Increasing Breast and Cervical Cancer Screening in Low-Income Women

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OBJECTIVE: **To determine if women would have higher breast and cervical cancer screening rates if lay health advisers recommended screening and offered a convenient screening opportunity.**

DESIGN: **Controlled trial.**

SETTING: **Urban county teaching hospital.**

PARTICIPANTS: **Women aged 40 years and over attending appointments in several non-primary-care outpatient clinics.**

INTERVENTIONS: **Lay health advisers assessed the participants' breast and cervical cancer screening status and offered women in the intervention group who were due for screening an appointment with a female nurse practitioner.**

MEASUREMENTS AND MAIN RESULTS: **Screening rates at baseline and at follow-up 1 year after the intervention were determined. At follow-up, the mammography rate was 69% in the intervention group versus 63% in the usual care group (p = .009), and the Pap smear rate was 70% in the intervention group versus 63% in the usual care group (p = .02). In women who were due for screening at baseline, the mammography rate was 60% in the intervention group versus 50% in the usual care group (p = .006), and the Pap smear rate was 63% in the intervention group versus 50% in the usual care group (p = .002). The intervention was effective across age and insurance payer strata, and was particularly effective in Native American women.**

CONCLUSIONS: **Breast and cervical cancer screening rates were improved in women attending non-primary-care outpatient clinics by using lay health advisers and a nurse practitioner to perform screening. The effect was strongest in women in greatest need of screening.**

KEY WORDS: **mass screening; vaginal smears; mammography; nurse practitioners; community health aides.**
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Screening mammography and Pap smears have been shown convincingly to decrease breast and cervical cancer mortality.[1,2] Recent population-based surveys suggest progress toward the year 2000 goals in the general population for both breast and cervical cancer screening.[3,4] However, nonwhite women, older women, and those with lower incomes and less education generally have lower screening rates.[4–6] Strategies to improve screening rates in these groups are needed.

Hennepin County Medical Center, the urban county teaching hospital in Minneapolis, serves many women from groups that are less likely to receive breast and cervical cancer screening. Preliminary reviews of the charts of women attending appointments in the general medicine clinic, medical subspecialty clinics, and surgical clinics, showed the lowest screening rates in women attending surgical clinics (K.L. Margolis, unpublished data). Primary care physicians have been urged to "put prevention into practice" with each patient contact,[7] but few specialists are prepared to utilize each patient contact this way. Physician-oriented interventions such as education,[8] feedback of screening rates,[9] checklists,[10,11] nurse-generated reminders,[12] and computer-generated reminders[9,13] have been modestly successful in increasing cancer screening in primary care settings. Although these methods have not been tested outside the primary care setting, none of them seemed likely to overcome the fundamental barriers to screening by specialist physicians.

An intervention that seemed more likely to work outside the primary care setting was to use nonphysicians to identify women who were not up-to-date with screening and to use standing orders to offer them screening. This approach has been successful in primary care settings,[14–17] and in a public hospital emergency department.[18] Some studies have used nurses to deliver screening recommendations; however, several studies involving minority populations have employed culturally sensitive lay health advisers in medical settings[19] and in the community.[14,20,21] These studies have demonstrated the ability of trained lay workers to counsel women who have not responded to or have not received screening recommendations from traditional health care providers. In addition, some of these interventions have used nurses, rather than physicians, to perform breast examinations and obtain Pap smears.[14,17,18] We felt that a nurse practitioner would have more flexibility to adapt to the scheduling needs of the women who were referred, and would be able to provide a more consistently supportive and culturally sensitive clinical environment.

We tested the hypothesis that women attending non-primary-care outpatient clinics at our hospital would have higher breast and cervical cancer screening rates if a lay health adviser recommended screening on the physician's behalf and offered a convenient screening opportunity with a nurse practitioner.

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METHODS

The study was a controlled trial. Women aged 40 years and over were recruited in several of the non-primary-care outpatient clinics between July 1992 and August 1994 at Hennepin County Medical Center. Most of the participants were recruited from the surgery and orthopedics clinics (85%); the balance were from the ophthalmology, dental, and psychiatry clinics. We planned to include enough Native American participants to test the study hypothesis in this subgroup; thus, Native American women aged 40 years and over with any non-primary-care clinic appointment were eligible for the study. Patients were allocated to the usual care group or the intervention group according to whether their medical record number was odd or even. These numbers are assigned sequentially as patients register in the institution for the first time. We excluded women who were too disoriented to give their address, were acutely ill, or refused to participate. Women who had a history of cervical cancer or hysterectomy were eligible only for the breast cancer screening component of the intervention. Women who had a history of breast cancer were eligible only for the cervical cancer screening component.

Recruitment for the study was conducted by "senior aides," low-income elderly lay women whose salaries were paid by a federal job training program. The senior aides were trained and supervised by the study coordinator as previously described.[22] Because the senior aides were not masked to study group allocation, regular group meetings, direct observation, and manual data checks were performed frequently to ensure that they adhered to the study protocol.

After participants completed a short baseline questionnaire that included the date of their last mammogram, breast examination, and Pap smear, the senior aides classified them as "due" or "up-to-date" for both breast and cervical screening. Women were considered up-to-date for breast screening if they had had a mammogram within the year for women aged 50 years and older, and within the last 2 years for women aged 40 to 49 years. Women were considered up-to-date for cervical screening if they had had a Pap smear within the last year.

Women in the usual care group were not contacted again by the study team until follow-up data collection took place at least 1 year later. Women in the intervention group who were due for either breast or cervical screening were told by the senior aide: "You are due for a mammogram and/or Pap smear. Your doctor would like you to have this screening." They were then offered a visit at the Women's Cancer Screening Clinic (WCSC), staffed by a female nurse practitioner who was trained to perform breast and pelvic examinations for older, low-income women, with cultural sensitivity to the needs of African Americans, Native Americans, and Asians. Each WCSC appointment was linked with an appointment for mammography on the same day, so that all screening could be completed at one visit. Women who were due for screening but declined to visit the WCSC were encouraged to follow up with their regular health care provider. The senior aides encouraged women in the intervention group who were up-to-date with screening to continue to receive regular screening and offered them a mailed reminder when their next breast or cervical screening would be due.

We collected follow-up data for women in both the usual care group and the intervention group according to their screening status at baseline. If they were due for screening at baseline, follow-up occurred 12 months later. If they were up-to-date at baseline, follow-up occurred 12 months after they would next become due for screening. To ascertain screening status at follow-up, we first searched the hospital computerized radiology and cytology databases since baseline for each participant. If there was no record of mammogram or Pap smear after the date of recruitment in these databases, an interviewer who was masked to the study group assignment telephoned the participant to administer a standardized questionnaire. If the participant could not be reached by telephone, the questionnaire was mailed.

The main outcomes were completion of mammography and Pap smear between baseline and follow-up. We excluded from the analysis women who were too confused to answer the follow-up questionnaire, had died, or were not yet due for follow-up as of August 1995. The latter group consisted mainly of women who were up-to-date with screening at baseline and were recruited late in the study. Women who could not be located or refused follow-up were assumed not to have been screened. The intervention and usual care groups were compared using the χ^2 statistic for categorical variables and Student's t tests for continuous variables. We used the Mantel-Haenszel χ^2 statistic to compare the intervention with usual care while controlling for confounders and the Breslow-Day test for homogeneity of the odds ratios to test for potential interactions.[23] We performed multivariate logistic regression analysis in the subgroup of women who were due for screening at baseline. We ran two models: one with intervention status, age, insurance payer, and race, and another with these variables plus an interaction term for intervention $\times$ race. All analyses were performed using SAS software (SAS Institute, Cary, NC, 1989).

RESULTS

Recruitment and Characteristics of Study Sample

Recruitment is summarized in Figure 1. The senior aides approached 1,908 women (81% of the eligible women), of whom 1,693 (89%) agreed to participate in the study. At baseline, 35 women had a history of breast cancer, leaving 1,658 women eligible for breast screening follow-up. Hysterectomy or a history of cervical cancer was found for 591 women, leaving 1,102 eligible for cervical screening follow-up. The results of follow-up are shown in

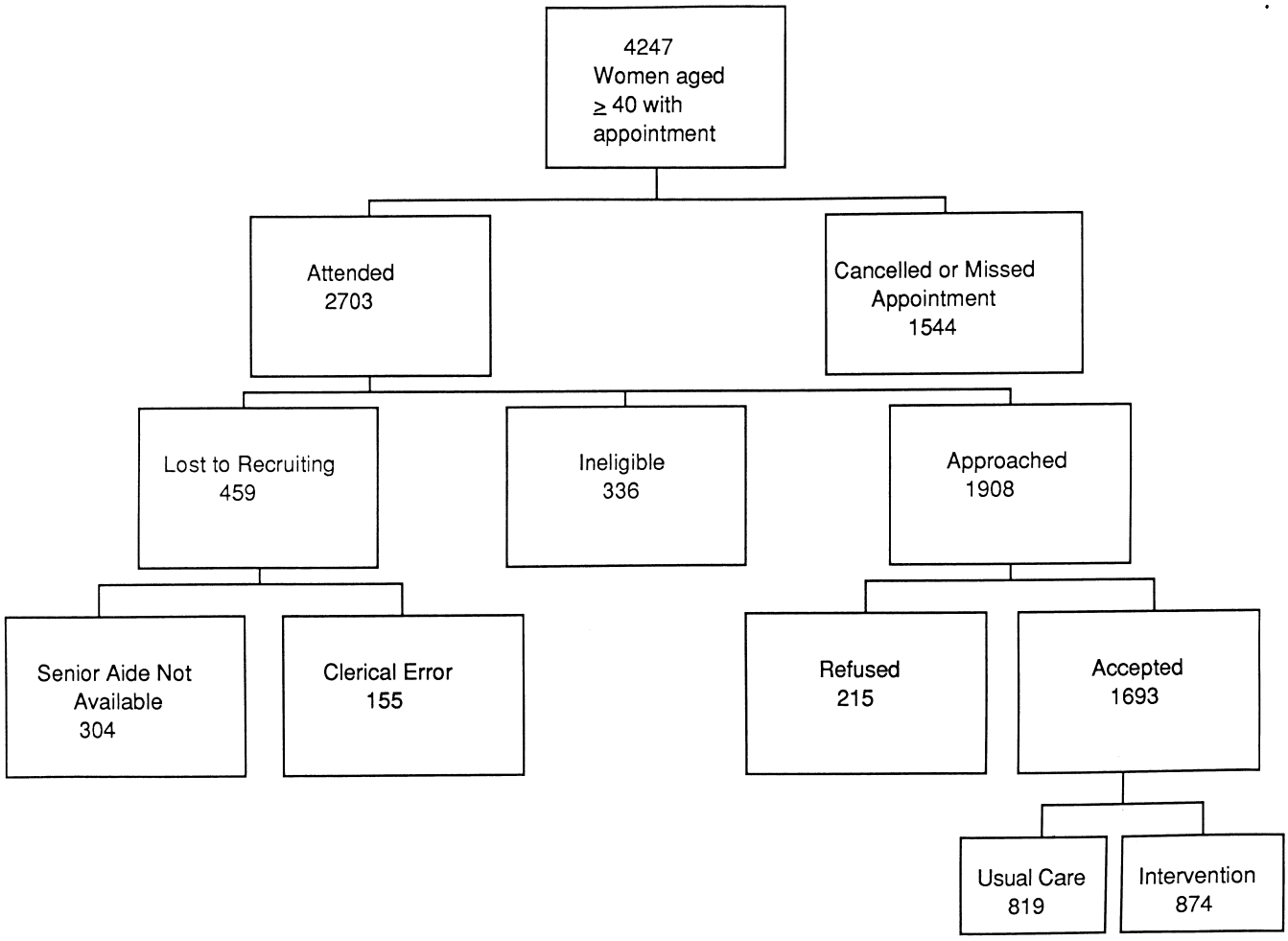

FIGURE 1. Recruitment and allocation of the study participants.

Table 1. As expected, fewer women in the intervention group required interviews because they had test results in the hospital databases, but an equivalent follow-up rate was achieved in both groups (82%–85% for both breast and cervical screening). Excluding women who were too confused, not yet due for screening, or deceased from the follow-up analysis left 1,483 women (89%) in the final breast screening group and 967 women (88%) in the final cervical screening group.

The baseline characteristics of the breast and cervical screening groups are shown in Table 2. Over one third of the participants were not white, and most of the women

Table 1. Follow-up of Participants Eligible for Breast Screening and Cervical Screening

	Breast Screening (n = 1,658)		Cervical Screening (n = 1,102)	
Follow-up	Usual Care (n = 801), n (%)	Intervention (n = 857), n (%)	Usual Care (n = 536), n (%)	Intervention (n = 566), n (%)
Follow-up obtained				
Hospital database	295 (37)	357 (42)	160 (30)	211 (37)
Self-report	375 (47)	368 (43)	277 (52)	259 (46)
No follow-up obtained				
Couldn't locate	28 (4)	36 (4)	18 (3)	21 (4)
Refused	13 (2)	11 (1)	11 (2)	10 (2)
Too confused	2 (0.3)	3 (0.4)	3 (0.6)	4 (0.7)
Deceased	25 (3)	18 (2)	22 (4)	10 (2)
Not yet due	63 (8)	64 (7)	45 (8)	51 (9)

Table 2. Baseline Characteristics of Study Participants in Final Sample for Breast Screening and Cervical Screening

Characteristics	Breast Screening (n = 1,483)			Cervical Screening (n = 967)		
	Usual Care (n = 711)	Intervention (n = 772)	p Value	Usual Care (n = 466)	Intervention (n = 501)	p Value
Age in years, mean ± SD	55.9 ± 12.0	54.5 ± 11.2	.02	54.8 ± 13.4	53.7 ± 11.6	.13
Race, %			.08			.25
White	64	61		65	63	
African American	17	20		15	18	
Native American	14	12		15	12	
Other	5	7		5	7	
Education in years, mean ± SD	11.8 ± 3.1	11.9 ± 3.0	.67	12.0 ± 3.3	12.0 ± 3.1	.99
Income (monthly), mean ± SD	$1,028 ± $1,373	$1,083 ± $1,168	.48	$1,063 ± $1,501	$1,085 ± $1,144	.82
Has regular provider, %	76	75	.49	75	73	.51
Insurance payer, %			.002			.15
Private	21	26		23	27	
Medicaid	46	46		47	47	
Medicare	27	20		25	19	
Self	5	8		6	8	
Due for screening, %	61	52	.001	63	59	.20

in the "other" racial category were Southeast Asian. The women in the usual care group were slightly older than those in the intervention group and thus more likely to be insured by Medicare than by private insurance. Among women who were not recruited for the study because a senior aide was unavailable, the same trend toward older age was also found in women with odd versus even medical record numbers (60.0 vs 58.7 years.) There was also a large difference in the proportion of women who were due for mammography screening at baseline, with more women in the usual care group being due for screening.

Results of Intervention

Of 772 women in the intervention group who were eligible for breast screening, 168 visited WCSC (119 of 401 [30%] women who were due for breast screening and 49 of 371 [13%] women who were up-to-date with breast screening at base line). Of the 501 women in the intervention group who were eligible for cervical screening, 116 visited WCSC (95 of 296 [32%] who were due for cervical screening and 21 of 205 [10%] who were up-to-date with cervical screening at baseline).

The intervention was associated with higher screening rates for both mammography and Pap smear (Table 3). A stratified analysis by baseline screening status showed that women who were up-to-date at baseline were very likely to be screened subsequently, and there was no effect of the intervention. However, women in the intervention group who were due for screening at baseline had significantly higher screening rates in the year following the intervention (Table 3). The Breslow-Day test confirmed an interaction between the intervention and baseline screening status for both mammography and Pap smear (p = .02 and p = .01, respectively.) For this reason, the analyses that follow are confined to the women who were due for screening at baseline.

Table 4 shows the follow-up screening rates in women due for screening at baseline stratified by age, insurance payer, and race. As indicated by the significant Mantel-Haenszel summary χ^2 statistics, after controlling for age and insurance payer, the intervention was associated with higher screening rates in women who were due for screening on entering the study. There was little or no evidence for interaction ($p > .20$). Thus, it appears that the intervention was effective across age and insurance strata. In the breast screening group, the Breslow-Day test showed strong evidence for an interaction of the intervention by race (p = .017). There was no effect of the intervention on mammography rates for white women, and the differences were modest for African–American women, whereas Native–American women and women of other ethnic backgrounds in the intervention group had large and statistically significant gains. In the case of cervical screening, the result of the Breslow-Day test for interaction with race was not statistically significant (p = .20), but this may simply reflect the smaller number of

Table 3. Rates of Screening at Follow-up Stratified by Baseline Screening Status

Screening	Usual Care, %	Intervention, %	p Value
Mammography (overall)	62.9	69.3	.009
Due at baseline	50.3	59.9	.006
Up-to-date at baseline	82.1	79.4	.37
Pap smear (overall)	62.9	70.3	.02
Due at baseline	50.3	63.2	.002
Up-to-date at baseline	84.3	80.5	.33

Table 4. Rates of Screening at Follow-up on Women Due for Screening at Baseline, Stratified by Age, Race, and Insurance Payer

Characteristic	Mammography (n = 830)			Pap Smear (n = 597)		
	Usual Care (n = 431), %	Intervention (n = 399), %	p Value*	Usual Care (n = 299), %	Intervention (n = 296), %	p Value*
Age, years			.003			.002
40–59	48	56		56	65	
60+	54	68		41	59	
Payer			.002			.003
Private	53	55		58	71	
Medicaid	52	70		39	60	
Medicare	50	60		54	65	
Self	35	49		60	45	
Race			.015			.004
White	55	55	.900	51	62	.020
African American	57	70	.110	71	66	.230
Native American	33	55	.010	37	56	.060
Other	40	76	.007	45	76	.040

**Values for age, payer, and race represent test of the Mantel-Haenszel summary χ^2 statistic; values for racial strata represent test of χ^2 statistic.*

women in this group. Although there was no intervention effect for African–American women, the intervention group had higher rates of cervical screening in the other racial or ethnic groups.

The results of the logistic regression analyses are shown in Table 5. In model 1, after controlling for age, insurance payer, and race, the women in the intervention group had 56% and 64% higher odds of receiving mammography and Pap smear, respectively. In model 2, the interaction between race and the intervention is shown as an adjusted intervention effect for each race. For mammography, the differences in favor of the intervention were striking and statistically significant in Native–American women and women of other ethnic backgrounds, and

Table 5. Adjusted Odds Ratios (95% Confidence Intervals) for Screening at Follow-up in Women Due for Screening at Baseline

Characteristic	Mammography (n = 759)		Pap Smear (n = 536)	
	Model 1*	Model 2†	Model 1*	Model 2†
Treatment group				
Intervention	1.56 (1.16, 2.10)	—	1.64 (1.16, 2.34)	—
African American	—	2.06 (0.98, 4.34)	—	0.74 (0.29, 1.87)
Native American	—	2.59 (1.25, 5.37)	—	1.98 (0.85, 4.64)
Other	—	8.76 (2.42, 31.67)	—	3.59 (0.92, 13.94)
White	—	1.07 (0.73, 1.56)	—	1.72 (1.09, 2.71)
Usual care	1.00	1.00	1.00	1.00
Age, years				
40–59	0.68 (0.48, 0.97)	0.67 (0.47, 0.97)	1.31 (0.87, 1.96)	1.30 (0.87, 1.96)
60+	1.00	1.00	1.00	1.00
Insurance payer				
Private	1.56 (0.83, 2.91)	1.57 (0.84, 2.94)	1.69 (0.80, 3.58)	1.67 (0.79, 3.55)
Medicaid	1.67 (0.88, 3.17)	1.70 (0.89, 3.24)	0.94 (0.45, 1.99)	0.92 (0.43, 1.95)
Medicare	1.71 (0.97, 3.17)	1.80 (1.01, 3.19)	1.29 (0.66, 2.53)	1.26 (0.64, 2.48)
Self	1.00	1.00	1.00	1.00
Race				
African American	1.16 (1.06, 2.44)	—	1.57 (0.93, 2.65)	—
Native American	0.64 (0.42, 0.97)	—	0.63 (0.39, 1.04)	—
Other	1.10 (0.60, 2.03)	—	1.15 (0.57, 2.32)	—
White	1.00	—	1.00	—

**Model includes intervention status, age, insurance payer, and race.*

†Model includes race-specific intervention effects, age, and insurance payer.

marginally statistically significant in African–American women. For Pap smear, only the white women had a statistically significant effect of the intervention, but the odds ratios were similar for Native Americans and women of other racial backgrounds.

DISCUSSION

Our results show that rates of breast and cervical cancer screening can be improved by identifying women due for screening in hospital outpatient specialty clinics, and using lay health advisers to invite them to be screened by a nurse practitioner. This approach resulted in an absolute improvement of 10% to 15% in the screening rates for women due for screening at baseline. Native–American and Southeast–Asian women, who had the lowest screening rates, had 20% to 25% improvements. Similar interventions, some of which included referral to a nurse practitioner, have been successful in primary care and emergency department settings,[14,15,17–19] but have not been tested previously in non-primary-care clinics. Approximately one quarter of our study participants could not identify a regular health care provider. Although coordinated care through a primary provider may be a goal of many organizations, clearly many women in our setting and in others do not receive their health care in this manner.

Although our intervention was effective and more than 30% of the women who were due for screening examinations received them through WCSC, the absolute number of patients seen in WCSC was relatively small. The nurse practitioner spent a considerable proportion of her time contacting women who missed appointments and arranging follow-up of abnormal findings. If we had intervened on the entire sample of women due for screening at baseline, approximately 80 more mammograms (830 × 0.096) and 77 more Pap smears (597 × 0.129) would have been performed over a 2-year period. After start-up, we estimate that a program such as this would require a nurse practitioner (annual salary $56,000 × 0.4 full-time equivalent [FTE] × 2 years), a clerical worker ($25, 000 × 0.1 FTE × 2 years), and a supervisor for the lay health educators ($40,000 × 0.1 FTE × 2 years). Thus, without considering any of the clinical revenue or the benefits of early detection, this program cost approximately $700 per additional mammogram and $750 per additional Pap smear. Although a formal cost-effectiveness analysis is beyond the scope of this article, an analysis from a program that used a nurse practitioner to screen similar numbers of women in an emergency department clinic concluded that their program of joint cervical and breast screening had comparable cost-effectiveness to screening in other health care settings.[24]

A number of caveats in the interpretation of the study deserve mention. First, our method of allocation did not result in equal distribution of patients on several potentially important confounders. Because medical record numbers are sequentially assigned, we assumed that our method would be equivalent to randomization and would be simpler for the senior aides. After discussions with the medical records department did not reveal any source of bias, we considered the possibility that the senior aides had differentially recruited younger women into the intervention group. However, this is unlikely given that the same age difference was seen in women who were not recruited for the study. Our multivariate analyses indicate that the positive study result was not due to baseline differences between the intervention and usual care groups.

Second, because our follow-up screening rates were obtained by a mixture of database results and self-reports, they may not be directly compared with our baseline screening rates, which were based solely on self-reports of screening. Numerous studies have shown that women underestimate the interval since their last mammogram and Pap smear.[25–28] As more women in the usual care group self-reported the date of their most recent screening test at follow-up, we may have underestimated the effectiveness of the intervention. Excluding women who were not yet due for follow-up, most of whom were up-to-date with screening at baseline and hence were likely to be screened again, would also tend to underestimate the follow-up screening rates.

Third, our decision to consider women due for Pap smear screening if their last test was more than 12 months before entry into the study could be disputed. This decision was based in part on practical considerations, such as the length of follow-up required if a 3-year Pap smear screening interval had been adopted as recommended by Eddy.[2] Although most guidelines now permit a 3-year screening interval when women at low risk for the development of cervical cancer have had normal results on three consecutive annual Pap smears, these criteria would have rarely been met in our patient population.

We conclude that mammography and Pap smear screening rates were improved by using lay health advisers to identify women due for screening in non-primary-care clinics, and to recruit them for screening. Access to and completion of cancer screening for these women, most of whom reported that they had a regular source of medical care, was improved by referral to a nurse practitioner. The intervention appears to have had its greatest impact on the women who needed it most: older women of color who were not privately insured and were due for screening. It should be possible to implement this type of intervention at reasonable cost in many settings caring for low-income women.

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