comparison and intervention cities.

^b $P < 0.05$ at baseline between comparison and intervention cities.

Discussion

The goal of this study was to examine the effect of a multifaceted intervention program on improving rates of breast and cervical cancer screening among women age 40 and older who resided in low-income housing communities. The data presented here indicate significant increases in both mammography and Pap smear screening among women in the intervention city suggesting that the intervention program was effective. No differential effects of the intervention were observed for either of the screening tests within any subgroup (*e.g.*, age, race, education). Regular use of Pap smear screening seemed to be higher among younger women and women who had a examination in the last 12 months. Women who had a examination in the last 12 months and who reported that a physician recommended a mammogram were more likely to have had a mammogram within guidelines. Beliefs, barriers, and knowledge also impacted screening and were somewhat affected by the intervention. Process evaluation data published elsewhere (57) can also shed some information as to how the intervention improved screening rates. Overall, 66% of Winston-Salem women at follow-up reported having seen or attended at least one FoCaS intervention activity: 43% had attended at least one class, 28% had attended at least one Women's Fest, 20% had seen a FoCaS newspaper ad, 17% had heard a FoCaS radio ad, and 12% had seen a FoCaS church bulletin. Women who attended at least one FoCaS class were significantly more likely to have been regular mammogram users compared with women who did not attend a class (65.3 versus 48.4%; $P = 0.03$).

Several limitations need to be kept in mind when interpreting these data. This study used only two cities and, thus, did not provide all of the assurances of internal validity expected in formal community trials. Therefore, the results cannot be used to estimate true intervention effects or actual screening rates over time. The fact that the unit of randomization, cities, was different from the unit of analysis, individuals, may have artificially decreased variance estimates and thereby increased the likelihood of finding a significant result (58). Randomization of individual women or by housing units were not options because women in each unit in the intervention city received medical care at RHC where clinic-based interventions were delivered. In addition, the use of more cities was not possible due to limited resources.

Because of the fact that the follow-up survey began only 2½ years after the start of the intervention, the rates of regular Pap smear use (as defined by a Pap smear in the last 3 years) may not have been affected by the intervention. Inasmuch as both cities were affected by preintervention influences equally,

the overall effect would be to reduce the magnitude of effects of the intervention; therefore, our findings represent a conservative estimate of the effect of the intervention. In addition, this issue does not affect women in the comparison city.

The data reported here are self-reports of screening; however, validation of self-reports of screening conducted on baseline data indicated good agreement (77%) for mammography self-reports and fair agreement (67%) for Pap smear use (59). Response rates were generally adequate (78% for baseline and 75% for follow-up survey); however, the response rates in the comparison community were lower for both surveys. This could be due to the fact that the project was sponsored by the WFUSM, which is located in Winston-Salem. The consortium included members of the community in Greensboro in an attempt to promote community ownership rather than medical school ownership. In addition, project letterhead rather than WFUSM letterhead was used to again promote identification with the study. Interviewers used similar recruitment strategies to the same degree in both communities; thus, there was no special effort to recruit more heavily in the intervention community. Although the strengths of the results are reduced by the study design features, they do add evidence supporting the value of community interventions and the use of multiple strategies and multiple behavioral theories in community studies (60). In addition, the best approach to have a maximum effect relative to costs incurred may be a combination of community-based and clinic-based strategies, as used in this study.

Previous community studies focusing on increasing mammography and/or Pap smear utilization have also faced methodological difficulties. Of the 19 representative reports of community-based programs that we examined, 8 included no control group as part of the evaluation design, 6 selected intervention and control communities and sampled women within each of the communities, and 5 sampled individuals within one or more communities or work sites and randomized them in some fashion (not always simple random assignment) to intervention and control conditions. Although many of the studies that used no control group reported interesting intervention programs and positive results (17–24), deficiencies in the research designs do not allow generalization. Three of the six studies that compared women in intervention and control communities reported no intervention effect (23, 25, 26). The interventions tested in these studies included a combination of physician and public education approaches (25) and a community organization approach that consisted of various activities conducted by physician and lay community boards (23, 26). Other studies with intervention and control communities did find significant effects (27, 33, 61). Of the five studies with the methodologically strongest research designs—randomization of women to intervention and control groups—one reported no intervention effect (28), and the other four studies reported very similar intervention effects ranging from 10- to 15-percentage-point greater increases in screening among women in the intervention groups (29–32).

The effects of the intervention tested in the study reported here showed an 18-percentage-point increase in mammography screening and a 21% increase in Pap smear screening, which are slightly higher than the effects reported in previous studies. This could be partly due to the use of multiple behavioral theories as the framework for the intervention. As previously noted, the largest intervention effect for a community-based study for mammography reported by Rimer *et al.* (33) also used multiple behavioral theories to design health education messages (Health Belief Model and Social Learning Theory).

In this community intervention study, the combination of

community outreach and clinic-based in-reach strategies was associated with increases in mammography and Pap smear utilization. The use of multiple theories also allowed for the development of an intervention program that addressed the unique needs of the population while also addressing the individual barriers of women. Other studies that have used multiple theories to design interventions reported similar effects (33, 60). Future studies that examine methods to improve screening utilization among community groups should use multiple intervention strategies tailored to the needs of the specific populations and use study designs and analytic tools more appropriate for identifying the effects of these interventions.

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