



Research paper

CAPS on the move: Crafting an approach to recruitment for a randomized controlled trial of community gardening



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ABSTRACT

Objective: To describe and evaluate recruitment approaches for a randomized controlled trial (RCT) of community gardening in Denver, Colorado. (ClinicalTrials.gov: NCT03089177).

Methods: We used community and staff feedback to adapt our recruitment approach from year 1 to year 2 of a multi-year RCT to address health behaviors related to cancer prevention. In year 2, we added a full-time recruitment coordinator, designed and implemented a tracking spreadsheet, and engaged advisory committee members, local garden leaders, and health partners in planning and outreach. Screening and consent rates, staff time and costs for years 1 and 2 are compared.

Results: In year 1, recruitment methods yielded 136 initial contacts, 106 screenings and 64 consented participants. In year 2, enhanced staffing and outreach yielded 257 initial contacts, 193 screenings, and 123 consented participants. Personal referrals, health fairs, NextDoor, and fliers yielded the highest percentage of consented participants. School and community meetings yielded the lowest yield for potential participants. Spanish-speaking participants were mostly recruited by direct methods. Compared to year 1 recruitment, which required 707 h of staff time and cost \$14,446, year 2 recruitment required 1224 h of staff time and cost \$22,992. Average cost for retained participants was \$226 (year 1) and \$186 (year 2).

Discussion: Those planning pragmatic clinical trials with recruitment in multi-ethnic communities can use the results from this study to understand the efficacy of techniques, and to budget costs for recruitment. While our culturally-tailored recruitment methods cost more, they provided more effective and efficient ways to reach recruitment goals.

1. Introduction

People of color and those of lower socioeconomic status have been historically underrepresented in medical and behavioral research, including interventions that aim to modify health behaviors and prevent chronic disease [1–7]. Lack of underrepresented populations in research studies compromises the internal and external validity of investigations about behavioral interventions [8]. Therefore, inclusion of

underrepresented populations in research is necessary to inform our understanding of interventions that improve behaviors and reduce disease across different social and demographic groups [8,9].

Within the context of randomized controlled trials, recruitment can be the rate-limiting step for the inclusion of underrepresented populations [10,11]. Many factors complicate recruitment efforts and these may be more severe in minority and low SES communities. These include lack of awareness about trials, low educational attainment,

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mistrust, linguistic isolation, geographic isolation, and lack of awareness about disease risk [9]. Additional barriers include lack of transportation, lack of time, and adequate consideration of culture and context [9,12].

While there is limited data on trial setting as a factor in successful recruitment, Sully and others found that recruitment difficulties in community settings are similar to those experienced in other settings, with 47% of community-based trials reporting unsuccessful recruitment [13]. In community-based trials, where recruitment occurs outside of controlled clinical settings, a multi-layered recruitment strategy is essential to overcome potential barriers to participation by individuals from different social and economic groups [8,14].

Although there is a standard array of direct and indirect strategies used for recruitment to clinical trials [15], there is less information about strategies that work in community-based settings, the time and costs associated with each strategy, and the tradeoffs of investing these resources in order to achieve recruitment goals. The Community Activation for Prevention Study (CAPS) trial, which is funded by the American Cancer Society, aims to increase physical activity, improve consumption of fruits and vegetables, foster social connections, and enhance mental wellbeing among individuals assigned to community gardening in Denver, Colorado. Increasing physical activity and fruits and vegetable intake can reduce the risk for cancer and other chronic diseases [16]. Details of the study design, eligibility criteria, interventions and outcome measures have been published elsewhere [17]. In this paper, we compare and contrast the outcomes of different recruitment strategies, in the context of a randomized controlled trial of community gardening, and the recruitment outcomes each year by race, ethnicity, age, and gender [17]. Moreover, we aimed to quantify the costs of implementing a tailored recruitment strategy in order to inform project budgeting for these types of trials and ongoing recruitment activities in support of ongoing studies.

2. Methods

The recruitment framework and strategies we describe in this analysis were used within the context of CAPS, a randomized controlled trial that aims to investigate whether participating in a community garden can improve diet and activity behaviors that are known to reduce risk for cancer and other chronic disease over one year. Denver Urban Gardens (DUG) is our core community partner in this trial. DUG, which was established in 1985, is a non-profit organization that designs and operates over 180 community gardens throughout Metro Denver. The aim of the organization is to support residents in creating and maintaining food-producing neighborhood community gardens. DUG and the University of Colorado have partnered since 2005 to co-create a research platform to support the evaluation of community gardens on health and wellbeing.

For the CAPS trial, the recruitment target is 312 participants, equally split across three years of data collection. The recruitment goal also included a target of 22% either monolingual Spanish-speakers or bilingual in Spanish and English. The recruitment target is based on a final sample of 220, and assumes that roughly 30% would be lost to follow-up. Potential participants are required to be adults aged 18 and over who have not gardened within the past two years and who are able to give written informed consent for the study in either English or Spanish. Participants were largely recruited in neighborhoods within ½ mile of a study garden. Study staff ascertained eligibility, and collected basic demographic information such as age, race, ethnicity, and gender during a screening phone call, before the participant came in to give informed consent in person. During the screening phone call, participants described how they learned about the study.

Eligible participants are randomized to participate in community gardening or wait for a year before gardening. Those assigned to garden receive a garden plot, a beginner's gardening class, seeds and transplants, composting material, tools, and a garden orientation by garden leaders. They also receive two follow-up phone calls with study research

assistants and three in-person health visits in early spring, at harvest time, and at a one-year follow-up visit. At in-person health visits, study participants respond to questionnaires, and are measured for height, weight, and waist circumference. The control group receives two follow up phone calls by study research assistants and three similar in person visits, on the same schedule. All health visits are conducted either in a private room at a school, or at a designated office within the workspace of our community partner, Denver Urban Gardens, which is located in the northern part of central Denver.

Institutional Review Board (IRB) approval was received from the University of Colorado Boulder in December 2016 (Protocol 16–0644) and is registered at [ClinicalTrials.gov](https://www.clinicaltrials.gov) (NCT03089177). Because of the affiliation of the trial with the University of Colorado Cancer Center, the protocol was also reviewed and approved by the Protocol Review and Monitoring System (PRMS) Office.

We developed a staffing plan following advice from experienced clinical and community trial specialists at the University of Colorado. We hired Spanish speaking study personnel including a bilingual study coordinator and two bilingual staff members, one of whom was a garden leader in the Denver Urban Gardens garden network.

Health visit surveys, garden class and recruitment materials, CAPS website, and other related study materials were written in both English and Spanish and reflected input from community stakeholders including Denver Urban Gardens staff and community garden leaders. The recruitment plan was reviewed by our advisory committee, which includes members of the Denver Urban Garden community as well as gardening organizations outside the Denver area. The study builds upon partnerships and community ties developed during a 15-year collaboration between the University of Colorado and Denver Urban Gardens, as well as with gardening organizations in Michigan [18–20].

2.1. Recruitment process

Gardens are selected for the trial based on their location in low-income and minority areas as determined by 2010 census data, the presence of a waitlist at the garden, the cooperation of a designated garden leader at time of recruitment, and the capacity for a garden to reserve two to six plots to the study for study participants. Once a garden is identified, garden leaders are presented an overview of the clinical trial, the criteria and incentive package for participation. That is, community gardens receive \$50 for every plot reserved for the study and the study will pay plot fees for each participant, which cost an average of \$40 per season. Once the garden leaders complete their garden registration materials, study staff work with garden leaders to contact residents on existing waitlists to screen for eligibility for the trial and begin recruitment within the neighborhood surrounding the garden.

The recruitment approach used during the initial year (year 1) and the second year of recruitment (year 2) are described in [Table 1](#). Each approach consisted of several recruitment strategies. During the first year, we used eight recruitment strategies. During the second year, we added four more strategies, for a total of twelve recruitment strategies. Strategies included both direct (face-to-face) and indirect (media-based) approaches. There were three major shifts in the recruitment approach for the second year of the trial compared to the first year of the trial. First, the team hired a full-time bilingual recruitment coordinator to lead the team of six part-time community-based staff members, three of whom spoke Spanish. Second, the team developed an Excel spreadsheet that identified local governmental and non-governmental organizations, schools, recreation centers, libraries, health centers, churches, and community organizations in each neighborhood. The asset sheet included information about contact information and websites for each resource. The key feature of the spreadsheet was to facilitate monitoring of outreach with organizations and people, schedule activities, and monitor recruitment efforts. Finally, the team increased communication with community advisory committee members and local garden leaders, health partners (e.g., 9Health Fair, Kaiser Permanente) and community

Table 1
Direct and indirect recruitment strategies by recruitment year.

| Recruitment Strategy | Year 1 | Year 2 |
|--|--------|--------|
| Direct recruitment strategies | | |
| Referrals by participants | | ✓ |
| Referrals by non-participants | ✓ | ✓ |
| Attendance at community and school meetings | ✓ | ✓ |
| Attendance at health fairs | ✓ | ✓ |
| Denver Urban Gardens waitlist | ✓ | ✓ |
| Met while canvassing | ✓ | ✓ |
| Indirect recruitment strategies | | |
| Post fliers and distribute post cards at neighborhood organizations (health, WIC, and human services clinics, libraries, recreation centers, common areas of residences) | ✓ | ✓ |
| Attend church services | | ✓ |
| Media: Advertisements in local radio, television newscasts, newsletters, | ✓ | ✓ |
| Media: Study website, Facebook | | ✓ |
| NextDoor posts | | ✓ |
| Canvassing | ✓ | ✓ |

organizations. The goal was to increase awareness about the study. The team encouraged stakeholders to spread the word about the CAPS trial to their respective communities.

Statistical analysis plan: To compare the effect of the recruitment approach for the first and second year of the studies, we tabulated the demographic characteristics of the study participants for year 1 and year 2. We computed counts and percentages by sex, race, and ethnicity. We cross-classified the table by whether the participant was screened, but not consented, compared to the participants who were both screened and consented. We tabulated counts and percentages by recruitment strategy in year 1 and year 2 for those who were screened and consented. We computed the yield as the percentage of those screened who eventually gave consent. Recruitment strategies were classified as direct or indirect using the classification shown in Table 1. Fisher’s exact tests were used to assess the effectiveness of direct or indirect approaches in attracting study participants.

Staffing, travel, and supply costs were calculated for each recruitment strategy. Staffing costs were calculated using the average hourly rate paid (\$18 per hour). For each year of recruitment, staff members recorded how much time they spent developing plans and deploying recruitment strategies. These data were captured in spreadsheets and used to calculate the total number of hours per strategy. Costs were calculated by multiplying the total number of hours by hourly wages and were added together to generate total personnel costs. We calculated recruitment time per respondent by dividing total number of staff hours by the number of consented participants. We tabulated costs for material design, professional printing, photocopying, and postage. Mileage and transportation time were captured through individual travel logs. An average cost per participant was calculated by dividing the sum of personnel and supply costs by the number of consented participants.

3. Results

In Year 1, 20 gardens leaders agreed to participate in the study. In Year 2, 10 gardens from Year 1 continued with the study and 10 new gardens were added to the garden sample.

In total, 393 individuals were initially contacted regarding the study (data not shown) and 299 individuals were screened for study eligibility, indicated how they learned about the study, and provided demographic information (see Table 2 and Table 3). Study fliers and door hangers were the primary method of outreach and accounted for 98 screening individuals (79%). Recruitment from existing community garden waitlists yielded 29 additional screenings (24%).

By the conclusion of year 1 recruitment, CAPS staff made 136 contacts with potential study participants. Of the 136 initial contacts, 106 participants (78%) were screened for eligibility; subsequently, 64 of

Table 2
Demographic characteristics of year 1 and year 2 screened and consented participants.

| | Year 1 | | Year 2 | |
|--------------------|--------------------|--------------------|--------------------|---------------------|
| | Screened (n = 106) | Consented (n = 64) | Screened (n = 193) | Consented (n = 123) |
| Gender (n%) | | | | |
| Male | 24 (22.6) | 11 (17.2) | 35 (18.1) | 24 (19.5) |
| Female | 79 (74.5) | 53 (82.8) | 146 (75.6) | 99 (80.5) |
| Not-Specified | 3 (2.8) | | 12 (6.2) | |
| Age (n%) | | | | |
| 18–24 | 10 (9.4) | 7 (10.9) | 7 (3.6) | 4 (3.3) |
| 25–44 | 43 (40.6) | 37 (57.8) | 93 (48.2) | 76 (61.8) |
| 45–64 | 24 (22.6) | 18 (28.1) | 44 (22.8) | 36 (29.3) |
| 65 plus | 3 (2.8) | 2 (3.1) | 4 (2.1) | 4 (3.3) |
| Missing | 26 (24.5) | | 45 (23.3) | 3 (2.4) |
| Race (n%) | | | | |
| White | 73 (68.9) | 44 (68.8) | 138 (71.5) | 94 (76.4) |
| Black | 12 (11.3) | 5 (7.8) | 12 (6.2) | 9 (7.3) |
| American Indian | 3 (2.8) | 1 (1.6) | 4 (2.1) | 4 (3.3) |
| Asian | 6 (5.7) | 5 (7.8) | 5 (2.6) | 3 (2.4) |
| Other | 9 (8.5) | 9 (14.1) | 20 (10.4) | 12 (9.8) |
| Missing | 3 (2.8) | | 14 (13.2) | 1 (0.8) |
| Latinx (n%) | | | | |
| Latinx | 24 (22.6) | 18 (28.1) | 74 (38.3) | 47 (38.2) |
| Non-Latinx | 79 (74.5) | 46 (71.9) | 104 (53.9) | 76 (61.8) |
| Prefer not to say | 3 (2.8) | | 15 (7.8) | |

Table 3
Effectiveness of recruitment strategies comparing years 1 and 2.

| Year 1 | Screened | | % of screened who consented |
|---|----------------|-----------------|-----------------------------|
| | n (%) | n (%) | |
| How Participant was Identified for Study | | | |
| Fliers and door hangers | 65 (61.3) | 37 (57.8) | 56.9 |
| Denver Urban Garden waitlist | 20 (18.9) | 13 (20.3) | 65.0 |
| Health Fair | 7 (6.6) | 5 (7.8) | 71.4 |
| Referred by non-participant | 4 (3.8) | 4 (6.3) | 100.0 |
| Community/School Meeting | 4 (3.8) | 3 (4.7) | 75.0 |
| Media ^a | 2 (1.9) | 1 (1.6) | 50.0 |
| Met while canvassing | 2 (1.9) | 1 (1.6) | 50.0 |
| Unknown | 2 (1.9) | 0 (0.0) | 0.0 |
| Totals | 106 | 64 | 60.4 |
| Year 2 | Screened n (%) | Consented n (%) | % of screened who consented |
| How Participant was Identified for Study | | | |
| Health Fair | 34 (17.6) | 25 (20.3) | 73.5 |
| Fliers and door hangers | 33 (17.1) | 22 (17.9) | 66.7 |
| Community/School Meeting | 32 (16.6) | 14 (11.4) | 43.8 |
| Referred by non-participant | 17 (8.8) | 12 (9.8) | 70.6 |
| Next Door | 14 (7.3) | 9 (7.3) | 64.3 |
| Media ^b | 13 (6.7) | 10 (8.1) | 76.9 |
| Food bank | 13 (6.7) | 9 (7.3) | 69.2 |
| Contacted Us | 9 (4.7) | 6 (4.9) | 66.7 |
| Denver Urban Garden waitlist | 9 (4.7) | 4 (3.3) | 44.4 |
| Public library or class | 8 (4.2) | 6 (4.9) | 75.0 |
| Participant referral | 5 (2.6) | 4 (3.3) | 80.0 |
| Church | 2 (1.0) | 1 (0.8) | 50.0 |
| Unknown | 2 (1.0) | 1 (0.8) | 50.0 |
| Met while canvassing | 2 (1.0) | 0 (0.0) | 0.0 |
| Totals | 193 | 123 | 63.7 |

^a Media defined as websites, email, newsletters.

^b Media defined as websites, email, newsletters, Facebook.

those screened consented to the study (n = 60) (Table 2). Of this final sample, the majority were women (83%), were aged 25–44 years (58%), and included 28% Latinx, exceeding our recruitment target of 22% for this subpopulation. In year 2, from initial contact to completed health visit, fliers and door hangers were the primary strategies with the most success in engaging residents and sustaining interest (n = 37). Recruiting from waitlists already in place at each garden remained effective throughout screening and consent procedures (n = 13, 65% recruited from waitlists were consented). Recruitment from health fairs resulted in seven screenings and five consents.

Staffing improvements and tailored neighborhood-specific outreach tactics in year 2 more than doubled the recruitment reach of year 1. At the conclusion of year 2 recruitment, CAPS staff contacted 281 individuals. Of those individuals, CAPS staff contacted and screened 193 individuals for their eligibility in the study and consented 122 individuals. In year 2, the most successful strategies for recruitment included staff attending health fairs, distributing fliers and door hangers, attending community and school meetings, and non-study participant referrals - which accounted for over 50% of consented individuals (Table 3).

We examined the various strategies for their effectiveness in reaching low income and minority participants. As shown in Table 4, the only statistically significant difference between direct and indirect methods for recruiting different social groups was language spoken at home (p < 0.01). While English speaking participants were recruited using indirect and direct methods, almost all participants who spoke Spanish as their first language were recruited by direct methods.

Costs for recruitment for year 1 and year 2 are shown in Table 5. Year 1 dedicated 707 h, or 1.77 full time equivalents for study recruitment over a 10-week period. Year 2 dedicated 1,224 h, or 2.55 full time equivalents for study recruitment over a 12-week period. Although we dedicated more resources towards recruitment in year 2, average cost for retained participants was lower in year 2 (\$186) than in year 1 (\$226).

4. Discussion

While the commitment by government agencies to include under-represented populations in research has not wavered over the past several decades, there remain challenges to effectively and efficiently recruit and retain underrepresented populations for community and clinical research studies. This paper described recruitment protocol and outcomes across two years of data collection in a community randomized controlled trial among a diverse population of urban residents. Low recruitment during the first year of the trial prompted changes to the

recruitment strategy. As the study team learned from its first year of experience, we used a modified recruitment approach in the second year. The approach was tailored to meet the concerns of the communities, and to increase recruitment among racial, ethnic and socio-economic subgroups.

This study illustrates that the assignment of designated bilingual staff and the use of a tiered approach to recruitment that is tailored to different geographies is effective in increasing initial contacts with potential study participants and those that ultimately consent to the study [21]. For example, in our community, people asked about whether information about immigration status would be collected. A tailored approach allowed us the time required to take the care necessary to address these and other concerns. Our findings showed that Spanish speakers were statistically more likely to be recruited into the study using direct methods in our second year of recruitment. Language spoken at home rather than race or ethnicity mattered more for recruitment, emphasizing the need to identify the indicators most meaningful in each community that will inform neighborhood-specific recruitment methods.

Designated recruitment coordinator time was the most important change in year 2 recruitment. By bringing on a part-time hire for a concentrated period of time, it enabled the project coordinator to focus on retention of existing study participants and the coordination and conduct of the last set of health visits for Year 1 participants. The recruitment coordinator was able to seize on the study team’s knowledge of the population, the neighborhoods, and the relationships already in place with other stakeholders to design and implement a more robust recruitment approach for Year 2. With a designated recruitment coordinator, staff were able to support recruitment in a way that better balanced with their study participant retention responsibilities, including health visits and process evaluation requirements.

Regarding specific recruitment tactics and activities, the 9Health Fairs represent another important strategy for recruitment because they allowed CAPS staff to interact directly with low income and minority residents in the Denver Metro area through a well-respected and trusted venue for delivering health services to those in greatest need. 9Health is a community non-profit organization that provides preventive health education and comprehensive screenings for over 40 years (www.9healthfair.org). We linked our participation in the health fair with 9Health Facebook Live Series Health Happens just before the launch of the health fair season, raising awareness and providing a digital platform to learn more about the study. The 9Health Fair setting was conducive for facilitating authentic conversations about the research study and providing a comfortable setting where staff could address questions and concerns. Individuals who expressed interest were contacted within one

Table 4
Comparison of direct and indirect recruitment methods by baseline demographic characteristics and year of recruitment.

| Characteristic | Year 1 | | | | | | Year 2 | | | | | |
|----------------|----------|----------|------|-----------|----------|-------|----------|----------|-------|-----------|----------|-------|
| | Screened | | | Consented | | | Screened | | | Consented | | |
| | Direct | Indirect | p | Direct | Indirect | p | Direct | Indirect | p | Direct | Indirect | p |
| Race/Ethnicity | | | | | | | | | | | | |
| White | 27 | 46 | 0.82 | 17 | 27 | 0.78 | 78 | 60 | 0.87 | 52 | 42 | 0.67 |
| Non-White | 10 | 21 | | 9 | 11 | | 31 | 22 | | 14 | 14 | |
| Age | | | | | | | | | | | | |
| 18-24 | 3 | 7 | 0.56 | 2 | 5 | 0.66 | 3 | 4 | 0.62 | 1 | 3 | 0.58 |
| 25-44 | 20 | 22 | | 17 | 20 | | 51 | 41 | | 42 | 33 | |
| 45-64 | 10 | 17 | | 7 | 13 | | 29 | 19 | | 22 | 18 | |
| Income | | | | | | | | | | | | |
| <50,000 | N/A | N/A | N/A | 17 | 25 | >0.99 | N/A | N/A | N/A | 35 | 28 | 0.85 |
| >=50,000 | | | | 8 | 12 | | | | | 30 | 27 | |
| Gender | | | | | | | | | | | | |
| Male | 6 | 18 | 0.23 | 3 | 8 | 0.50 | 20 | 15 | >0.99 | 14 | 10 | 0.82 |
| Female | 31 | 47 | | 23 | 30 | | 82 | 62 | | 52 | 46 | |
| First Language | | | | | | | | | | | | |
| English | 33 | 65 | 0.18 | 23 | 37 | 0.30 | 71 | 56 | <0.01 | 42 | 42 | <0.01 |
| Spanish | 4 | 2 | | 3 | 1 | | 22 | 6 | | 12 | 3 | |

Table 5
Total Recruitment Time and Costs for Year 1 and Year 2.

| | Year 1 | | | Year 2 | | | | |
|--|--------------------------|------------------------------|-------------------|----------------------|--------------------------|------------------------------|-------------------|----------------------|
| | Time Per Unit (hours-wk) | Total Time for Study (hours) | Cost per Hour | Total Estimated Cost | Time Per Unit (hours-wk) | Total Time for Study (hours) | Cost per Hour | Total Estimated Cost |
| Project Coordinator (planning, canvassing, attending events), 12 Weeks | 15 | 150 | \$29 | \$4,420 | 40 | 480 | \$20 | \$9,600 |
| Study Assistant Recruitment Time, 10 weeks | 35 | 350 | \$18 ^a | \$6,300 | 30 | 360 | \$18 ^a | \$6,480 |
| Drive Time, Canvassing | | 27 | \$18 ^a | \$486 | | 31 | \$18 ^a | \$558 |
| Prescreening/Screening | | 106 | \$18 ^a | \$1,908 | | 190 | \$18 ^a | \$3,420 |
| Health Visits Scheduled | | 21 | \$18 ^a | \$378 | | 40 | \$18 ^a | \$720 |
| Health Visit Notes | | 53 | \$18 ^a | \$954 | | 123 | \$18 ^a | \$2,214 |
| TOTAL | | 707 | | \$14,446 | | 1224 | | \$22,992 |

^a Average cost per hour.

week of the health fair.

Social media sites were also used to raise awareness about the study. For example, *NextDoor* offers a place-based social media recruitment strategy that is designed to reach residents in their respective neighborhoods. Through our networks, we collaborated with residents and community leaders to post information about the study, thus enabling the information to be shared in a more familiar manner by residents rather than study personnel. We also used neighborhood-, government-, community- and school-based Facebook sites, email blasts, and online newsletters to promote the study. For each of these postings, we reached out to leaders in these respective organizations and asked them to post about the study on our behalf. Similar to *NextDoor*, the message came from someone within the community and thus strengthened the credibility of the post. While social media is effective in study recruitment, past studies caution that it can skew recruitment towards a younger demographic and thus may not be sufficient in attracting representative samples of the target population [22]. When used in combination with other recruitment strategies, it can be considered a useful component in a comprehensive community-based recruitment approach [23].

Fliers accounted for 58% of consented participants in year 1 and 18% in year 2. For both years, the recruitment yield as a result of this strategy remained consistent at 65 and 67%, respectively. This strategy was key to the study because it served as the connective tissue of recruitment by filling in throughout neighborhoods when there were not community meetings, health fairs, or other events available for CAPS staff to utilize for recruitment. Participants recruited by fliers often visited the CAPS website before calling or emailing. The amount of ownership involved in initiating contact translated into a higher conversion rate.

Community and school-based meetings are appealing because they generated the second highest amount of initial contacts. However, this approach yielded some of the lowest numbers of consented participants. This may be due to CAPS staff receiving names of individuals who expressed interest or felt a desirability to sign up from social reasons but could not commit for various personal reasons. Although it is time consuming and not the highest yielding method for recruitment, it allowed CAPS staff to interact with community members, answer questions, connect with other leaders in the community, and gain a better understanding of the demographics associated with each garden area.

Referrals by individuals not in the study were shown to be successful. These referrals were made by people who were knowledgeable of DUG or who played a significant role in the study. These referees served as direct and trusted points of contact who served as the catalyst for participation and also a liaison if communication with study participant became difficult. This strategy resulted in 100% yield from initial contact to consented participant after being personally referred to the study.

5. Conclusion

Recruitment to CAPS, community-based trial, was complicated in year 1 due to the short time between grant initiation (January 2017) and the beginning of the garden season (May 2017). Additionally, the absence of a designated recruitment lead required staff to stretch themselves across many dimensions of the study protocol. In year 2, the addition of more lead time to recruit participants, a dedicated recruitment lead, and a tailored neighborhood specific approach that included direct and indirect methods created a more positive and successful recruitment environment. The creation of neighborhood-specific asset sheets and the assignment of staff members to review and collect detailed recruitment strategies for a subset of assigned neighborhoods generated more efficient processes for recruitment across diverse neighborhoods. These tailored approaches also provided opportunities for increased in-person contact with potential participants to discuss the study and assess potential fit for interested individuals. For reaching the Latinx population, this study showed that direct recruitment methods, which facilitated in-person contact, were the most successful. While a culturally-tailored approach costs more, it provides a more effective and cost efficient way to reach recruitment goals.

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References

- [1] G.L. Burke, P.J. Savage, T.A. Manolio, et al., Correlates of obesity in young black and white women: the CARDIA Study, *Am. J. Public Health* 82 (12) (1992) 1621–1625.
- [2] S.I. Duelberg, Preventive health behavior among black and white women in urban and rural areas, *Soc. Sci. Med.* 34 (2) (1992) 191–198.
- [3] M.A. Winkleby, C. Cubbin, D.K. Ahn, H.C. Kraemer, Pathways by which SES and ethnicity influence cardiovascular disease risk factors, *Ann. N. Y. Acad. Sci.* 896 (1999) 191–209.

- [4] M.A. Winkleby, H.C. Kraemer, D.K. Ahn, A.N. Varady, Ethnic and socioeconomic differences in cardiovascular disease risk factors: findings for women from the Third National Health and Nutrition Examination Survey, 1988-1994, *J. Am. Med. Assoc.* 280 (4) (1998) 356-362.
- [5] J. Kimmons, C. Gillespie, J. Seymor, M. Serdula, H.M. B. Fruit and vegetable intake among adolescents and adults in the United States: percentage meeting individualized recommendations, *Medscape J. Med.* 11 (1) (2009).
- [6] C.L. Ogden, M.D. Carroll, B.K. Kit, K.M. Flegal, Prevalence of Obesity in the United States, 2009-2010, vol. 82, National Center for Health Statistics, Hyattsville, MD, 2012.
- [7] M. McPherson, L. Smith-Lovin, M. Brashears, Social isolation in America: changes in core discussion networks over two decades, *Am. Sociol. Rev.* 71 (2006) 353-375.
- [8] I.C. Sankaré, R. Bross, A.F. Brown, et al., Strategies to build trust and recruit African American and Latino community residents for health research: a cohort study, *Clin. Transl. Sci.* 8 (5) (2015) 412-420.
- [9] J. Otado, J. Kwagyan, D. Edwards, A. Ukaegbu, F. Rockcliffe, N. Osafo, Culturally competent strategies for recruitment and retention of African American populations into clinical trials, *Clin. Transl. Sci.* 8 (5) (2015) 460-466.
- [10] J. Fleming, A. Kamal, E. Harrison, et al., Evaluation of recruitment methods for a trial targeting childhood obesity: families for Health randomised controlled trial, *Trials* 16 (2015) 535.
- [11] A. Krusche, I. Rudolf von Rohr, K. Muse, D. Duggan, C. Crane, J.M.G. Williams, An evaluation of the effectiveness of recruitment methods: the staying well after depression randomized controlled trial, *Clin. Trials* 11 (2) (2014) 141-149.
- [12] M.M. Reeves, E.G. Eakin, S.S. Bull, K. Riley, P. McLaughlin, S. Gutierrez, Recruitment and retention of Latinos in a primary care-based physical activity and diet trial: the Resources for Health study, *Health Educ. Res.* 22 (3) (2006) 361-371.
- [13] B.G.O. Sully, S.A. Julious, J. Nicholl, A reinvestigation of recruitment to randomised, controlled, multicenter trials: a review of trials funded by two UK funding agencies, *Trials* 14 (2013), 166-166.
- [14] R.J. Copeland, K. Horspool, L. Humphreys, E. Scott, Booster trial t. Recruiting to a large-scale physical activity randomised controlled trial - experiences with the gift of hindsight, *Trials* 17 (1) (2016), 104-104.
- [15] J.M. Watson, D.J. Torgerson, Increasing recruitment to randomised trials: a review of randomised controlled trials, *BMC Med. Res. Methodol.* 6 (2006), 34-34.
- [16] W.M.P. Klein, M. Bloch, B.W. Hesse, et al., Behavioral research in cancer prevention and control: a look to the future, *Am. J. Prev. Med.* 46 (3) (2014) 303-311.
- [17] J.S. Litt, K. Alaimo, M. Buchenau, et al., Rationale and design for the community activation for prevention study (CAPs): a randomized controlled trial of community gardening, *Contemp. Clin. Trials* 68 (2018) 72-78.
- [18] J.S. Litt, M. Soobader, M.S. Turbin, J. Hale, M. Buchenau, J.A. Marshall, The influences of social involvement, neighborhood aesthetics and community garden participation on fruit and vegetable consumption, *Am. J. Public Health* 101 (2011) 1466-1473.
- [19] K. Alaimo, T.M. Reischl, J. Ober-Allen, Community gardening, neighborhood meetings and social capital, *J. Community Psychol.* 38 (4) (2010) 497-514.
- [20] A.W. Beavers, A. Atkinson, K. Alaimo, How gardening and a gardener support program in detroit influence participants' diet, food security, and food values, *J. Hunger Environ. Nutr.* (2019) 1-21.
- [21] E.T. Warner, R.E. Glasgow, K.M. Emmons, et al., Recruitment and retention of participants in a pragmatic randomized intervention trial at three community health clinics: results and lessons learned, *BMC Public Health* 13 (1) (2013) 192.
- [22] D.E.R.T. Ramo, K. Chavez, M.J. Sommer, J.J. Prochaska, Facebook recruitment of young adult smokers for a cessation trial: methods, metrics, and lessons learned, *Internet Interv.* 1 (2) (2014) 58-64.
- [23] M.T.M. Frandsen, S.G. Ferguson, The effectiveness of social media (Facebook) compared with more traditional advertising methods for recruiting eligible participants to health research studies: a randomized, controlled clinical trial, *JMIR Res. Protoc.* 5 (3) (2016) e161.