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Responding to a significant recruitment challenge within three nationwide psychoeducational trials for cancer patients

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Abstract
Purpose When faced with a significant recruitment challenge for three nationwide psychoeducational trials targeting prostate and breast cancer patients, the Cancer Information Service Research Consortium initiated outreach efforts to increase accrual. Recruitment is reported by major outreach strategy to inform the use of similar campaigns, either as primary recruitment efforts or to supplement "in-reach" recruitment within oncology settings.
Methods During a 33-month period, recruitment was tracked from the National Cancer Institute's Cancer Information Service (CIS), the American Cancer Society (ACS), Dr. Susan Love Research Foundation's Love/Avon Army of Women (AOW), Internet advertising, press releases, radio/television interviews, recruitment materials in community venues, and outreach to churches and cancer support organizations.
Results Across projects, the majority (89 %) of recruited participants (N=2,134) was obtained from the CIS (n=901, 19 months of recruitment), AOW (n=869, 18 months), and ACS (n=123, 12 months). Other efforts showed minimal gain in recruitment.
Conclusions Cancer information programs (e.g., CIS and ACS) and registries of individuals willing to participate in cancer-related research (e.g., AOW) can represent exceptional resources for outreach recruitment of cancer patients, especially when the eligibility criteria are highly restrictive. However, these resources do not yield samples representative of the larger population of adults diagnosed with cancer, and conclusions from such trials must be tempered accordingly.
Implications for cancer survivors Inadequate recruitment to randomized controlled trials limits the creation of useful interventions for cancer survivors. By enrolling in cancer registries and taking part in research, cancer survivors can contribute to the development of effective resources for the survivor population.

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Introduction

According to the Institute of Medicine (IOM), poor recruitment and retention of research participants constitutes a major threat to the clinical trials enterprise in the USA [1, 2]. For the National Cancer Institute (NCI), which supports the largest network for clinical trial research in the country, this threat is severe. It is estimated that 40–50 % of NCI-sponsored clinical trials end prematurely with no published results, reflecting a substantial waste of resources and missed opportunities for moving science forward [2, 3]. Challenges to clinical trials recruitment occur not only in investigating medical treatments for cancer patients but also in examining effects of psychoeducational approaches to bolster quality of life and health of those who experience cancer diagnosis and treatment [4, 5]. This is especially true when the recruitment plan relies on community outreach efforts that are external to the health care system or oncology practice setting, where promoting "in-reach" for recruitment in these venues may not be feasible or efficient for large-scale psychoeducational intervention trials [6, 7], or where additional outreach efforts are needed to bolster in-reach recruitment. Further complicating this challenge is that the scientific questions in such research often require recruiting patients within a narrow time period for eligibility which can be accompanied by high levels of distress (e.g., diagnostic and treatment phases) [5, 8].

Investigators conducting behavioral and population science research have successfully used a diverse array of outreach strategies for recruitment, including traditional mass media advertising (newspapers, newsletters, flyers, radio, and television), online advertising (e-mail, search engines, affiliate websites, and online communities), and other community outreach efforts (e.g., forming partnerships with churches and cancer support groups, use of direct mail, or telephone outreach) [9–25]. However, little is known about the effectiveness of these strategies within the specific context of recruiting cancer patients into psychoeducational intervention trials, which is the topic of this report. More specifically, we report the results obtained from an intensive, multichannel recruitment effort that was launched when the Cancer Information Service Research Consortium (CISRC) encountered a significant and unanticipated recruitment challenge for three such trials that targeted prostate and breast cancer patients. We compare these outreach strategies with regard to their recruitment rates, in order to identify the most successful recruitment strategies that emerged from this effort, as well as to identify challenges and lessons learned that may assist future recruitment efforts that use community outreach for psychoeducational studies of cancer patients and survivors.

Overview of the CISRC

Originally funded by the NCI in 1993, the CISRC is a collaboration between national cancer prevention and control researchers and the NCI's Cancer Information Service (CIS). The CIS is a program of the federal government that provides free cancer information and education. Professional, highly trained cancer information specialists provide accurate and current cancer information to patients, their families and friends, the general public, and health professionals. The typical CISRC research design involves recruiting callers at the end of their usual service call (i.e., the information specialist responding to the caller's request for cancer-related information) to the 1-800-4-CANCER telephone information program, an approach that has resulted in rapid recruitment into trials involving participants with no cancer diagnosis [26, 27]. Adopting this same approach, but specifically targeting individuals with a cancer diagnosis, the three randomized controlled trials in the current CISRC tested a Web-based multimedia program to help newly diagnosed prostate (project 1) and breast cancer patients (project 2) make informed treatment decisions, and breast cancer patients prepare for life after primary medical treatments (project 3) [28, 29]. In addition, project 3 tested a callback intervention by a trained cancer information specialist to respond to any new questions or concerns related to cancer survivorship that may have occurred after randomization, as well as to promote use of the project 3 multimedia program.

CISRC recruitment challenges and final accrual

Shortly after the three randomized trials were launched (August, 2008), the CISRC encountered significant problems with accrual. Call volume to the CIS from potentially eligible research participants was far less than anticipated. Intensifying this challenge was that the recruitment window for eligibility was small by any standard. For projects 1 and 2, participants had to be newly diagnosed with localized/early stage disease and still making treatment decisions. For project 3 (also localized/early stage disease), the window for recruitment extended from 6 weeks of completing primary therapy to 6 months after completing primary therapy. Moreover, to provide a fair test of the multimedia programs, eligibility was further restricted to those having access to a computer, either personally or mediated by others. The interventions were readily accessible through the Internet and CD (project 3 also included a telephone callback) and involved two telephone assessments beyond initial recruitment. Thus, the trials required a minimal time commitment

by participants, but they were conducted during phases of the cancer trajectory that often are highly stressful. In addition, original recruitment was conducted immediately following completion of participants receiving requested information from the CIS through a usual service call, which perhaps successfully met callers' need for information and rendered additional service less necessary,

An additional challenge emerged when the NCI awarded a new CIS contract that consolidated the three contact centers into one national contact center. During the extended transition period that followed, the CIS was no longer able to continue with study enrollment. Although recruitment originally was projected to require 20 months for projects 1 and 2 and 26 months for project 3, it occurred through the CIS for 17 months (September, 2008 to February 2010). When CIS recruitment ended, the CISRC established its own telephone call center specifically for recruitment to the three trials, located at the University of Colorado Cancer Center, and conducted numerous outreach efforts to promote calls to this new call center. Recruitment continued through April, 2011, at which point all CISRC projects were closed to accrual (31 total months of recruitment). The challenges encountered during participant accrual to the research and the ensuing measures taken by the CISRC to bolster recruitment allowed for a critical examination of the success of various recruitment strategies.

Methods

All research protocols and materials for this program of research were approved by the Institutional Review Board (IRB) of the University of Colorado Denver, Anschutz Medical Campus. Secondary IRB approval was obtained from the Fox Chase Cancer Center and the University of California, Los Angeles, as collaborating research institutions, and from the parent institutions of the three CIS contact centers (i.e., University of Miami, Fred Hutchinson Cancer Research Center, and Memorial Sloan-Kettering Cancer Center). The three CISRC randomized trials were also registered on www.clinicaltrials.gov (NCT00830635).

Recruitment strategies

The numerous outreach strategies used by the CISRC for recruitment are described in Table 1. As shown, these included CIS/CISRC call centers, creation of a CISRC recruitment website, distribution of recruitment brochures in numerous community venues nationwide including outreach to churches by CISRC staff (separate from the National Black Church Initiative (NBCI) described below), Internet pay-per-click (Google) advertising, and other promotions through several well-established cancer support organizations, press releases, radio and TV interviews, and individual recruitment websites. In addition, three major outreach partnerships for recruitment were formed that merit special emphasis: (1) the American Cancer Society's (ACS) National Cancer Information Center (NCIC), (2) the Love/AVON Army of Women (AOW), and (3) the NBCI, each of which is highlighted below.

ACS national cancer information center

The ACS collaboration targeted projects 1 and 2. Mirroring the original CIS recruitment effort, potentially eligible callers to the NCIC were introduced to project 1 or 2 after receiving ACS standard service (i.e., provision of cancer-related information requested by the caller). They then were transferred in the moment to the CISRC call center and/or were mailed a CISRC recruitment brochure and encouraged to call the center for recruitment.

Dr. Susan Love Research Foundation's Love/Avon AOW program

AOW represents a registry of over 365,000 individuals who have joined AOW as potential research participants in future breast cancer studies [30]. All registrants are 19+years of age, with or without a history of breast cancer. The majority of registrants do not have a breast cancer diagnosis. To promote recruitment for projects 2 and 3, "call-to-action" e-mails, which described and provided a vehicle for recruitment for project 2 or 3, as well as general AOW e-mails, which reminded potential participants about several studies recruiting through the AOW, were sent to all in the registry with encouragement to pass them on to others. Entry criteria were described in the e-mail, along with instruction to call the CIS or CISRC call center in order to enroll.

National Black Church Initiative

NBCI consists of a network of 34,000 primarily African American churches that collaborate in various faith-based initiatives, including health-related programs [31]. Although the NBCI collaboration targeted both projects 1 and 2, one major goal of this partnership was to increase recruitment of African American men with prostate cancer, who are not only disproportionally affected by prostate cancer [32] but also represent a particularly challenging group for recruitment [33]. The CISRC-NBCI collaboration included e-mails to member churches to encourage recruitment among eligible congregants, postings on the NBCI website and in church bulletins, and press conferences.

Of all the recruitment strategies shown in Table 1, four were implemented while the CIS was still collaborating with accrual. These included the Internet pay-per-click campaign,

Table 1 Overview of CISRC recruitment strategies

1. CIS/CISRC call centers (August 2008–April 2011)	The National Cancer Institute's CIS offers information and education regarding cancer to the general public through its toll-free telephone number (1-800-4-CANCER). Trained cancer information specialists introduced the research project to potentially eligible callers at the end of usual service. When the CIS terminated accrual, a CISRC toll-free call center was initiated specifically to respond to callers potentially eligible for the research from all other recruitment sources in this table
2. CISRC recruitment website[a] (April 2009–April 2011, all projects)	A general CISRC recruitment website included a brief description of each project as well as NCI sponsorship for this research. Highlighted on the website was the CIS-1-800 number when the CIS was collaborating with accrual, which was changed to the CISRC call center number when this collaboration ended. Also included were key personnel and contact information for each project. A special tab was included on the website for individuals and organizations who wanted to assist with recruitment. This tab allowed users to print the CISRC recruitment flyers described in No. 3
3. Recruitment flyers/information sheets[a] (April 2009–February 2011, all projects)	Separate one-page multi-color recruitment flyers were produced for each CISRC project. Similar to the general CISRC recruitment website (see No. 2), these flyers provided a brief description of each project, highlighted NCI sponsorship, included key personnel and contact information for each project as well as the CIS-1-800 number when the CIS was collaborating with accrual, and the CISRC call center number when this collaboration ended. These recruitment materials were distributed or made available (either hard copy or by e-mail) to several prominent cancer support organizations (see No. 5), within each of the main academic cancer research centers collaborating in this research, at community-based cancer survivorship meetings, research conferences and other professional meetings, and among numerous community-based hospitals, urology and breast cancer clinics and departmental meetings. Recruitment materials were distributed among a large number of churches, exclusive of the National Black Church Initiative (NBCI) described in No. 11. The NCI Office of Advocacy Relations sent recruitment materials to its affiliate institutions and organizations, as did the CIS Partnership Program to its partner organizations. ACS also distributed these materials (see No. 10). Not counting the ACS, other cancer support organizations and the NBCI, which are listed separately below, it is estimated that across all three CISRC projects, about 8,000 flyers and other recruitment materials were distributed or made available to the constituencies and target audiences reflected in these outreach efforts
4. Pay-per click (PPC) Internet advertising[a] (May 2009–August 2009, all projects; March 2010–April 2010, project 1)	A Google ad-word PPC campaign was created for each project. For project 1, 145 keywords were tested. For projects 2 and 3, 74, and 72 keywords were tested, respectively. For project 1, examples of keywords included: prostate cancer, prostate cancer diagnosis, prostate cancer prognosis, prostate cancer treatments, prostate cancer treatment decisions, prostate cancer research, prostate cancer help, clinical trials prostate cancer, and prostate cancer counseling. Numerous other keywords highlighted specific prostate cancer treatment options. For project 2, illustrative keywords for breast cancer paralleled those for project 1. For project 3, illustrative keywords included breast cancer, breast cancer survivors, breast cancer recovery, after breast cancer, breast cancer support, breast cancer help, cancer survivorship, life after breast cancer, surviving breast cancer, and breast cancer counseling. Landing pages for each project were created with a unique video for each. When the CIS was collaborating with accrual, the CIS-1-800 number was promoted for recruitment. When the CISRC call center was established, unique phone numbers were created for each page to track enrollment
5. Cancer support groups (June 2009–June 2010, all projects)	In addition to ACS (see No. 10), outreach efforts were conducted in collaboration with several prominent cancer support organizations, including *The Wellness Community*, *Cancer Care*, *Project Zero*, *Us Too*, *Prostate Survivors Network*, *Gilda's Club*, and *Women Against Prostate Cancer*. These outreach efforts focused mainly on website and

	e-newsletter advertising. E-newsletter advertisements were sent to more than 70,000 individuals. Virtually, all of these outreach efforts occurred after the CISRC recruitment call center was established
6. Dr. Susan Love Research Foundation's Love/AVON Army of Women (AOW) Program[a] (September 2009–January 2011, project 3; April 2010–March 2011, project 2)	The Love/AVON AOW was launched in 2008 by the Dr. Susan Love Research Foundation thanks to funding from the Avon Foundation for Women [30]. Participation is open to any adult (19+years of age) who is interested in participating in breast cancer research, including those with and without a history of breast cancer. Participants are recruited from a variety of sources, including scientific conferences, social media, private and public meetings and speaking events, partnerships with other organizations and other grassroots efforts, as well as by other media opportunities. Studies approved by AOW must be funded and IRB approved. Once approved, one or more "call-to-action" e-mails that target a specific research project are sent to all AOW members, which currently include over 365,000 individuals. In addition, studies might also be mentioned in general AOW e-mails, which reminded potential participants about several studies recruiting through the AOW. All recruitment e-mails encourage participants to pass them along to others. For project 2, call-to-action e-mails were sent on 7 April 2010, 4 August 2010, 17 November 2010, and 2 March 2011, with general e-mails sent on 21 June 2010, 21 October 2010, and 28 February 2011. For project 3, call-to-action e-mails were sent on 16 September 2009 and 20 January 2010, with general e-mails sent on 16 April 2010, 7 May 2010, 19 July 2010, 21 October 10, and 29 January 2011
7. Press releases (PR) (February 2010–April 2010, all projects)	Monthly press releases were distributed on PR news wire for dissemination by news agencies and other sites
8. Radio/TV interviews (March 2010–February 2011, all projects)	Research investigators participated in 18 radio and TV interviews for project 1 recruitment involving a wide range of media markets from New York, New Jersey, Pennsylvania, Texas, Iowa, Ohio, Georgia, Michigan, Massachusetts, Missouri, and Alaska
9. Individual recruitment websites (April 2010–April 2011, all projects)	To augment the general CISRC website (see No. 2) when the CIS accrual collaborations ended, three project-specific websites were created for use in conjunction with other advertising and marketing efforts. Unique phone numbers were created for each website to track enrollment. A custom video was created for each website to explain the study and to urge users to call the CISRC call center
10. American Cancer Society (ACS) (May 2010–April 2011, projects 1 and 2)	The ACS accrual partnership specifically targeted projects 1 and 2. All callers to the ACS National Cancer Information Center (NCIC) were initially assessed for potential eligibility during their standard service call. If potentially eligible and they expressed interest in participating in either project, they were triaged to a specialized group of Information Specialists who explained the study in more detail, and if they remained interested, were then either transferred directly to the CISRC call center, or given the call center number as a referral. In addition, during this same time period, ACS included the CISRC recruitment flyers (see No. 3) when mailing ACS materials to potentially eligible participants who called the NCIC. Although this partnership with ACS did not specifically target project 3, several ACS referrals for project 2 were subsequently determined to be eligible for project 3
11. National Black Church Initiative (NBCI) (November 2010–April 2011, projects 1 and 2)	NBCI, consisting of a network of 34,000 member churches divided into five geographic areas across the USA, has collaborated in previous health-related programs on the national, state, and local level [31]. NBCI launched a 6-month e-mail campaign to all member churches to promote projects 1 and 2 and to encourage sharing of this information with congregants. In addition, press conferences highlighting this collaboration were held in New York and Philadelphia, two metropolitan areas with large African American populations. These efforts were further supported by frequent study announcements on the NBCI website and church bulletins as well as a more intensive prostate cancer "Awareness" campaign in three selected churches

[a] These recruitment strategies were implemented when the CIS was collaborating with accrual and continued when this collaboration ended and the CISRC call center was established.

the general CISRC website, distribution of CISRC recruitment flyers and information sheets, and the AOW collaboration. During this period, these recruitment efforts encouraged calls to the CIS for CISRC recruitment. When the CIS was no longer able to participate in accrual, these strategies were continued with recruitment directed to the new CISRC call center.

Coding recruitment by source

CIS recruitment

Cancer information specialists, at the end of usual service, complete the standard service Electronic Contact Record Form (ECRF) for all calls to the CIS. Included in the ECRF is a question that asks callers how they found out about the CIS. Responses to this question are coded from a checklist of pre-coded responses with an "other-specify" response. For all participants recruited from the CIS, responses to this question were reviewed, and when indicated, coded as Internet (Google), CISRC recruitment website, CISRC recruitment flyers/print materials, and AOW. Release dates of the AOW e-mail blasts to their members also were used to help code recruitment resulting from AOW. CIS call frequency data were examined before and after each AOW e-mail blast. Calls were coded as AOW from the point of the e-mail blast until call frequency returned to pre-e-mail blast frequency. All remaining CIS recruitments were coded as "CIS Standard Service Program", where traditional CIS promotion efforts were presumed to account for the calls to the CIS.

CISRC call center recruitment

All research participants recruited from the CISRC call center were asked how they learned of the CISRC. Responses were originally coded using a checklist that included all of the outreach strategies listed in Table 1, augmented with an "other-specify" code that allowed verbatim responses to be recorded. After a systematic review of all responses, the final coding scheme adopted for this question included all of the referral sources listed in Table 1, as well as additional codes, including: (a) other Internet/not specified as Google, (b) physicians/nurses/other health professionals, (c) another person, (d) NCI website (www.cancer.gov), (e) e-mail/not specified, (f) another source, (g) other not specified/don't know, and (h) missing/refusal.

Data analyses

Accrual to each project was calculated by recruitment source. Analyses also were conducted to compare participants' baseline sociodemographic characteristics by recruitment source. For categorical variables (e.g., education and race/ethnicity), a Chi-square statistic was used to compare frequencies and test for statistical significance within each of the three CISRC randomized trials. Age, coded as a continuous variable, was analyzed using either a *t* test (comparing two means) or a one-way ANOVA (comparing three means) [34]. All analyses were conducted as two-tailed tests.

Results

The final recruitment was 439 participants for project 1 (61 % of accrual goal), 617 for project 2 (86 % of accrual goal), and 1,078 for project 3 (100 % of accrual goal). Table 2 reports sample accrual by recruitment source separately by project. For projects 1 and 2, the CIS call center standard service program provided the majority of study participants, ranging from 59 to 69 % (n=261 and 423, respectively), compared with 20 % (n=217) for project 3. For project 1, only one of the CISRC outreach efforts provided a noticeable increase in accrual, and that was the collaboration with ACS (n=60). For project 2, the partnership with AOW was particularly effective (n=100), followed by ACS (n=41), with all other referral sources producing only small or no gains in accrual. For project 3, AOW emerged as an exceptional recruitment resource, accounting for over 70 % of the final sample (n=769), with all other referral sources showing negligible or no gains in recruitment.

As Table 2 illustrates, Internet advertising produced little or no gain in accrual, including both the pay-per-click campaign as well as other Internet referrals (not otherwise specified) that might also capture the effects of the pay-per-click campaign. To help elucidate the poor performance of the Internet pay-per-click campaign, the analytics for this campaign are reported in Table 3. As shown, the exceptionally low click-through ratio (CTR) and number of clicks generated by this campaign, combined with the high cost of the keywords, made this campaign cost-prohibitive for the CISRC relative to the small numbers of participants who were subsequently enrolled. As a case in point, the best performing keyword of "breast cancer" for projects 2 (CTR=0.37 %) and 3 (CTR=0.14 %) cost on average between $4.50–5.00 per click, while the entire pay-per-click campaign across both projects yielded only one confirmed enrollment. Thus, despite testing a large number of key words and key word placements, the pay-per-click campaign was abandoned after 5 months of implementation.

Given the success of the AOW campaign, the recruitment trajectory of this campaign was plotted over time for both projects 2 and 3 (see Fig. 1). For project 3, two large spikes in recruitment are evident. The first spike occurred when the first AOW call-to-action e-mail was sent. The second (and final) call-to-action e-mail, which occurred about 4 months

Table 2 Source of referral for recruitment by CISRC project

Source of referral	Project 1 (n=439) N (%)	Project 2 (n=617) N (%)	Project 3 (n=1,078) N (%)
CIS standard service program	261 (59.4)	423 (68.6)	217 (20.1)
Army of Women[a]	–	100 (16.2)	769 (71.3)
American Cancer Society[b]	60 (13.7)	41 (6.6)	22 (2.0)
National Black Church Initiative	1 (0.2)	0 (0.0)	–
Recruitment flyers/print materials	7 (1.6)	5 (0.8)	5 (0.5)
Cancer support groups	6 (1.4)	1 (0.2)	1 (0.1)
CISRC websites	21 (4.8)	2 (0.3)	7 (0.6)
NCI website	10 (2.3)	4 (0.6)	1 (0.1)
Press releases/newspapers	9 (2.1)	0 (0.0)	0 (0.0)
Internet (Google)/pay-per-click	7 (1.6)	0 (0.0)	1 (0.1)
Other Internet (not specified)	14 (3.2)	3 (0.5)	2 (0.2)
Physicians/nurses/other health professionals	5 (1.1)	1 (0.2)	3 (0.3)
Another person	5 (1.1)	13 (2.1)	7 (0.6)
E-mail (unspecified)	1 (0.2)	7 (1.1)	5 (0.5)
Radio/TV	0 (0.0)	0 (0.0)	0 (0.0)
Another specific source	7 (1.6)	5 (0.8)	5 (0.5)
Don't know/not specified	23 (5.2)	10 (1.6)	16 (1.5)
Missing/refusal	2 (0.5)	2 (0.3)	17 (1.6)

[a]AOW, with its focus on breast cancer research, did not do outreach for project 1

[b]Although the ACS collaboration focused on projects 1 and 2, several ACS referrals were not eligible for project 2 but did enroll in project 3

after the first e-mail, also produced a large increase in accrual. All remaining AOW e-mails, which were general e-mails, produced only modest increases in accrual.

Standing in sharp contrast to project 3 is the recruitment trajectory for project 2, which shows a consistent low-level recruitment pattern over time. Modest deviations to this pattern can be seen for the first and third call-to-action e-mails that produced small increases in accrual. Note that AOW recruitment for project 2 began even before the project 2 AOW campaign was launched, undoubtedly reflecting the fact that the project 3 AOW campaign, which was initiated prior to that of project 2, generated recruitment calls from individuals who were subsequently determined to be eligible for project 2.

Table 3 Overview of analytics for internet pay-per-click campaign

	Total[a] impressions	Total clicks	Click through[b] ratio (CTR; %)	Average cost per click (CPC)	Average[c] position
Project 1	2,898,200	3,029	0.10	$2.63	3.9
Project 2	9,203,052	2,160	0.02	$2.25	1.9
Project 3	7,407,592	1,304	0.02	$1.92	1.6

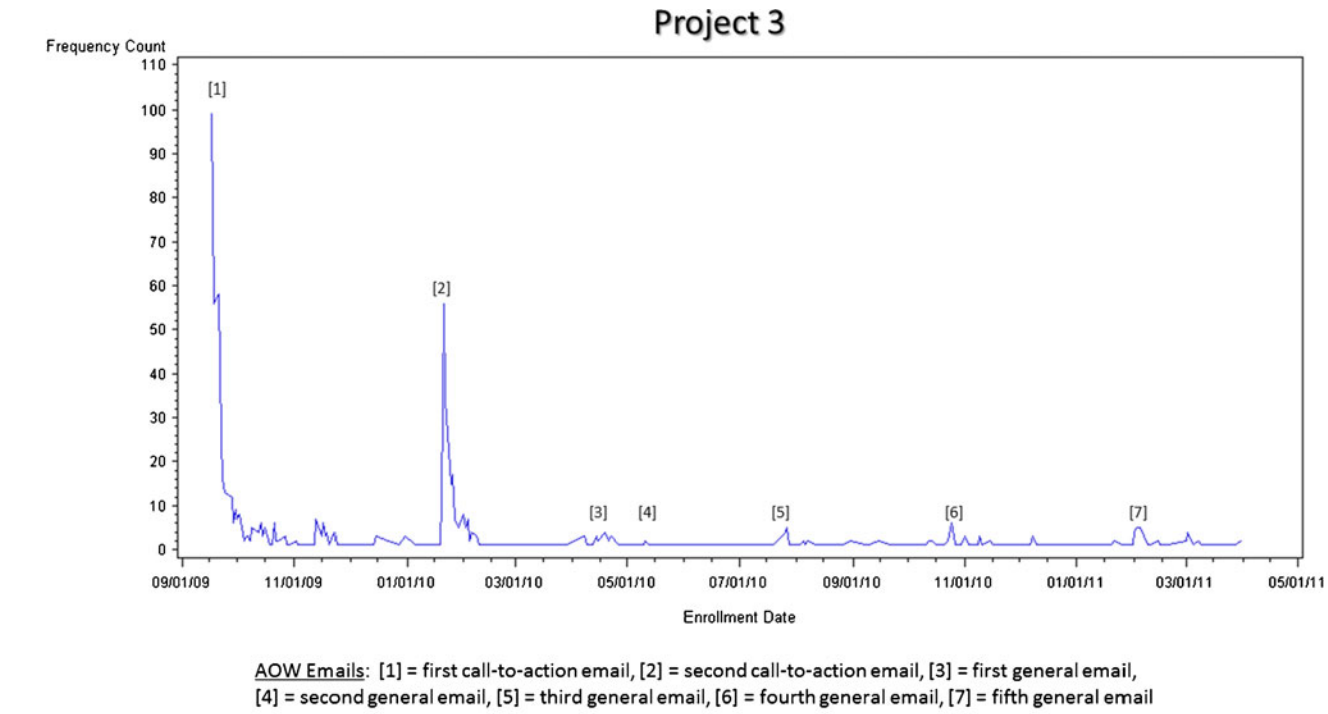
[a] Number of times the project-specific ad was shown to users

[b] CTR represents the total clicks divided by total impressions for each project

[c] The average placement of the project-specific ad in the list of ads shown to the user

Table 4 compares the sociodemographic characteristics (age, education, income, and race/ethnicity) for each major recruitment source for projects 1 (CIS and ACS), 2 (CIS, ACS, and AOW), and 3 (CIS and AOW). For project 1, there were no significant differences between CIS and ACS enrollees, with both groups having a mean age of about 64 years, and the vast majority being non-Hispanic white and having at least some college education. Across both groups, about 45 % had total family incomes of $60,000 or more.

For project 2, most of the sociodemographic comparisons showed significant differences. Although participants from each of the major recruitment sources were highly educated and mainly non-Hispanic white, AOW participants were much more likely to be college graduates or above (81 %), followed by ACS (51 %) and CIS (40 %), with a similar gradient found for percent non-Hispanic white (98, 85, and 74 %, respectively). Income also showed a similar gradient, with AOW participants having a much lower percentage with incomes less than $30,000 (AOW=12 %, ACS=50 %, and CIS=40 %), and a much higher percentage with incomes of $80,000 or above (AOW=51 %, ACS=15 %, and CIS=23 %). No differences were found for age (55–56 years of age). For project 3, all sociodemographic comparisons showed significant differences that mirror project 2. AOW participants were much more likely to be college graduates or above when compared with CIS participants (73 vs. 54 %), more likely to be non-Hispanic white (96 vs. 82 %), and more likely to have total family incomes of



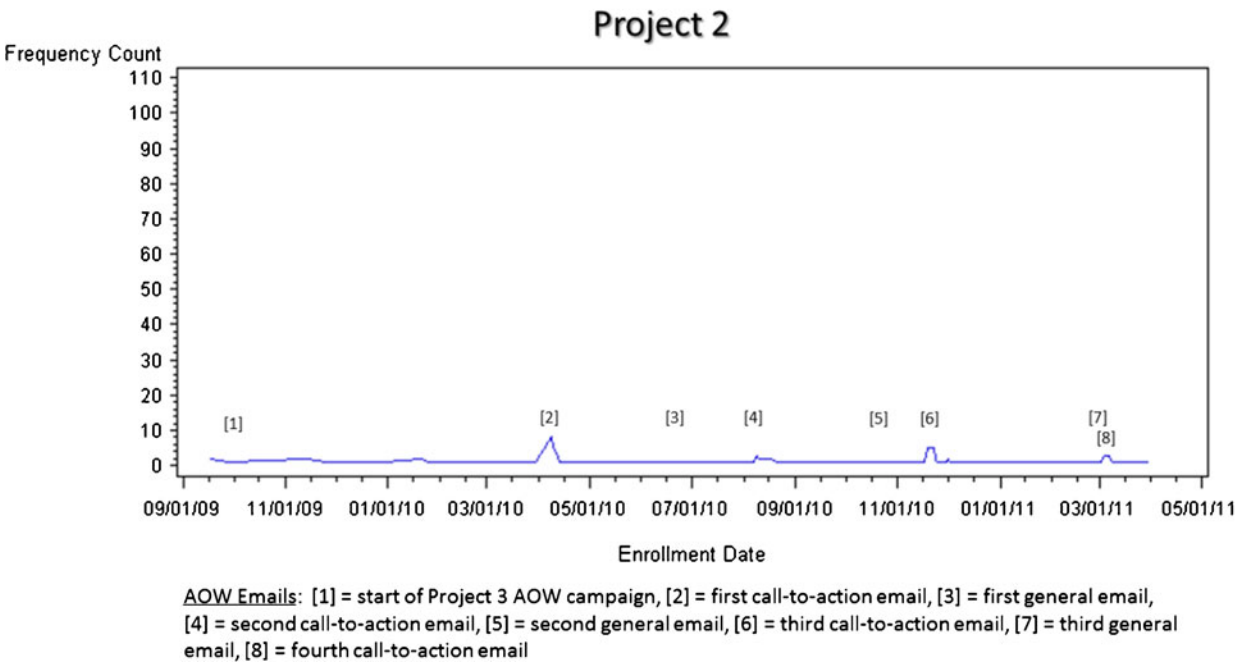


Fig. 1 Army of Women (*AOW*) recruitment trajectory for projects 3 and 2

$80,000 or higher (58 vs. 39 %). AOW participants were also more likely to be younger (52 vs. 55 years of age).

Discussion

Prior to ending its 19-month recruitment effort, the CIS contributed more participants to the CISRC than any other recruitment source (n=901). The ACS partnership came closest to matching the original CIS recruitment protocol in that the trials were introduced at the end of usual service to callers seeking cancer-related information. Lasting 12 months and specifically targeting projects 1 and 2, this collaboration yielded more than 120 participants across the three trials. Spanning 18 months, the AOW campaign added 100 research participants to project 2 (16 % of the final

Table 4 Baseline characteristics by major recruitment source

Baseline characteristics	Project 1			Project 2				Project 3		
	CIS	ACS	*P* value	CIS	ACS	AOW	*P* value	CIS	AOW	*P* value
Age (mean/(SD))[a]	64.6 (8.8)	64.3 (8.3)	0.78	55.3 (11.4)	55.1 (11.4)	56.0 (10.3)	0.83	54.8 (10.9)	52.2 (9.5)	0.002
Education (*N*/(%))										
High school or less	65 (25.0)	15 (25.0)	0.95	117 (27.9)	4 (9.8)	6 (6.0)	<0.001	45 (20.8)	40 (5.2)	<0.001
Some college	83 (31.9)	18 (30.0)		136 (32.5)	16 (39.0)	13 (13.0)		55 (25.5)	169 (22.0)	
College graduate and above	112 (43.1)	27 (45.0)		166 (39.6)	21 (51.2)	81 (81.0)		116 (53.7)	560 (72.8)	
Race/ethnicity (N/(%))										
Non-Hispanic White	181 (73.3)	41 (70.7)	0.16	296 (74.0)	34 (85.0)	94 (97.9)	<0.001	173 (81.6)	725 (96.0)	<0.001
African American	55 (22.3)	17 (29.3)		82 (20.5)	6 (15.0)	2 (2.1)		28 (13.2)	16 (2.1)	
Other	11 (4.5)	0 (0.0)		22 (5.5)	0 (0.0)	0 (0.0)		11 (5.2)	14 (1.9)	
Income (N/(%))										
<$30,000	69 (28.9)	20 (36.4)	0.37	151 (39.6)	20 (50.0)	11 (11.8)	<0.001	54 (27.7)	48 (6.5)	<0.001
$30,000–59,000	69 (28.9)	10 (18.2)		104 (27.3)	8 (20.0)	22 (23.7)		44 (22.6)	129 (17.5)	
$60,000–79,000	38 (15.9)	8 (14.5)		38 (10.0)	6 (15.0)	13 (14.0)		22 (11.3)	131 (17.8)	
$80,000 or higher	63 (26.4)	17 (30.9)		88 (23.1)	6 (15.0)	47 (50.5)		75 (38.5)	429 (58.2)	

[a] Number for projects vary depending on missing data for the different sociodemographic variables. For project 1, CIS=260–239 and ACS=60–55. For project 2, CIS=422–381, ACS=41–40, and AOW=100. For project 3, CIS=216–195 and AOW=769–737

sample) and 769 participants to project 3 (71 % of the final sample). Lacking this partnership with AOW, it is likely that project 3 would have been severely compromised in meeting its accrual and scientific objectives. These three recruitment venues were distinct in that the CIS and ACS involved recruitment via telephone; whereas, the AOW involved recruitment via e-mail blasts to a research registry. Their commonality, however, is that each involved self-initiated activity on the part of the cancer patient, either in seeking cancer-related information (CIS and ACS) or in volunteering for a research registry (AOW).

The response trajectory to the AOW campaign for projects 2 and 3 were noticeably different. For project 3, there were large spikes in recruitment that coincided with the two AOW call-to-action e-mails. For project 2, there was a much lower recruitment response that remained relatively stable over time. This difference likely reflects the two projects' distinct eligibility windows. For project 2, eligibility was restricted to newly diagnosed breast cancer patients who were still making treatment decisions, a group who would be unlikely to have entered an independent research registry so early in the cancer trajectory. For project 3, eligibility encompassed a broader spectrum of the cancer care continuum, where the number of eligible participants could accumulate between AOW e-mails to allow for the observed recruitment spikes. The networking effects of the AOW campaign (e.g., AOW members referring friends/others) also may have been greater for project 3 because of the larger eligibility window.

A comparison of the baseline characteristics of participants enrolled from the CIS and ACS for project 1 showed no significant differences in age, education, income or race/ethnicity, with both recruitment resources yielding a participant profile characterized by high education and total family incomes as well as a high percentage of non-Hispanic whites. Although a similar demographic profile was observed across the different recruitment resources examined for both projects 2 (CIS, ACS, and AOW) and 3 (CIS and AOW), participants recruited from AOW actually accentuated this profile by having even higher percentages who were well educated with higher total family incomes. AOW participants were also almost exclusively non-Hispanic white. Although these demographics are representative of the CIS, ACS, and AOW pools, they are not representative of the larger prostate cancer or breast cancer populations. It is evident that other resources for recruitment are needed if achieving diversity in cancer patient accrual is a major research goal. Such resources could include hospital- or population-based cancer registries. For narrow eligibility windows such as was the case in the current trials, however, potentially costly rapid case ascertainment would be necessary. Recruitment strategies also are necessary that involve culturally competent recruitment staff and recruitment messages that respond effectively to such barriers as patients' lack of trust in research [13, 14, 33, 35–41].

Other recruitment strategies included pay-per-click Internet advertising, distributing recruitment brochures in community venues, press releases, radio and TV interviews, website advertising, other promotion efforts conducted in partnership with prominent cancer support organizations (exclusive of the ACS), and outreach to churches, as exemplified by the NBCI collaboration. These approaches

yielded few participants compared with the CIS, ACS, and AOW. Without the proactive motivation evident in patients seeking cancer-related information (CIS, ACS) or intending to take part in cancer-related research (AOW), these strategies likely were not sufficiently intensive to motivate recently diagnosed or treated patients to pursue participation in informational trials for which no benefits were promised.

Several potential limitations should be noted when interpreting these findings. During the period when the CIS was collaborating with accrual, it is conceivable that CIS information specialists did not probe adequately for answers to the question of how participants learned of the CIS, producing an under-estimate of specific recruitment strategies. However, when the CISRC call center was established and call center interviewers had intensive training to probe for recruitment source, no change in reported recruitment source was noted. Another limitation is that although the yield of the various outreach strategies can be determined, their effectiveness cannot be systematically estimated or compared. This limitation occurs because the denominators for most of the outreach strategies are not known, precluding estimates of the proportion of eligible individuals who were exposed to a specific outreach strategy and subsequently enrolled in the CISRC. Similarly, the costs of different outreach strategies were not captured, which precludes estimates of cost per enrolled participant. Despite these limitations, the yield for most outreach strategies was so low that their lack of effectiveness and of cost-effectiveness can be reasonably inferred.

The results reported herein suggest several key observations that may inform future outreach efforts for recruitment, especially those targeting cancer patients and survivors. Of all the CISRC-initiated recruitment partnerships and outreach efforts, the CIS, AOW, and ACS yielded the substantial majority of the three samples. The CISRC experience confirms the underlying premise of AOW that forming registries of individuals who are motivated to participate in research can provide fertile ground for recruitment. Indeed, the 2012 IOM report [2] highlighted the AOW as an exemplar to support its recommendation to establish registries of individuals who are interested in participating in clinical trials research. Creating additional registries could offer significant benefit as recruitment resources for cancer prevention and control research nationwide, particularly if outreach efforts to compose the registries were successful in achieving representativeness of the cancer survivor population.

Also noteworthy were the recruitment collaborations formed with the CIS and ACS. These and other cancer information programs attract and provide services to active information-seekers. Given our findings and those of previous CISRC research, where recruitment of CIS callers into cancer prevention and control studies has been highly successful [26, 27], it would appear that programs which attract cancer information-seekers can also be a rich resource for recruitment, including recruitment into psychoeducational trials targeting cancer patients and survivors. When the clients of such programs are approached for research recruitment after receiving information tailored to their needs, a sense of trust and reciprocity could facilitate willingness to participate in research that is supported or endorsed by these credible cancer information programs, especially when this research is framed as an effort to improve educational resources and materials for future information-seekers. It should be noted, however, that such recruitment strategies set a "high bar" for testing psychoeducational interventions, in that service provision to potential research participants already has been completed through the recruitment source itself. For example, CIS and ACS callers likely might have received aid in making treatment decisions or in managing post-treatment concerns prior to being recruited into the three trials, which had similar goals for aiding those patients. In addition, the recruitment window was restrictive and occurred during phases in which cancer patients can experience high distress and many demands (e.g., initiation of treatment, return to employment). Taken together, these factors might have contributed to the necessity for an extended recruitment period (31 months) beyond that originally projected (20 months for projects 1 and 2 and 26 months for project 3). Even at 31 months, projects 1 and 2 fell short of accrual goals.

The very small recruitment yield of all remaining recruitment efforts (e.g., Internet and website advertising, outreach to churches and various cancer support organizations, radio and TV advertising, and press releases) should not be interpreted as a broad indictment against them, many of which have proven to be successful in other behavioral and population science research. Nonetheless, these findings underscore the cautionary note that when the eligibility criteria are highly targeted and restrictive, as is the case in most psychoeducational trials in oncology, and when recruitment collaborations are not likely to reach large numbers of eligible individuals who are intrinsically motivated to participate in such research, the cost–benefit ratio for investing resources in these efforts can be disappointing, as the CISRC experience and other studies have illustrated [4, 6, 7, 42]. Accordingly, it may be wise to conduct formative research of these outreach strategies to assess and refine their effectiveness before launching larger-scale and potentially expensive recruitment efforts [16]. The recent IOM reports contain additional recommendations for improving clinical trials research [1–3], which include developing strong collaborative relationships with community physicians, forming community and patient advisory boards, ensuring that clinical trials are feasible to implement, incentivizing participation of patients, physicians, and other referral sources by providing adequate reimbursements for the

costs of the research, attending to convenience issues to make it easier to participate, being responsive to cultural and health literacy barriers and patient motivations for participation, engaging caregivers to promote recruitment and retention, and initiating earlier involvement of IRBs and expediting the IRB approval process. Certainly, multiple resources and strategies are necessary to promote effective and efficient recruitment of cancer survivors into psychoeducational and other cancer prevention and control trials.

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