



Nina Mikhailenko. *Black and Red*. Oil on canvas, 12" × 16".

*Mammography and cervical cancer screening in older women are underutilized, and few screening studies for colorectal cancer have been performed.*

# A Review of Breast, Cervical, and Colorectal Cancer Screening Interventions in Older Women

Janice V. Bowie, PhD, Barbara A. Curbow, PhD, Mary A. Garza, PhD,  
Erin K. Dreyling, BA, Lisa A. Benz Scott, PhD, MS, and Karen A. McDonnell, PhD

*Although cancer-screening guidelines recommend periodic testing for women 50 years of age and older, these tests are underused. A search of databases identified 156 community-based breast, cervical, and colorectal cancer screening intervention studies published before April 2003. Most were conducted in the United States. More than half used randomization procedures or pre-post measures, and one third used both. Most reported significant intervention effects. Cervical and combined cervical and breast studies had higher rates of pre-post designs, and breast studies had the highest percentage using randomization. Although effective community-based breast and cervical interventions have been conducted, there is an urgent need for amplification of colorectal cancer screening.*

## Introduction

By 2030, 20% of the US population will consist of women over 65 years of age.<sup>1</sup> This population demographic has significant implications for breast, cervical, and colorectal cancer incidence and mortality. The rates of breast and colorectal cancers increase with age, and there is general consensus that the incidence of cervical cancer in older women is almost entirely confined to the unscreened and underscreened.<sup>2</sup> The median age at diagnosis for most

cancers is 68 years.<sup>3</sup> Additionally, a woman's age can determine whether she perceives herself to be at risk or she receives a recommendation from a health care provider to obtain a screening procedure or be clinically examined. As such, attention to cancer control efforts to serve older women and reduce the burden of cancer is critical.<sup>4</sup> Too little attention has been given to the topic of cancer in older people.<sup>3</sup>

Substantial evidence shows that mortality from all these cancers can be reduced through detection and early

*From the Department of Social and Behavioral Sciences at Johns Hopkins Bloomberg School of Public Health, Baltimore, Md (JVB, BAC, MAG, EKD, LABS, KAM), the Department of Health Care Policy and Management at the Health Sciences Center at the School of Health Technology and Management at the State University of New York at Stony Brook, NY (LABS), and the Maternal and Child Health Program*

*at the George Washington University School of Public Health, Washington, DC (KAM).*

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*Address correspondence to Janice V. Bowie, PhD, Johns Hopkins Bloomberg School of Public Health, 624 N. Broadway, Room 743, Baltimore, MD 21205. E-mail: jbowie@jhsph.edu*

treatment. In spite of the efficacy of the recommended practices and Medicare coverage for many of the screening procedures, a number of barriers among older women have been identified. Additionally, the practice of early detection occurs less often in minority, elderly, less educated, and poor women. Although screening guidelines recommend periodic testing for adults aged 50 and older, a number of studies report that these tests are underused among this population. For older women, timely use of preventive practices such as mammography, Pap smears, and colorectal screening critical to reducing mortality depends on effective intervention studies that target cancer control.

The Johns Hopkins Bloomberg School of Public Health and the Centers for Medicare and Medicaid Services collaborated to identify interventions that could be replicated to affect behavior change in adults 50 years of age or older. This project, called the “Healthy Behaviors Project,” focused on a number of health conditions such as diabetes, falls, and certain cancers that affect many aging Americans. In this paper, we describe published studies that target cancer-screening interventions for breast, cervical, and colorectal cancers.

The goal of our study was to identify community-based screening interventions and to assess the overall quality of the work conducted to date. Literature searches were conducted in two phases: phase 1 was to accommodate the original contract, and phase 2 was to update the search for publication. The two phases of the search employed identical search strategies in terms of keyword terminology, combinations of terms, and databases. Additionally, we used the same researchers, criteria for abstract review and evaluation, and coding of information from the articles. However, because reliability of abstract selection was demonstrated during phase 1, abstracts in phase 2 were screened initially by the second author.

## Methods

### *Selection of the Literature Prior to 2000*

The process for selecting articles for review included electronic database searches using keywords related to each type of cancer screening behavior, review of titles and abstracts identified through the searches, and a detailed review and abstraction of selected articles. The search strategies according to keywords for the three entities are listed in Table 1. Databases searched included MEDLINE, CancerLit, and PsycINFO. The searches included articles published before and in 2000. A total of 1,562 nonduplicate articles were identified. Those determined to be outside the scope of the project were excluded from further consideration. Of these, we deleted 558 articles (37.7%) for being unrelated to the literature search goals. Those focusing only on interventions for younger-aged women (<50 years of age) were deleted. We also excluded studies that used patient samples from physician offices, clinics, hospitals, or health maintenance organizations without an outreach component, studies that reported only program descriptions or baseline or interim results, and those that did not include routine screening.

Abstracts of selected articles were reviewed and coded. Two researchers reviewed a minimum of 10% of the abstracts to ensure interrater reliability. A total of 156 abstracts were identified as potentially representing community-based interventions. Copies of all behavioral (n = 134) and knowledge and attitude (n = 22) intervention papers were obtained. From the 156 intervention studies, 112 (71.8%) were found to be appropriate for inclusion in this review. These interventions included a mixture of clinical and community interventions. Clinical interventions were included if they used outreach strategies to generate women’s use of screening services.

**Table 1. — Search Strategies for Breast, Cervical, and Colorectal Cancers According to Keywords Used**

|                               |   |
|-------------------------------|---|
| Keywords used for breast:     | mammography AND knowledge, attitudes, practice OR attitude to health OR intervention studies OR program evaluation AND knowledge, attitudes, practice OR health promotion OR health behavior OR community health services OR patient acceptance of health care OR reminder systems OR patient compliance OR community health centers/utilization OR health education/methods OR comparative study.  |
| Keywords used for cervical:   | cervix neoplasm/prevention & control OR vaginal smears OR Pap tests OR cervical cancer AND mass screening/psychology OR mass screening/statistics & numerical data OR mass screening/utilization OR mass screening/methods OR mass screening/organization & administration OR screening OR knowledge, attitudes, practice OR vaginal smears/utilization OR patient education OR marketing of health services OR attitude to health AND knowledge, attitudes practice OR health promotion OR health behavior OR community health services OR patient acceptance of health care OR reminder systems OR patient compliance OR cervical OR community health centers/utilization OR health education/methods OR comparative study OR cancer screening. |
| Keywords used for colorectal: | colorectal neoplasms OR colorectal cancer screening OR colonic neoplasms OR colon cancer AND mass screening/psychology OR mass screening/statistics & numerical data OR mass screening/utilization OR mass screening/methods OR mass screening/organization & administration OR screening OR knowledge, attitudes, practice OR colon cancer OR patient education OR marketing of health services OR attitude to health AND knowledge, attitudes, practice OR health promotion OR health behavior OR community health services OR patient acceptance of health care OR reminder systems OR patient compliance OR community health centers/utilization OR health education/methods OR comparative study.  |

### Selection of the Literature Between 2000 and April 2003

An additional literature review was conducted in April 2003 using the same search terms and abstract retrieval procedure utilized for the period prior to 2000. In this phase, we first developed a list of 4,179 potential articles: 1,397 breast, 1,677 cervical, and 1,105 colorectal. All abstracts that appeared to be community-based interventions were again initially reviewed by the second author: 202 breast, 346 cervical, and 49 colorectal. After deleting

duplicate entries, the first and second authors rated each abstract as to whether it represented a community-based intervention. This review process left a total of 44 studies published in this set as representing community-based interventions: 27 breast, 8 cervical, 5 colorectal, and 4 breast and cervical. This is not an exhaustive review of all interventions for the time periods but reflects a range of designs that are representative of the literature. Descriptions of the final 156 studies, as well as citation information, are presented in Table 2.

Table 2. — Descriptions of 156 Selected Intervention Studies

| Intervention and Authors       | Reference  | Sample Size (N) | Design Specifics: |    | Significant Findings | Type of Intervention $P \leq .05$ |
|--------------------------------|--|-----------------|-------------------|----|----------------------|-----------------------------------|
|                                |  |                 | P/P               | RA |                      |                                   |
| <b>Breast Health:</b>          |  |                 |                   |    |                      |                                   |
| Aiken LS                       | Health Psychol<br>1994;3:526-538                   | 295             | Y                 | Y  | Y                    | EC                                |
| Andersen MR                    | Am J Prev Med<br>2000;18:199-207                   | 6,592           | Y                 | Y  | Y                    | EC, M, S/I, T                     |
| Banks SM                       | Health Psychol<br>1995;14:178-184                  | 133             | Y                 | Y  | Y                    | MM                                |
| Barr JK                        | Am J Manag Care<br>2001;7:887-894                  | 1,908           | N                 | Y  | Y                    | L, M, MM, T                       |
| Bastani R                      | Prev Med<br>1994;23:83-90                          | 626             | Y                 | Y  | N                    | L                                 |
| Bastani R                      | Prev Med<br>1999;29:355-364                        | 753             | Y                 | Y  | Y                    | HE, S/I                           |
| Beaulieu MD (Canada)           | CMAJ<br>1996;154:1335-1343                         | 171             | Y                 | N  | Y                    | EW, PE                            |
| Bloom JR                       | Cancer Epidemiol Biomarkers Prev<br>1991;1:75-82   | 670             | N                 | Y  | Y                    | S/I                               |
| Bowen D                        | Womens Health<br>1997;3:227-242                    | 129             | N                 | N  | Y                    | S/I                               |
| Brenes GA                      | J Womens Health Gend Based Med<br>1999;8:1313-1321 | 381             | N                 | Y  | Y                    | S/I                               |
| Burhansstipanov L              | J Cancer Educ<br>2000;15:28-32                     | 71              | N                 | N  | Y                    | EC, LW, M                         |
| Champion V                     | J Behav Med<br>1995;18:169-187                     | 405             | N                 | Y  | Y                    | HE, PE                            |
| Champion VL                    | Oncol Nurs Forum<br>2000;27:1565-1571              | 1,098           | Y                 | Y  | Y                    | M, R, S/I, T                      |
| Champion VL                    | Ann Behav Med<br>2002;24:211-218                   | 976             | Y                 | Y  | Y                    | L, M, S/I                         |
| Clark MA                       | Am J Prev Med<br>2001; 22:1-7                      | 1,026           | Y                 | Y  | Y                    | HE, L, M, S/I                     |
| Clover K (Australia)           | Prev Med<br>1996;25:126-134                        | 955             | N                 | Y  | Y                    | EC, MM                            |
| Cockburn J (Australia)         | J Epidemiol Community Health<br>1997;51:62-66      | 315             | Y                 | N  | N                    | L, MM                             |
| Costanza ME                    | Am J Prev Med<br>2000;19:39-46                     | 1,655           | Y                 | Y  | Y                    | M, PE, S/I, T                     |
| Crane LA                       | Prev Med<br>1998;27:S39-S49                        | 2,182           | N                 | Y  | Y                    | L, S/I, T                         |
| Curry SJ                       | Prev Med<br>1993;22:350-360                        | 1,479           | N                 | Y  | N                    | L                                 |
| Danigelis NL                   | J Cancer Educ<br>2001;16:55-58                     | 2,607           | N                 | N  | Y                    | HE, M                             |
| Drossaert CH (The Netherlands) | Patient Educ Couns<br>1996;28:121-131              | 2,961           | N                 | Y  | N                    | HE                                |

**Table 2. — Descriptions of 156 Selected Intervention Studies**

| Intervention and Authors | Reference  | Sample Size (N)      | Design Specifics: |    | Significant Findings | Type of Intervention<br><i>P</i> ≤ .05 |
|--------------------------|--|----------------------|-------------------|----|----------------------|--|
|                          |  |                      | P/P               | RA |                      |  |
| Duan N                   | Am J Public Health<br>2000;90:1468-1471          | 813                  | Y                 | N  | Y                    | M, S/I, T                              |
| Earp JA                  | Am J Public Health<br>2002;92:646-654            | 801                  | Y                 | Y  | Y                    | EC, LW, M, S/I                         |
| Erwin DO                 | J Cancer Educ<br>1996;11:210-215                 | 204                  | Y                 | N  | Y                    | EC                                     |
| Fletcher SW              | J Natl Cancer Inst<br>1993;85:112-120            | 970                  | Y                 | Y  | Y                    | EC, MM, PE, S/I                        |
| Flynn BS                 | Prev Med<br>1997;26:102-108                      | 540                  | N                 | Y  | Y                    | EC, M                                  |
| Fox SA                   | J Health Care Poor Underserved<br>1998;9:309-321 | 302                  | Y                 | N  | Y                    | EC                                     |
| Fox SA                   | Am J Public Health<br>2001;91:55-61              | 917 (T1)<br>922 (T2) | Y                 | Y  | Y                    | M, L, S/I, T                           |
| Gardiner JC              | J Cancer Educ<br>1995;10:155-162                 | 1,545                | Y                 | N  | Y                    | EC, PE                                 |
| Gelfand DE               | Oncol Nurs Forum<br>2000;27:659-666              | 567                  | Y                 | N  | Y                    | EW, HE, M, S/I                         |
| Gimotty PA               | Control Clin Trials<br>1999;20:280-293           | 1,669                | N                 | Y  | Y                    | EW, M                                  |
| Harrison RV              | Med Care<br>2003;41:375-385                      | 1,229                | N                 | Y  | Y                    | L, M                                   |
| Hurley SF (Australia)    | Am J Public Health<br>1994;84:1655-1658          | 2,266                | N                 | Y  | Y                    | L                                      |
| Husaini BA               | Natl Med Assoc<br>2002;94:100-106                | 364                  | Y                 | Y  | Y                    | EC, HE, M, MM                          |
| Janz NK                  | Am J Public Health<br>1997;87:1683-1686          | 460                  | N                 | Y  | Y                    | L, O, T                                |
| Kiefe CI                 | Arch Intern Med<br>1994;154:1217-1224            | 119                  | N                 | Y  | Y                    | HE, M                                  |
| King ES                  | Am J Public Health<br>1994;84:104-106            | 1,343                | N                 | Y  | Y                    | L, T                                   |
| King ES                  | J Aging Health<br>1995;7:529-551                 | 548                  | N                 | Y  | Y                    | L, T                                   |
| King E                   | J Cancer Educ<br>1998;13:108-115                 | 436                  | Y                 | Y  | N                    | EC, EW                                 |
| Lauver DR                | Cancer Detect Prev<br>1999;23:254-264            | 101                  | N                 | Y  | Y                    | T                                      |
| Lerman C                 | Am J Public Health<br>1992;82:729-730            | 446                  | N                 | Y  | Y                    | HE, S/I                                |
| Levin JR                 | Am Geriatr Soc<br>1997;45:1365-1370              | 148                  | N                 | N  | N                    | M                                      |
| Lipkus IM                | Am J Prev Med<br>2000;18:1-10                    | 1,099                | Y                 | Y  | Y                    | L, M, T                                |
| Mayer JA                 | Prev Med<br>2000;31:315-322                      | 1,562                | Y                 | Y  | Y                    | L, M, S/I, T                           |
| McAlister AL             | J Natl Cancer Inst Monogr<br>1995;18:123-126     | 309                  | Y                 | N  | Y                    | S/I                                    |
| Ore L (Israel)           | Isr J Med Sci<br>1997;33:103-111                 | 1,500                | N                 | Y  | Y                    | L                                      |
| Paskett ED               | Prev Med<br>1998;27:120-128                      | 540                  | Y                 | N  | Y                    | EC, EW                                 |
| Reuben DB                | AJR Am J Roentgenol<br>2002;179:1509-1514        | 463                  | N                 | Y  | Y                    | EC, HE, M, S/I, T                      |
| Reynolds KD              | Health Educ Q<br>1990;17:429-441                 | 156                  | Y                 | Y  | Y                    | HE                                     |

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**Table 2. — Descriptions of 156 Selected Intervention Studies**

| Intervention and Authors | Reference  | Sample Size (N) | Design Specifics: |    | Significant Findings | Type of Intervention $P \leq .05$ |
|--------------------------|--|-----------------|-------------------|----|----------------------|-----------------------------------|
|                          |  |                 | P/P               | RA |                      |                                   |
| Richardson JL            | Cancer Epidemiol Biomarkers Prev<br>1996;5:71-76   | 396             | Y                 | Y  | Y                    | L, O                              |
| Rimer BK                 | Public Health Rep<br>1992;107:369-380              | 412             | Y                 | Y  | Y                    | EC, L                             |
| Rimer BK                 | Am J Prev Med<br>2002;22:247-257                   | 1,091           | Y                 | Y  | Y                    | L, M, S/I, T                      |
| Roberson NL              | Cancer<br>1994;74:2034-2041                        | 271             | N                 | N  | Y                    | EC, M                             |
| Saywell RM Jr            | Prev Med<br>1999;29:374-382                        | 808             | Y                 | Y  | Y                    | EW, L                             |
| Scammon DL               | J Ambul Care Mark<br>1995;6:59-71                  | 195             | N                 | N  | Y                    | M                                 |
| Schapira DV              | Cancer<br>1992;70:509-512                          | 220             | N                 | Y  | Y                    | O                                 |
| Schneider TR             | Health Psychol<br>2001;20:256-266                  | 752             | Y                 | Y  | Y                    | EC, M, MM, S/I, T                 |
| Schwartz MD              | Am J Public Health<br>1999;89:924-926              | 430             | Y                 | Y  | Y                    | EW, S/I                           |
| Segura JM (Spain)        | Prev Med<br>2001;33:325-332                        | 986             | N                 | Y  | Y                    | L, M, T                           |
| Seow A (Singapore)       | Ann Acad Med Singapore<br>1998;27:838-842          | 1,500           | N                 | Y  | Y                    | HE, L                             |
| Shenson D                | Am J Prev Med<br>2001;20:97-102                    | 284             | Y                 | Y  | Y                    | T, HE                             |
| Simon MS                 | Breast Cancer Res Treat<br>2001;65:63-70           | 1,717           | N                 | Y  | N                    | L, M, R                           |
| Skinner CS               | Am J Public Health<br>1994;84:43-49                | 497             | N                 | Y  | Y                    | L                                 |
| Skinner CS               | Health Educ Behav<br>1998;25:60-78                 | 253             | Y                 | N  | Y                    | EC                                |
| Slater JS                | Prev Med<br>1998;27:862-870                        | 427             | Y                 | N  | Y                    | EC, R                             |
| Stoddard AM              | Prev Med<br>2002;34:90-99                          | 3,461           | Y                 | Y  | N                    | M, S/I, T                         |
| Stoner TJ                | Health Serv Res<br>1998;33:11-28                   | 232             | Y                 | Y  | Y                    | M                                 |
| Suarez L                 | Am J Prev Med<br>1993;9:290-296                    | 1,822           | N                 | N  | Y                    | MM, O                             |
| Taplin SH                | Am J Public Health<br>1994;84:571-574              | 1,327           | N                 | Y  | Y                    | L                                 |
| Taplin SH                | J Natl Cancer Inst<br>2000;92:233-242              | 1,775           | Y                 | Y  | Y                    | L, M, S/I, T                      |
| Taylor V                 | J Gen Intern Med<br>1999;14:104-111                | 314             | N                 | Y  | Y                    | HE, L, O, PE                      |
| Trock B                  | Cancer Epidemiol Biomarkers Prev<br>1993;2:151-156 | 2,724           | N                 | Y  | Y                    | EW, L, PE, R, T                   |
| Urban N                  | Prev Med<br>1995;24:477-484                        | 1,697           | Y                 | Y  | N                    | EC, L, MM                         |
| Valdez A                 | J Cancer Educ<br>2001;16:221-224                   | 1,197           | Y                 | N  | Y                    | HE, M, S/I, T                     |
| Weber BE                 | Arch Intern Med<br>1997;157:2345-2349              | 376             | N                 | Y  | Y                    | EW                                |
| Wolosin RJ               | J Fam Pract<br>1990;30:542-547                     | 687             | N                 | Y  | Y                    | L                                 |
| Worden JK                | Prev Med<br>2002;35:349-361                        | 4,096           | Y                 | Y  | N                    | EC, HE, M, MM, P, R, S/I, T       |

Table 2. — Descriptions of 156 Selected Intervention Studies

| Intervention and Authors     | Reference  | Sample Size (N) | Design Specifics: |                | Significant Findings | Type of Intervention<br><i>P</i> ≤ .05 |
|------------------------------|--|-----------------|-------------------|----------------|----------------------|--|
|                              |  |                 | P/P               | RA             |                      |  |
| Zapka JG                     | Prev Med<br>1993;22:34-53                          | 838             | Y                 | N              | N                    | EC, L, MM, PE                          |
| Zhu K                        | Prev Med<br>2002;34:536-545                        | 865             | Y                 | Y              | N                    | EC, HE, LW, M, S/I                     |
| <b>Cervical Cancer:</b>      |  |                 |                   |                |                      |  |
| Alexander K                  | J Community Health<br>1981;6:216-222               | 85,029          | N                 | N              | N                    | EC, MM                                 |
| Allen JD                     | Am J Public Health<br>2001;91:584-590              | 2,943           | Y <sup>a</sup>    | Y <sup>b</sup> | Y <sup>c</sup>       | LW, HE, EC                             |
| Berger P                     | J Emerg Med<br>1998;16:691-694                     | 1,000           | N                 | N              | N                    | EW                                     |
| Bird JA                      | Prev Med<br>1998;27:821-829                        | 918             | Y                 | N              | Y                    | EC, LW                                 |
| Bowman J                     | J Med Screen<br>1995;2:211-218                     | 659             | Y                 | N              | Y                    | EW, L                                  |
| Buehler SK                   | CMAJ<br>1997;157:521-526                           | 441             | Y                 | Y              | N                    | L                                      |
| Burger RA                    | Obstet Gynecol<br>1995;86:491-498                  | 126             | Y                 | N              | N                    | EW, MM, P                              |
| Byles JE (Australia)         | J Med Screen<br>1994;1:150-158                     | 14,000          | Y                 | Y              | Y                    | L, MM, PE                              |
| Byles JE (Australia)         | Aust N Z J Public Health<br>1996;20:254-260        | Unkn            | Y                 | N              | Y                    | L                                      |
| Campbell E                   | Prev Med<br>1997;26:801-807                        | 411             | Y                 | Y              | Y                    | EW, S/I                                |
| Cockburn J                   | Med J Aust<br>1990;152:190-194                     | 466             | Y                 | N              | Y                    | EW                                     |
| Dignan MB                    | Health Educ Res<br>1994;9:411-420                  | 1,830           | Y                 | N              | Y                    | EC, PE, S/I                            |
| Dignan MB                    | Health Educ Res<br>1998;13:545-556                 | 979             | Y                 | Y              | Y                    | EC, LW                                 |
| Doyle JP                     | Am J Prev Med<br>1996;12:345-350                   | 387             | Y                 | N              | N                    | P                                      |
| Hancock L (Australia)        | Prev Med<br>2001;32:109-117                        | NA              | Y                 | Y <sup>d</sup> | Y                    | HE, MM, L                              |
| Hermens RP (The Netherlands) | Prev Med<br>2000;30:35-42                          | 9,531           | N                 | N              | Y                    | L                                      |
| Jenkins CNH                  | Prev Med<br>1999;28:395-406                        | 933             | Y                 | N              | Y                    | EC, MM                                 |
| Kelly AW                     | Mayo Clin Proc<br>1996;71:437-444                  | 57              | Y                 | N              | N                    | EC, MM                                 |
| Lantz P                      | Am J Public Health<br>1995;85:834-836              | 659             | Y                 | Y              | Y                    | L, T                                   |
| Margolis KL                  | J Gen Intern Med<br>1998;13:515-521                | 1,102           | Y                 | Y              | Y                    | LW                                     |
| McMenamin JP                 | N Z Med J<br>1992;105:495-497                      | 329             | Y                 | N              | Y                    | R                                      |
| Mitchell H (Australia)       | Med J Aust<br>1991;155:79-82                       | 2,000           | Y                 | Y              | Y                    | MM, L                                  |
| Nygaard JF (Norway)          | J Med Screen<br>2002;9:86-91                       | NA              | Y                 | N              | Y                    | L                                      |
| Paskett ED                   | Cancer Epidemiol Biomarkers Prev<br>1999;8:453-459 | 650             | Y                 | N              | Y                    | EC, EW, O, S/I                         |
| Pritchard DA                 | Aust J Public Health<br>1995;19:167-172            | 757             | N                 | Y              | Y                    | L                                      |

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Table 2. — Descriptions of 156 Selected Intervention Studies

| Intervention and Authors           | Reference                                    | Sample Size (N)    | Design P/P | Specifics: RA  | Significant Findings | Type of Intervention $P \leq .05$ |
|------------------------------------|--|--------------------|------------|----------------|----------------------|-----------------------------------|
| Ramirez AG                         | J Natl Cancer Inst Monogr<br>1995;18:117-122 | 1,798              | Y          | N              | N                    | S/I                               |
| Sheeran P (United Kingdom)         | Health Psychol<br>2000;19:283-289            | 114                | Y          | Y              | Y                    | L, S/I                            |
| Shelley JM (Australia)             | Health Educ Res<br>1991;6:267-277            | 850 <sup>e</sup>   | Y          | N              | Y                    | EC, MM, PE, S/I                   |
| Somkin CP                          | Arch Intern Med<br>1997;157:1658-1664        | 3,564              | Y          | Y              | Y                    | L                                 |
| Stillwater B                       | Public Health Rep<br>1995;110:211-214        | 90                 | Y          | N              | Y                    | EW, MM                            |
| Suarez L                           | Am J Prev Med<br>1993;9:290-296              | 376                | Y          | N              | N                    | MM, O                             |
| Swaddiwudhipong W (Thailand)       | Int J Epidemiol<br>1995;24:493-498           | 1,603              | Y          | N              | Y                    | EW, P                             |
| Taylor VM                          | J Natl Cancer Inst<br>2002;94:670-677        | 482                | Y          | Y              | Y                    | EW, P                             |
| Torres-Mejia G (Mexico)            | Int J Cancer<br>2000;87:869-873              | 4,802              | N          | Y              | Y                    |                                   |
| White GE                           | N Z Med J<br>1993;106:357-360                | 152                | Y          | NR             | N                    | L, O                              |
| Windsor RA                         | Am J Public Health<br>1981;71:641-643        | 3,500              | N          | N              | Y                    | EC, LW, MM                        |
| Yu MY                              | Res Theory Nurs Pract<br>2002;16:237-248     | NA                 | N          | N              | NR                   | HE, MM, S/I, T                    |
| <b>Breast and Cervical Cancer:</b> |  |                    |            |                |                      |                                   |
| Eaker ED                           | J Public Health Manag Pract<br>2001;7:20-30  | 2,393 <sup>f</sup> | Y          | N <sup>g</sup> | Y—both               | EC, MM                            |
| Fernandez ME                       | Am J Prev Med<br>1999;16:35-49               | 27,494             | Y          | N              | N                    | EC, R                             |
| Gotay CC                           | Prev Med<br>2000;31:529-537                  | 678                | Y          | N              | Y—both               |                                   |
| Navarro AM                         | Am J Prev Med<br>1998;15:32-41               | 512                | Y          | Y              | Y                    | EC, LW                            |
| Newell SA (Australia)              | Am J Prev Med<br>2002;22:15-22               | 20                 | Y          | Y <sup>h</sup> | N                    | EC, L, M, MM, P                   |
| Segnan N (Italy)                   | Tumori<br>1998;84:348-353                    | 16,454             | N          | Y              | Y                    | L                                 |
| Sung JFC                           | Am J Prev Med<br>1997;13:51-57               | 321                | Y          | Y              | N                    | EC, LW                            |
| Valanis BG                         | Prev Med<br>2002;34:40-50                    | 510                | Y          | Y              | Y                    | HE, L, M, P, T                    |
| <b>Colorectal Cancer:</b>          |  |                    |            |                |                      |                                   |
| Adamsen S (Denmark)                | Scand J Gastroenterol<br>1984;19:531-534     | 700                | N          | N              | Y                    | FOBT, L, S/I                      |
| Bejes C                            | Fam Pract Res J<br>1992;12:83-90             | 527                | N          | N              | Y                    | FOBT, M                           |
| Berry DB (Britain)                 | Br J Surg<br>1997;84:1274-1276               | 6,371              | N          | Y              | NR                   | FOBT                              |
| Blom J (Sweden)                    | Eur J Surg Oncol<br>2002;28:827-831          | 2,000              | N          | Y              | N                    | HE, L, S/I, T                     |
| Cummings KM                        | N Y State J Med<br>1986;86:68-72             | 58,934             | N          | N              | NR                   | FOBT, MM                          |
| Goswitz JT                         | Wis Med J<br>1987;86:25-28                   | 995                | N          | N              | NR                   | FOBT, MM                          |
| Hardcastle J (United Kingdom)      | Lancet<br>1980;1:791-793                     | 1,638              | N          | N              | NR                   | FOBT, L                           |

**Table 2. — Descriptions of 156 Selected Intervention Studies**

| Intervention and Authors      | Reference                                       | Sample Size (N) | Design Specifics: P/P | RA             | Significant Findings | Type of Intervention $P \leq .05$ |
|-------------------------------|---|-----------------|-----------------------|----------------|----------------------|-----------------------------------|
| Hardcastle J (United Kingdom) | Lancet<br>1996;348:1472-1477                    | 150,251         | N                     | Y              | Y                    | FOBT, L                           |
| Hart AR (United Kingdom)      | Public Health<br>1996;110:247-249               | 556             | N                     | N              | Y                    | EW, FOBT, L                       |
| Hart AR (United Kingdom)      | J Epidemiol Community Health<br>1997;51:187-191 | 1,571           | N                     | Y              | Y                    | EC, FOBT                          |
| Herbert C (France)            | Prev Med<br>1995;24:498-502                     | 11,947          | N                     | N              | Y                    | EW, FOBT, L                       |
| Hoogewerf P (Canada)          | CMAJ<br>1987;137:195-198                        | 5,003           | N                     | N              | Y                    | EW, FOBT                          |
| King J (Australia)            | Aust N Z J Surg<br>1992;62:714-719              | 966             | N                     | N              | Y                    | EC, FOBT, L, O                    |
| Klaaborg K (Denmark)          | Scand J Gastroenterol<br>1986;21:1180-1184      | 8,000           | N                     | Y              | Y                    | FOBT, L, S/I                      |
| Kronborg O (Denmark)          | Lancet<br>1996;348:1467-1471                    | 61,933          | N                     | Y              | Y                    | FOBT, L                           |
| Macrae F (Australia)          | Prev Med<br>1984;13:115-126                     | 581             | N                     | N              | Y                    | FOBT, S/I                         |
| McGarrity T                   | Arch Intern Med<br>1989;149:140-144             | 57,000          | N                     | N              | N                    | FOBT, MM                          |
| McGarrity T                   | Am J Gastroenterol<br>1990;85:266-270           | 73,508          | N                     | N              | N                    | FOBT, MM                          |
| Miller M                      | Arch Surg<br>1988;123:63-65                     | 72,000          | N                     | N              | NR                   | FOBT, MM                          |
| Myers RE                      | Prev Med<br>1990;19:502-514                     | 838             | N                     | Y              | Y                    | FOBT, L, O, S/I                   |
| Myers RE                      | Med Care<br>1991;29:1039-1050                   | 2,201           | N                     | Y              | Y                    | EC, L                             |
| Myers RE                      | Prev Med<br>1994;23:142-151                     | 501             | N                     | Y              | Y                    | EC, FOBT, L, S/I                  |
| Ore L (Israel)                | Eur J Cancer Prev<br>2001;10:251-256            | 1,940           | Y                     | Y              | Y                    | FOBT, HE, S/I                     |
| Plaskon P                     | Soc Work Health Care<br>1995;21:59-70           | 81              | N                     | Y              | Y                    | EW, FOBT                          |
| Powe BD                       | Oncol Nurs Forum<br>1999;26:583-588             | 70              | Y                     | N              | Y                    | EW, FOBT, S/I                     |
| Powe BD                       | Cancer Pract<br>2002;10:139-146                 | 106             | Y                     | Y <sup>i</sup> | Y                    | EW, FOBT                          |
| Tazi MA (France)              | J Med Screen<br>1997;4:147-151                  | 45,642          | N                     | N              | Y                    | FOBT, L, MM, O                    |
| Thomas W                      | Am J Epidemiol<br>1995;142:176-182              | 15,476          | N                     | Y              | Y                    | FOBT, L, O                        |
| Thompson R                    | Med Care<br>1986;24:904-914                     | 507             | N                     | Y              | Y                    | EW, FOBT, L, O                    |
| Vinker S (Israel)             | Isr Med Assoc J<br>2002;4:424-425               | 2,315           | N                     | N              | Y                    | L, T                              |
| Wardle J (United Kingdom)     | Health Psychol<br>2003;22:99-105                | 2,966           | N                     | Y              | Y                    | M, O (booklet), S/I               |

Coding key used to classify the major methodological approaches identified in the study design and interventions: EC = education within community, EW = education within site, FOBT = fecal occult blood test, HE = health education, L = letter or some form of mailing, LW = lay worker, M = mammogram, MM = mass media, NA = not available, NR = not reported, O = other methods not clearly identified or do not fit within one of the other coding designations (eg, advisory boards, physical examinations, role models, volunteers), P = Pap smear, PE = provider education, PP = pre/post, R = referral, RA = randomized, S/I = survey or interview, T = telephone counseling or follow-up.

<sup>a</sup> For different cohorts. <sup>b</sup> At work-site level. <sup>c</sup> For Pap smears, not for mammography. <sup>d</sup> At the town level. <sup>e</sup> For interview and 338,000 for screening rates. <sup>f</sup> For baseline, 2,012 for follow-up, 1,359 for cross-sectional component. <sup>g</sup> Randomized at the county level. <sup>h</sup> At town level. <sup>i</sup> At the center level.

**Table 3. — Summary of Intervention Study Characteristics**

| Intervention Characteristics       | Breast<br>N = 80 |        | Cervical<br>N = 37 |        | Colorectal<br>N = 31 |        | Breast and Cervical<br>N = 8 |        | Total<br>N = 156 |        |
|------------------------------------|------------------|--------|--------------------|--------|----------------------|--------|------------------------------|--------|------------------|--------|
|                                    | n                | (%)    | n                  | (%)    | n                    | (%)    | n                            | (%)    | n                | (%)    |
| Pre-post tests and randomization   | 30               | (37.5) | 12                 | (32.4) | 2                    | (6.5)  | 4                            | (50.0) | 48               | (30.8) |
| Pre-post tests only                | 43               | (53.6) | 30                 | (81.1) | 3                    | (9.7)  | 7                            | (87.5) | 83               | (53.2) |
| Randomization only                 | 60               | (75.0) | 14                 | (37.8) | 15                   | (48.4) | 5                            | (62.5) | 94               | (60.2) |
| No randomization or pre-post tests | 7                | (8.7)  | 5                  | (13.5) | 15                   | (48.3) | 0                            | (0.0)  | 27               | (17.3) |
| Positive effects*                  | 68               | (85.0) | 27                 | (75.0) | 23                   | (88.4) | 4                            | (50.0) | 122              | (78.2) |

\* N = 150; significance levels could not be determined for 6 studies.

## Results

### Characterization of Intervention Studies for Breast, Cervical, and Colorectal Cancer Screening in Older Women

**Program Characteristics:** The majority of studies (76.3%) were conducted in the United States. Study characteristics are summarized by cancer type in Table 3. More than half of the studies used randomization procedures (60.3%) or pre-post measures (53.2%), but only 30.8% used both design features. Cervical cancer studies (81.1%) and combined cervical and breast studies (87.5%) had higher rates of pre-post designs (chi-square = 38.93; *df* = 3; *P* = .000) than did breast (53.6%) and colorectal (9.7%). Breast cancer studies (75.0%; chi-square = 16.87; *df* = 3; *P* = .001) had higher rates of randomization than did combined breast and cervical (62.5%), cervical (37.8%), and colorectal (48.4%). Most (78.2%) reported significant intervention effects.

We also reviewed study characteristics over time, according to publication date: 1980–1994 (*n* = 44), 1995–1999 (*n* = 68), and 2000–2003 (*n* = 44). As shown in Table 4, there were significant associations between time period and study characteristics. Use of a pre-post design increased from 31.8% to 55.95% to 70.5% over the three periods (chi-square = 13.54; *df* = 2; *P* = .001). Use of randomization also increased from 52.3% to 55.9% to 60.3% during the same time period (chi-square = 5.71; *df* = 2; *P* = .058). Intervention effects increased from 80.0% to 80.6% to 83.7% (chi-square = .232; *df* = 2; *P* = NS).

**Types of Interventions:** The context of community-based cancer screening interventions in this project refers

**Table 4. — Study Design Characteristics by Year of Publication**

| Year       | Pre/Post<br>N = 156      | Randomized<br>N = 156   | Studies With<br>Significant<br>Effects (%)<br>N = 150 |
|------------|--------------------------|-------------------------|---|
| 1980–1994  | 14 (31.8)                | 23 (52.3)               | 32 (80.0)   |
| 1995–1999  | 38 (55.9)                | 38 (55.9)               | 54 (80.6)   |
| 2000–2003  | 31 (70.5)                | 33 (75.0)               | 36 (83.7)   |
| Total      | 83 (53.2)                | 94 (60.3)               | 122 (81.3)  |
| Chi-square | 13.54 ( <i>P</i> = .001) | 5.71 ( <i>P</i> = .058) | 0.89 ( <i>P</i> = NS)                                 |

to programs and clinical services that either take place in community settings or include outreach strategies designed to reach older populations and engage them in health-promoting behaviors.

Promotion of breast, cervical and colorectal cancer screening was commonly implemented through three approaches. The majority (41.0%) of interventions used some form of letters that were either mailed or issued to study participants. These interventions usually start with a provider-based sample of individuals and then use mailed invitations or reminder prompts to draw patients in for screening. Inclusion of a community educational component (28.8%) was the second most cited component, followed by the use of surveys and interviews (27.6%), as part of an assessment strategy or an educational or counseling activity. Educational components occur in many forms but typically consist of workshops with presentations along with distribution of materials on cancer screening. As part of community education programs, pre- and post-test surveys assess knowledge and attitudes and, in randomized samples, determine differences between the intervention and control groups. The use of Pap smears (5.8%) and referrals (3.2%) were the least frequently cited components. Types of interventions are listed in Table 5.

**Table 5. — Percentage of Interventions by Educational Component**

| Type                                 | No. | Percentage |
|--------------------------------------|-----|------------|
| Letters                              | 64  | 41.0       |
| Educational counseling               | 45  | 28.8       |
| Fecal occult blood test              | 30  | 19.2       |
| Mass media                           | 31  | 19.9       |
| Education within setting             | 23  | 14.7       |
| Survey/interview                     | 43  | 27.6       |
| Health education                     | 24  | 15.4       |
| Other methods not clearly identified | 14  | 9.0        |
| Provider education                   | 11  | 7.1        |
| Lay worker                           | 10  | 6.4        |
| Mammogram                            | 37  | 23.7       |
| Telephone counseling or follow-up    | 29  | 18.6       |
| Pap smear                            | 9   | 5.8        |
| Referral                             | 5   | 3.2        |

## **Intervention Studies for Breast, Cervical and Colorectal Cancer Prevention**

**Breast:** As can be seen in Table 2, 60 (75.0%) of the 80 breast cancer prevention studies included some randomization of the study population to possible interventions. Pre- and post-tests were used in 43 (53.6%) of the studies, and positive effects were reported in 68 (85.0%). The majority of studies (90.0%) were conducted in the United States, and several included clinical interventions with outreach components such as tailored letters of invitation and chart reminders to schedule mammography screening. Community programs with referrals for screening were another widely promoted form of intervention. Few studies utilized a theoretical model as the basis for their study or educational intervention component. For those that did, the Health Belief Model (HBM) was mentioned most frequently. In most of the studies reviewed, the HBM was used to assess individual susceptibility and severity of developing cancer, determine the likelihood to get screened, and weigh the benefits and barriers to screening participation.

**Cervical:** With respect to the 37 cervical cancer screening studies, 14 (37.8%) were randomized, 30 (81.1%) included pre and posts measures, and 27 (75.0%) of 36 reported positive effects. The most commonly noted interventions used a combination of outreach community strategies and clinic-based in-reach strategies (general practitioner training). These interventions were associated with increases in cervical cancer knowledge, decreases in perceived barriers, and overall increases in the utilization of Pap smear screening programs. Though few, those that used some theoretical framework in developing the interventions were able to incorporate the unique needs of the population while also addressing women's individual barriers to screening.

**Colorectal:** Of 31 behavioral interventions reviewed, 15 (48.4%) were randomized, 3 (9.7%) included pre- and post-tests, and 23 (88.4%) of 26 reported positive effects. Single interventions, also commonly referred to as "one shot" approaches, accounted for the largest percentage of the cancer screening interventions featured (n = 7; 23%). This approach consisted primarily of a mass media campaign followed by the distribution of fecal occult blood test (FOBT) kits. The randomized control trials and comparison studies employed the standard care method: receipt of an FOBT kit. Overall, these studies showed positive findings when more than one strategy was used along with the standard of care method.

## **Lessons Learned From the Intervention Studies**

There are strong similarities in the intervention strengths and weaknesses cited across the three types of cancer. Below is a summary of nine issues that cut across research

areas. These issues reflect components of both clinic (outreach) and community-based interventions that we believe are essential to consider when developing programs, and they are similar to descriptions of best practices found in the literature reviewed for this study.<sup>5</sup> Each of these nine issues is summarized below.

### **Lesson 1: Develop Theory-based Interventions**

The literature regarding behavior change offers such a broad array of theories that it may seem bewildering to interventionists who are not trained in the field. However, the single most important mistake found in the literature reviewed in this project was the lack of appreciation for the critical nature of theory. There are four key reasons why theory is essential to intervention studies: (1) theories provide an orderly way of thinking about behavior change, (2) theories provide a "common language" among researchers and practitioners, (3) theories provide testable hypotheses about behavior change, and (4) theories guide the development and evaluation of interventions. At the most basic level, theory is needed for the adequate planning, evaluation, and interpretation of interventions.

### **Lesson 2: Develop Culturally Sensitive and Appropriate Interventions**

A second weakness found in many of the studies is that they did not assess the cultural appropriateness of their interventions. Problems can arise around many issues. For example, wording of study materials may miss the mark because of mistranslation of a term into another language or the use of terminology that has different meanings in the targeted group. Visual aids may not depict culturally relevant stimuli. Intervention staff may not be credible or trustworthy in the eyes of the target group. It is important to be sensitive to cultural differences and to include experts, ie, community members, in the development of the intervention and all materials related to it.

### **Lesson 3: Use Community Involvement in the Development of the Interventions**

A third major weakness of many of the intervention studies is that they failed to integrate the needs, perspectives, and lifestyles of the targeted communities into the design and planning of the projects. Communities can be involved in every phase of intervention development through such activities as assessing needs, building partnerships, and forming alliances with key stakeholder groups.

### **Lesson 4: Gain Health Care Provider Involvement**

Whether interventions are community-focused or clinical, it is essential to garner the support and participation of local health care providers. Few factors would be more detrimental to the credibility of an intervention than to create a need for a service that cannot be met or is not considered important by the local providers.

### ***Lesson 5: Use a Strong Research Design***

The fifth major factor that leads to failure of interventions, in addition to lack of a theoretical underpinning, is a weak methodological design. Prominent design shortcomings in the studies reviewed included lack of baseline data, absence of a control or comparison group, no random assignment or longitudinal data, inadequate sample size, lack of pre-testing of the intervention, failure to select appropriate sources to carry out the intervention, and failure to match the nature of the intervention to the target audience or health care issue. While there was an improvement in the number of breast and cervical studies using pre-post and randomized designs, this was not the case for colorectal studies.

### ***Lesson 6: Use Research Methods That Allow for Population-Specific Information in the Development and Testing of the Intervention***

The overall research design should include a component that allows formal participant or community input and participation into the development and testing of the intervention. Common “formal” methodological techniques used to ensure input are in-depth interviews, focus groups, and cognitive interviews. In addition, “informal” techniques can be used to assess the feasibility and suitability of interventions such as having an ongoing community panel review protocols and study materials.

### ***Lesson 7: Evaluate All Stages of the Intervention, Including Cost Effectiveness***

All stages of an intervention need to be assessed along a variety of dimensions to determine the overall effectiveness. For example, interventionists should not only evaluate the overall outcome of the program (eg, number of screening mammograms completed) but all of the key components that occur upstream of the behavior. These include the degree of community participation in the design of the intervention, barriers and facilitators to participation, attitudes about the intervention (from all groups involved), and changes that might be made. It is only through the evaluation of each component throughout the implementation phases that improvements can be made or suggested.

### ***Lesson 8: Consider How to Sustain and Build on the Intervention, if Appropriate***

Most of the interventions described here did not plan how to sustain the program within the targeted setting after the initial research question has been answered. The ultimate goal is to achieve an ongoing program that meets the needs of the targeted group or community, building on strengths and previous efforts when appropriate. Consideration also needs to be given to the concept of saturation to determine when there is sufficient evidence of effective strategies and thus, the need to redirect cancer control intervention studies to underutilized areas such as colorectal cancer in older populations.

### ***Lesson 9: Consider the Health of Aging Women, and Aging Populations in General, in an Integrated, Holistic Manner***

Although there is value in conducting targeted interventions around a single behavior that might be most relevant to a particular group, there is a growing recognition that the overall health of populations can and should also be addressed. For example, interventions that stress topics such as providing social support, taking control of one's own health, integrating within a community, or establishing peer-to-peer contacts may lead to improvements across cancer screening behaviors because older adults are empowered to be active health care consumers. An example of an integrated approach addressing the behaviors in this report would be one that focused on taking control of one's health through keeping track of preventive services that are needed. The cost effectiveness of such integrated approaches, compared to targeted, individual behaviors, needs to be assessed.

## **Discussion**

Mammography and cervical/colorectal screening by older women is underutilized. The goal of intervention efforts should be to communicate the importance of making cancer screening a habit, keeping in mind the need to balance informed decision making and clinical judgment in making screening decisions in older people.<sup>6</sup> While a number of effective interventions have been deemed feasible, not many of them have considered that beliefs as well as other barriers may be different for older women and thus interventions may require different strategies across the life span.<sup>7</sup> Although progress has been made, many studies continue to omit the use of theory and neglect to assess the needs of the target group or evaluate the effectiveness of the intervention. Other studies fail to take into account differences in age, ethnicity, and cultural heritage. Failure to include these elements in interventions designed to increase early detection significantly reduces the chance that older women will make cancer screening a regular and consistent habit.<sup>7</sup>

This review of the literature may provide some useful insight to those planning and reporting community-oriented cancer control interventions, especially those targeting older women. The lessons learned from these studies should guide investigators in strengthening their research protocols. Of utmost importance, these lessons can also serve as a starting point for researchers and communities in framing their cancer control programming needs. An investment of health care resources in older women is a necessity as our society begins to age dramatically. Community-based and clinical cancer control programs will require an understanding of how to keep older women healthier and how to improve their health outcomes.

## References

1. US Census Bureau. *Current Population Survey, July 2002*. Washington, DC: US Census Bureau, 2002. Available at: <http://www.census.gov>. Accessed on October 11, 2002.
2. Saslow D, Runowicz CD, Solomon D, et al. American Cancer Society guideline for the early detection of cervical neoplasia and cancer. *CA Cancer J Clin*. 2002;52:342-362.
3. Kennedy BK. Aging and cancer. *Oncology (Williston Park)*. 2000;14:1731-1733.
4. Edwards BK, Howe HL, Ries LA, et al. Annual report to the nation on the status of cancer, 1973-1999, featuring implications of age and aging on U.S. cancer burden. *Cancer*. 2002;94:2766-2792.
5. Curbow B, Bowie J, Garza MA, et al. Community-based cancer screening programs in older populations: making progress but can we do better? *Prev Med*. 2004;38:676-693.
6. Walter LC, Covinsky KE. Cancer screening in elderly patients: a framework for individualized decision making. *JAMA*. 2001;285:2750-2756.
7. Rimer BK. Interventions to increase breast screening: lifespan and ethnicity issues. *Cancer*. 1994;74:323-328.