

# Effectiveness of Lay Health Worker Outreach in Reducing Disparities in Colorectal Cancer Screening in Vietnamese Americans

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Vietnamese Americans are a predominantly refugee and immigrant population with a distinct culture and language. Vietnamese Americans are the fourth largest Asian group in the United States,<sup>1</sup> yet they have more socioeconomic and health disparities than do non-Hispanic Whites.<sup>2</sup> Vietnamese Americans have higher rates of unemployment (10.6% vs 9.0%), receiving public assistance (1.8% vs 1.2%), and poverty (15.5% vs 10.7%) than do non-Hispanic Whites and have a lower mean number of years of education (11.8 years vs 13.6 years).<sup>2</sup> One health care disparity is in colorectal cancer (CRC) screening, with the proportions ever screened by fecal occult blood test, sigmoidoscopy or colonoscopy, and any CRC screening test among Vietnamese Americans lower at 29.0%, 36.0%, and 52.0%, respectively, than those among non-Hispanic Whites at 58.0%, 57.0%, and 75.0%, respectively.<sup>3</sup>

Lay health workers (LHWs)—defined as “a member of the community who has received some training to promote health or to carry out some health care services, but is not a health care professional”<sup>4(p2)</sup>—in culturally appropriate community-based interventions can improve cancer screening behaviors in underserved, ethnic populations.<sup>4–6</sup> In our previous work, LHW outreach increased breast and cervical cancer screening rates among Vietnamese American women.<sup>7,8</sup> Two community-based cluster randomized trials in the African American and Latino communities did not increase CRC screening rates in these communities.<sup>9,10</sup>

A cluster randomized controlled trial, using churches as the units of randomization, compared the effectiveness of 2 intervention strategies to promote CRC prevention behaviors among African American members of rural churches. Campbell et al. used a 2 × 2 factorial design to compare a tailored print and video intervention, consisting of 4 individually tailored

**Objectives.** We conducted a cluster randomized controlled study of a lay health worker (LHW) intervention to increase colorectal cancer (CRC) screening rates among Vietnamese Americans, who typically have lower rates than do non-Hispanic Whites.

**Methods.** We randomized 64 LHWs to 2 arms. Each LHW recruited 10 male or female participants who had never had CRC screening (fecal occult blood test, sigmoidoscopy, or colonoscopy). Intervention LHWs led 2 educational sessions on CRC screening. Control LHWs led 2 sessions on healthy eating and physical activity. The main outcome was self-reported receipt of any CRC screening at 6 months after the intervention. We conducted the study from 2008 to 2013 in Santa Clara County, California.

**Results.** A greater proportion of intervention participants (56%) than control participants (19%) reported receiving CRC screening ( $P < .001$ ). When controlling for demographic characteristics, the intervention odds ratio was 5.45 (95% confidence interval = 3.02, 9.82). There was no difference in intervention effect by participant gender.

**Conclusions.** LHW outreach was effective in increasing CRC screening in Vietnamese Americans. Randomized controlled trials are needed to test the effectiveness of LHW outreach for other populations and other health outcomes. (*Am J Public Health.* 2015;105:2083–2089. doi:10.2105/AJPH.2015.302713)

newsletters and targeted videotapes, with a lay health advisor intervention. Results showed that the rates of CRC screening tests did not differ among study groups at 1-year follow-up.<sup>9</sup>

A community-based cluster randomized trial without a control group compared 2 different intervention delivery methods for lay health educator–taught cancer screening classes. The Latina participants were randomly assigned to classes delivered either individually or in social support groups. Results showed that CRC screening and maintenance behaviors did not differ significantly between the 2 delivery methods. Because there was no control group, it was not possible to observe the effectiveness of any of the delivery methods.<sup>10</sup>

No community-based LHW interventions have been conducted targeting CRC screening in Vietnamese Americans. Consequently, we examined the effectiveness of a community-based LHW intervention on increasing

self-reported CRC screening rates in Vietnamese American women and men and compared its effectiveness by gender. We hypothesized that (1) after intervention, the self-reported CRC screening rate would be higher among the intervention participants than the control participants, and (2) the intervention would be more effective in women than in men.

## METHODS

A coalition of 19 organizations and 6 community members (representing county health departments, health maintenance organizations, immigrant resettlement service providers, health care providers, cancer survivors, and researchers) partnered with 4 community-based organizations (CBOs) to provide the LHW services and with 2 research institutions to carry out the research protocols. Coalition and community members participated in all

phases of the research, including design, implementation, data analysis, interpretation, and dissemination.<sup>11,12</sup>

### Study Design, Recruitment, and Randomization

We used a cluster randomized controlled trial design, with LHWs and their recruited participants randomized together to either the intervention or the control condition. The proportion of male and female LHWs was equal in both conditions. The sample size of 64 LHWs and 640 participants was powered to detect an effect size of a 20% difference between the intervention and control group in the proportion screened for CRC at posttest, assuming an intraclass correlation coefficient of 0.05, an attrition rate of 0.05, a recruitment of 10 participants per LHW, and an estimated 20% of the control group and 40% of the intervention group being screened at posttest. We determined the number of participants per LHW by our prior LHW studies.<sup>7,8</sup>

Four CBOs delivered the LHW services from February 2008 to February 2012 (each CBO participated for 16 months). Each CBO hired a LHW coordinator. After training by the research staff, each coordinator recruited 16 LHWs, with equal numbers of men and women, from the CBO's client base or the coordinator's social networks (family, friends, or referrals). Eligibility criteria for LHWs included (1) self-identifying as Vietnamese or Vietnamese American, (2) being aged 50 to 74 years, (3) understanding and speaking Vietnamese, and (4) living in and intending to stay in the study area (Santa Clara County, CA) for the next 12 months. Research staff randomized LHWs to either the intervention or control group in a 1-to-1 ratio and then informed LHWs of their randomization assignment.

Each LHW recruited 10 participants of the same gender from his or her own social network. Intervention group LHWs informed their participants that they would attend 2 educational sessions about CRC screening; control LHWs informed their participants that they would be educated about healthy eating and physical activity. Inclusion eligibility criteria for participants included

1. self-identifying as Vietnamese or Vietnamese American,

2. being aged 50 to 74 years,
3. understanding Vietnamese,
4. living in and intending to stay in the study area for the next 6 months, and
5. never having had CRC screening (fecal occult blood test, sigmoidoscopy, or colonoscopy).

An exclusion criterion was living in the same household as another study participant.

### Theoretical Framework

The pathways framework<sup>13-19</sup> and the diffusion of innovations theory<sup>20</sup> provided the theoretical framework for the LHW intervention. According to the pathways framework, knowledge, attitudes, and beliefs are pathways to screening behavior.

The intervention LHWs delivered educational sessions, health educational materials, and follow-up support services to improve participants' knowledge, attitudes, and beliefs about CRC screening. According to the diffusion of innovations theory, "innovators," or "change agents," who are respected by peers influence public opinion.<sup>20,21</sup> The LHWs were the innovators, or change agents, because they asked participants to obtain a screening test that they had never had before.

### Health Educational Materials and Formative Research

We developed the educational materials "from scratch" as recommended by Achterberg<sup>22</sup> to develop an appropriate communication mechanism, content, and illustration. We chose the flip-chart format as a teaching tool for LHWs to make presentations in small group educational sessions because it does not require LHWs to be proficient in technological devices. We developed the CRC screening flip chart in Vietnamese to connect directly to the target audience by using their vernacular, colloquial, and idiomatic expressions. A team of bilingual and bicultural staff and consultants drafted the content of the CRC flip chart to cover the colon in the body; what cancer is and specifically what CRC is; CRC risk factors, symptoms, prevention, and screening tests; the recommended age to begin; and where to get CRC screening.

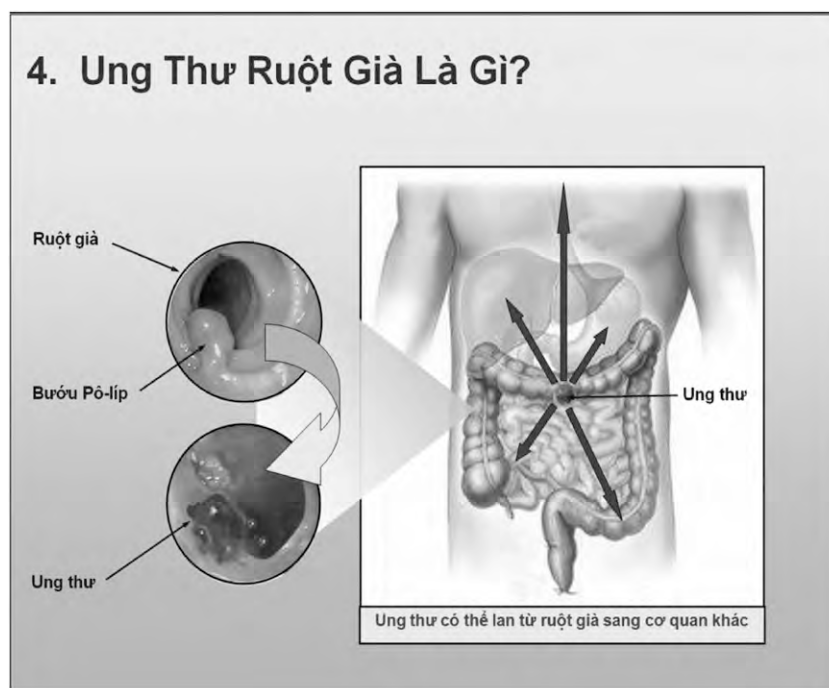
The CRC flip chart featured images of Vietnamese models obtaining CRC screening

tests and other images to illustrate CRC screening recommendations. The flip chart was printed on 18- × 12-inch glossy heavy stock that was spiral bound and could be set up in a tent format on a table for a small group to view. The front of each page, to be viewed by group participants, contained educational messages in Vietnamese, with graphics, photographs, and illustrations in full color to enhance the participants' understanding of the presentation (Figure 1). The back, to be viewed by the LHWs, contained teaching points in Vietnamese and a small image of the front page with an English translation to aid the LHWs in delivering the presentation (Figure 2).

We conducted cognitive interviews of community members (not participants in the research) regarding the flip charts. Results of these cognitive interviews are reported separately.<sup>23</sup> A bilingual and bicultural gastroenterologist reviewed the CRC flip chart for scientific accuracy. We used feedback and comments from the cognitive interview participants and the gastroenterologist to improve the prototype and make final adjustments to the flip chart. We then developed a CRC screening booklet with the same Vietnamese messages and images as on the front of the flip chart; the booklet contained the same messages in English at the bottom of each page. We also developed a healthy eating and physical activity flip chart and booklet for the control group using the same formative research process.

### Lay Health Worker Intervention

LHW activities consisted of attending LHW training, recruiting participants, delivering 2 educational sessions, distributing health educational booklets, and providing follow-up support and navigation services to the participants. We paid each LHW \$1200 to perform these functions. Over 2 days (for a total of 12 hours), the research staff and agency coordinator trained the LHWs in each study arm separately to prevent contamination. All LHWs were trained on recruitment of participants, outreach approaches and procedures, and organization and facilitation of educational sessions. The intervention LHWs were educated about CRC screening, whereas the control LHWs received information about healthy nutrition and physical activity. LHWs then practiced delivering their educational presentations using the flip



**FIGURE 1**—Front page of the flip chart contains educational messages for participants to follow during the educational session presentation: Santa Clara County, CA, 2008–2013.

charts. We gave LHWs a LHW reference manual covering their topics.

After the intervention LHWs recruited their 10 participants, they used the portable flip chart in the first educational group session to educate the participants about CRC screening and to recommend that they obtain it. At the end of the first session, the LHWs distributed the booklet. To permit the participants sufficient opportunity to obtain CRC screening, we allowed 2 to 3 months to pass between the first and the second educational sessions. In the second group session, the LHWs identified participants who had not followed the CRC screening recommendation, identified barriers to screening, and provided suggestions and support to overcome these barriers. Each session took 1 to 2 hours.

After each session, the intervention LHWs made follow-up telephone calls or in-person visits to participants to remind them to obtain CRC screening, to provide referrals to low-cost or no-cost CRC screening options for those without health insurance coverage, to assist with making appointments, and sometimes to accompany

participants to appointments. The control LHWs carried out the same number of educational sessions of equal length about healthy eating and physical activity, distributed a booklet, and made follow-up calls or visits to participants to remind them to follow recommendations on healthy eating and physical activity. We did not pay participants for intervention activities.

#### Measures

Before the first educational session, research staff conducted a pretest telephone survey of all participants to confirm their eligibility and to collect baseline data. Staff conducted a posttest telephone survey 6 months after the first educational session (and 3–4 months after the second session) to allow intervention group participants sufficient time and opportunity to follow the CRC screening recommendation.

The main outcome variable was participant report of ever having had a CRC screening test (screening status). Secondary outcome variables included knowledge (having heard of colon polyps and knowing the recommended age to begin CRC screening), attitudes

(perceived susceptibility: worrying about getting colon cancer and ever having thought they might get colon cancer), and belief (believing colon cancer can be cured if found early).

Demographic variables included gender, age, education, income, marital status, years lived in the United States, English language proficiency, employment, self-perceived health status, health insurance, having a place for health care, and having a personal doctor (Table 1). We chose these demographic and secondary outcome variables because they have been found to be associated with screening for other types of cancer.<sup>8,19</sup>

#### Statistical Analysis

From 2012 to 2013, we analyzed the pre- and posttest survey data using SAS version 9.3 (SAS Institute, Inc., Cary, NC). We used generalized estimating equation models in all analyses to account for participant clustering by LHW and correlated data between pre- and posttest on the same individual. In particular, we used bivariate generalized estimating equation models to assess the similarity between the study arms in participants' demographic characteristics and to compare the study arms regarding the main outcome (screening status at posttest) and regarding the pre–post change (difference between pretest and posttest) in secondary outcome variables.

To test hypothesis 1, we created a logistic regression generalized estimating equation model of the main outcome as a function of study arm (intervention group vs control group) to control for demographic characteristics and LHW agency. To test hypothesis 2—that participant gender moderated the intervention—we added an interaction term between gender and study arm to the model regarding screening status.<sup>24</sup>

#### RESULTS


Of 894 potential participants recruited by the LHWs, the study enrolled 640, yielding a participation rate of 71.6%. Reasons for exclusion were could not be contacted by telephone, duplicated names, or lived in the same household as another participant (87); refused before eligibility could be determined (1); did not meet inclusion criteria (147); and refused after eligibility determination (19). The major reason for ineligibility (95% of ineligible participants)

## 4. Ung Thư Ruột Già Là Gì?

- Ung thư ruột già bắt đầu từ các tế bào trong ruột già sinh sản một cách bất thường.
- Nhóm tế bào bất thường này mọc ra thành cục bướu còn gọi là “pô-líp”.
- Lâu ngày, một số pô-líp này có thể biến thành ung thư.
- Khởi đầu ung thư mọc ở trong ruột già, nhưng dần dần, nó mọc to ra và có thể lan qua những cơ quan khác của cơ thể.

4. What Is Colon Cancer?

- Colon cancer begins as an abnormal growth of cells in the colon
- This abnormal cell growth turns into a tumor. It is also called a “polyp”
- Over time, some colon polyps can become cancerous
- At first, the cancer develops in the colon but over time the cancer grows bigger and can spread into other organs



4. Ung Thư Ruột Già Là Gì?

4. What Is Colon Cancer?

- Colon
- Polyp
- Cancer

Colon cancer can spread into other organs

**FIGURE 2—Back page of the flip chart to be viewed by lay health workers, with teaching points to aid in delivering their presentations: Santa Clara County, CA, 2008–2013.**

was that the potential participant had already had CRC screening. At posttest, 8 participants could not be recontacted (moved, died, or no contact after at least 7 attempts), and 5 refused, yielding a high retention rate of 98%.

Table 1 shows that demographic characteristics did not differ significantly between study arms except that intervention participants were more likely to rate their health as “excellent, very good, or good” than were controls. As shown in Table 2, the intervention group was significantly more likely than were controls to report having had CRC screening at posttest (56% vs 19%;  $P < .001$ ). From pre- to posttest, the intervention group had significantly greater increases than did controls in the proportion who had heard of colon polyps, who knew the recommended age to begin CRC screening, and who believed that colon cancer can be cured if found early. From pre- to posttest, the intervention group showed a nonsignificant decrease in the proportion who worried about getting colon cancer, whereas the control group had a significant increase, and the pre–post change between the study arms was statistically significant.

In a multivariable model for the factors associated with CRC screening adjusted for LHW agency and participant demographic characteristics, the LHW intervention was effective (odds ratio [OR] = 5.45; 95% confidence interval [CI] = 3.02, 9.82) and no adjusted variables were significant. That is, the odds of participants in the intervention group having CRC screening were more than 5 times that of control group participants, thus confirming hypothesis 1. After we added an interaction term between participant gender and study arm to the model, the intervention was effective in both women (OR = 7.15; 95% CI = 3.11, 16.4) and men (OR = 4.09; 95% CI = 1.76, 9.48). However, the size of the effect did not differ significantly by gender ( $P = .36$ ). Therefore, participant gender was not a moderator of the intervention, and hypothesis 2 was not confirmed.

## DISCUSSION

We made a few key findings. First, in this cluster randomized controlled trial, LHW outreach was effective in increasing self-reported

CRC screening rates in Vietnamese American men and women. A previous quasiexperimental design study by our group of investigators found that a media-led intervention also increased CRC screening rates in Vietnamese Americans. The intervention effect size of 37 percentage points was large and clinically significant. The magnitude of the intervention effect—adjusted OR of 5.45 is similar to that in other randomized controlled trials aimed at increasing CRC screening in Asian Americans using clinic-based or professional-delivered approaches.<sup>25–27</sup> Large effect sizes have been found in other community-based randomized controlled trials using LHWs among Vietnamese Americans for breast cancer screening (OR = 3.62) and cervical cancer screening (OR = 2.02).<sup>7,8</sup> Thus, our study adds to the growing evidence that cancer screening can be increased significantly among Asian Americans when educational interventions are delivered in culturally appropriate ways and that LHW outreach can achieve similar effect sizes to those achieved by interventions delivered by CBO staff or health professionals.<sup>26,27</sup>

Second, to our knowledge, this is the first community-based cluster randomized controlled trial showing that LHW outreach is effective in increasing CRC screening in any ethnic group. Two previous community-based cluster randomized trials in the African American and Latino communities did not increase CRC screening rates in these communities.<sup>9,10</sup>

Third, the LHW intervention was effective in both women and men. Although our study was powered to detect an intervention effect in each gender, we did not find a significant difference in the intervention effect by gender. Most LHW intervention studies to promote cancer screening have been conducted in women.<sup>6–8,17,18,28–30</sup> The few CRC community-based randomized controlled trials that included both men and women were delivered by CBO staff or health professionals.<sup>26,27</sup> The result of our analysis supports the idea that community-based LHW outreach can work not only among women but also among men.

Why might this LHW intervention have worked? Social networks provided the existing relationships, trust, and social and cultural norms among the network members for LHWs to rely on for influencing the participants to obtain CRC screening. LHWs served as

**TABLE 1—Baseline Characteristics of Vietnamese American Participants by Study Arm: Santa Clara County, CA, 2008–2013**

Characteristics	Intervention Group, % (n = 320)	Control Group, % (n = 320)	P <sup>a</sup>
Gender, woman <sup>b</sup>	50.0	50.0	≥ .99
Age, y			
50–64	67.8	75.0	.18
65–74	32.2	25.0	
Lived in US, y			
≤ 10	39.1	37.7	.79
> 10	60.9	62.3	
English proficiency			
Fluent or good	8.4	4.4	.09
So-so	19.7	24.8	
Not very good or not at all	71.9	70.9	
Education			
≤ elementary school	22.4	19.1	.6
Junior high or some high school	22.1	17.9	
High school graduate or general equivalency diploma	20.2	22.9	
Some college	25.3	29.2	
≥ college graduate	9.9	11.0	
Employment			
Employed	26.9	27.2	.95
Unemployed, homemaker, student, retired, or disabled	73.1	72.8	
Marital status			
Married or living with partner	64.1	62.2	.69
Separated, widowed, divorced, or never married	35.9	37.8	
Health insurance			
None	30.9	29.4	.3
Indigent care from county	10.9	16.3	
Medicare or MediCal (Medicaid)	42.8	41.3	
Private	15.3	13.1	
Annual household income, \$			
< 10 000	17.8	15.3	.14
10 000–19 999	20.3	24.1	
20 000–39 999	10.9	16.3	
> 40 000	12.5	9.7	
Don't know or refused	38.4	34.7	
Self-perceived health status			
Excellent, very good, or good	49.7	38.4	.02
Fair, poor, or don't know	50.3	61.6	
Had a particular place for health care	61.3	55.9	.22
Had a personal doctor	71.2	69.1	.64
Personal doctor was Vietnamese <sup>c</sup>	90.8	92.8	.46

<sup>a</sup>P values are from generalized estimating equation models that account for clustering of participants by lay health workers.

<sup>b</sup>Equal numbers of men and women by design.

<sup>c</sup>Among those who had a personal doctor.

innovators, or change agents, to introduce a new behavior, namely, CRC screening. Shared common characteristics, such as language, culture, age group, and geographical residential area, between the participants and LHWs were the connectors for the LHWs to influence the participants' behavior.

Follow-up services through telephone calls and visits to remind the participants to get CRC screening reinforced the efforts made at the educational sessions. Navigation services, such as providing referrals to low-cost or no-cost CRC screening, making appointments, and accompanying participants to appointments, are practical supports enabling participants to overcome barriers to obtain screening. These factors and services may have contributed to the intervention's effectiveness. However, we did not assess how these individual factors influenced the intervention outcomes, and future research should examine the mechanisms through which such LHW outreach components increase cancer screening.

There are several limitations to this study. First, the study results may not be generalized to all Vietnamese Americans in the United States, because the study area was only a single urban area with a high concentration of Vietnamese Americans.

Second, there was the potential for contamination between the intervention and control group. For example, intervention members may have shared CRC screening information with control members during interactions in the community outside the educational sessions. However, if any such contamination occurred, it would have reduced only the intervention effect size.

Third, testing–observer (Hawthorne) effects (here, the effects of repeating the same question in the pre- and posttest surveys) may have affected respondents' answers in the posttest survey. However, testing–observer effects would influence participants in both study arms.

Fourth, there is a potential selection bias. Although the LHWs were randomized to study arms, the participants were informed of the topic of the educational sessions at recruitment and thus were not blinded. It is possible that intervention LHWs would be more likely to choose potential participants who were willing to get CRC screening and, similarly, that control LHWs would be more likely to pick potential participants who were more willing to eat more

**TABLE 2—Colorectal Cancer Screening Behavior, Knowledge, Perceived Susceptibility Attitudes, and Beliefs of Vietnamese American Participants by Study Arm: Santa Clara County, CA, 2008–2013**

Outcome	Intervention Group (n = 316)			Control Group (n = 311)			Intervention Minus Control Difference <sup>b</sup>
	Before Test, %	After Test, %	Difference <sup>a</sup>	Before Test, %	After Test, %	Difference <sup>a</sup>	
Reports ever having had CRC screening	0	56	NA	0	19	NA	37***
<b>Knowledge</b>							
Has heard of colon polyps	26	94	68***	27	46	19***	49***
Knows age to begin CRC screening	42	91	49***	39	60	21***	28***
<b>Perceived susceptibility attitudes</b>							
Worries about getting colon cancer	45	42	-3	42	53	11**	-14**
Ever thought might get colon cancer	28	54	26***	28	47	19***	7
Believes colon cancer can be cured if found early	86	99	13***	90	95	5*	8**

Note. CRC = colorectal cancer; NA = not analyzed. *P* values are from generalized estimating equation models that account for clustering of participants by lay health workers.

<sup>a</sup>*P* value for difference between pre- and posttest.

<sup>b</sup>*P* value for difference between study arms with respect to posttest (self-reported behavior) and pre-post change (all other outcomes).

\**P* < .05; \*\**P* < .01; \*\*\**P* < .001.

servings of fruits and vegetables and to be more physically active.

However, both the intervention and control participants started out at baseline with low levels of knowledge of CRC screening and had never had CRC screening because this was one of the study enrollment eligibility criteria. In fact, the LHWs reported that finding participants who met this “no prior CRC screening” criterion was their greatest challenge in recruitment. Having had CRC screening was the major reason for ineligibility for participants’ enrollment in the study (95% of ineligible participants). Furthermore, the intervention and control groups were very comparable in demographic characteristics as well as in knowledge, attitudes, and belief at the pretest survey. However, there may still be some unmeasured bias. This limitation could be avoided by informing the LHWs of their randomization status and training them on the subject of the educational session only after they recruited their participants.

Fifth, the intervention group might have been susceptible to social desirability bias. We did not validate screening status with medical records review but relied solely on self-report in both arms. Therefore, the proportion screened may be an overestimate of true screening rates.

Strengths of this study include the high participation and retention rates and the formative research processes. In addition, the

study contributes significantly to the LHW literature because it is a cluster randomized controlled trial including both women and men. Although our previous LHW studies concerned breast and cervical cancer in women,<sup>7,8</sup> this study shows that LHW outreach is effective for promoting CRC screening as well and that it works well for Vietnamese American men as well as women.

The robustness of the LHW intervention effect on 3 different cancer screening recommendations and for both genders suggests that LHW outreach might be productively disseminated to other geographic areas with large concentrations of Vietnamese Americans and potentially to other disease and risk factor outcomes. The literature on the effectiveness of LHW outreach on CRC screening in other ethnicities is mixed.<sup>25,29–31</sup> More randomized controlled trials are needed to test the effectiveness of LHW outreach for other populations and other health outcomes. ■

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#### Contributors

B. H. Nguyen originated the study, supervised all aspects of its implementation, and led the writing. S. L. Stewart led the analysis and assisted with study design and drafting the content. T. T. Nguyen assisted with analysis and interpretation of data. N. Bui-Tong assisted with conceptualization of the study and interpretation of data. S. J. McPhee assisted with study design and revised the content. All authors contributed substantially to the conceptualization and design or analysis and interpretation of data, the drafting or revision of the article, and the approval of the final version.

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#### Human Participant Protection

The institutional review boards of the Cancer Prevention Institute of California and the University of California, San Francisco approved the research protocol.

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