Journal of Community Health (2019) 44:921–931
https://doi.org/10.1007/s10900-019-00635-8

ORIGINAL PAPER

Addressing Tobacco Use in Underserved Communities Through a Peer-Facilitated Smoking Cessation Program

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Published online: 6 March 2019

Abstract
Communities Engaged and Advocating for a Smoke-Free Environment (CEASE) is a long-standing research partnership between a university and the neighboring community that was established to reduce tobacco use among poor and underserved residents. The CEASE tobacco cessation program was implemented in four phases, with each new phase applying lessons learned from the previous phases to improve outcomes. This study describes CEASE's community-based approach and reports results from implementing the second phase of the intervention which, among other things, varied in the type of incentives, setting, and providers used. CEASE implemented a mixed-methods study following the Community-Based Participatory Research (CBPR) approach. During Phase II, a total of 398 smokers were recruited into two 12-session group counseling interventions facilitated by trained peers in community venues, which differed in the type of incentives used to increase participation and reward the achievement of milestones. At 12-week follow-up, 21% of all participants reported not smoking, with a retention rate (i.e., attendance at six or more of the 12 cessation classes offered) of 51.9%. No significant differences in cessation outcomes were found between the two study arms. Using a CBPR approach resulted in a peer-led model of care with improved outcomes compared to Phase I, which was provided by clinicians. The combined use of monetary and non-monetary incentives was helpful in increasing participation in the program but did not significantly impact smoking cessation. A CBPR approach can increase the acceptability and effectiveness of cessation services for underserved populations.

Keywords Smoking cessation · CBPR · Peer-based approach · Underserved population

Introduction

For many years it has been known that smoking tobacco is very detrimental to health, making tobacco the most significant cause of preventable death in the U.S. and around the world [1, 2]. Regular tobacco use leads to a strong and multifaceted nicotine addiction with biological, psychological and social dimensions that make it very difficult for smokers to quit [3–5]. Poor and underserved populations are disproportionately burdened by smoking and its devastating effects on health. The prevalence of tobacco use is highest among people with the lowest educational attainment, lowest income and worst insurance coverage. These same poor and underserved populations also find it the most difficult to quit smoking [1, 6–8].

A variety of interventions have been and are being implemented across the country to address the tobacco problem. However, few of these interventions have focused on the populations most in need [6, 9, 10]. Relatively little research

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on tobacco control has involved the affected communities in planning and implementing these interventions or incorporating feedback to modify and improve cessation programs. Some of these interventions have been conducted in clinical settings according to prescribed guidelines. But the challenges of clinic-based interventions include high cost, limited access by smokers due to clinic regulations and intake requirements, the mistrust that many smokers have of medical personnel (most of whom have never smoked), and a lack of connection to community assets outside of the clinics [11]. Because of these challenges, clinic-based smoking cessation interventions suffer from poor recruitment, high dropout rates and limited outcomes [12, 13].

Community-Based Participatory Research (CBPR) is a paradigm that involves the community in every aspect of the research process from conception to completion and evaluation. In CBPR, interventions are based in the community and researchers and community members form equal partnerships to analyze and solve community health problems [14–16]. The study reported here is based on a CBPR initiative called Communities Engaged and Advocating for a Smoke-Free Environment (CEASE). CEASE is a partnership between health researchers from an Historically Black Colleges and Universities (HBCU) and two low-income inner-city neighborhoods who have committed to help smokers quit and thereby reduce tobacco-related health disparities [12]. The CEASE cessation intervention was initially delivered in a community health center by healthcare providers (Phase I). Based on evaluation and feedback from participants, CEASE evolved into a community-based intervention led by trained Peer Motivators (Phase II). This paper reports the process and outcome evaluations from the Phase II peer-facilitated community-based intervention. The benefits and challenges of using a peer-led model for conducting smoking cessation interventions in community venues are also discussed.

Methods

Study Design

This study used a mixed-methods experimental research design to assess the effectiveness of a peer-facilitated smoking cessation intervention implemented in community venues. Quantitative findings from the experimental cessation approach are integrated and presented alongside the qualitative findings from key informant interviews and focus group discussions.

Study Participants

A total of 389 participants were recruited from 2011 to 2012 into smoking cessation group counseling sessions that used one of two incentive models—monetary only or monetary plus non-monetary (see Table 1). At first, participants were randomly assigned to one of the two arms, but later, for logistical and other reasons, participants were allowed to self-select their groups. In Group A, participants received peer-led group counseling (including sessions devoted to

Table 1 A comparison of the incentive plans for Groups A and B

Activity/Condition	Group A	Group B
Participate in Group B	N/A	150 points
Attend each group session in Module I	$10.00	$10.00 plus 100 points/session
Set a quit date	$10.00	$10.00 plus 100 points
Quit for 1 week	$10.00	$10.00 plus 100 points plus a certificate
Attend mandatory sessions in Module II (1, 3 and 5)	$10.00 / session	$10.00 plus 100 points/session
Quit for 1 month	$25.00	$25.00 plus 250 points plus a certificate
Attend voluntary sessions in Module II (2, 4, and 6)	N/A	250 points/session
Attend at least 8 sessions	N/A	250 points plus a certificate
Attend follow-up sessions	$25.00 / session	$25.00 plus 250 points/session
Stay quit for 3 months	N/A	750 points plus a certificate
Stay quit for 6 months	N/A	1500 points plus a trophy
Refer other smokers to the program	$10.00 per person enrolled	$10.00 plus 500 points per person enrolled
Join the CEASE partnership	N/A	500 points

motivational enhancement, smoking cessation and relapse prevention), Nicotine Replacement Therapy (NRT) and monetary incentives. In this arm, participants were offered the free Maryland Quitline services, where they could receive additional telephone counseling and NRT. In Group B, participants received peer-led group counseling, monetary and non-monetary incentives, and were provided NRT on site.

Qualitative assessment included four in-depth interviews with Community Site Coordinators (i.e., the contact persons for every community venue), five focus group discussions with participants (total n = 31), and one focus group with all seven Peer Motivators who had led cessation classes. The goals of the qualitative assessment were to better understand the implementation process and to identify both the positive and negative factors associated with quitting.

All participants were 18 years and older and smoked regularly, defined as having smoked at least 100 cigarettes in one's lifetime and currently smoking every day [17]. Participants who were using tobacco products other than cigarettes, or who were recruited but did not show up for any of the sessions were excluded from the study.

Intervention

Seven residents of the target community were selected, trained and certified to serve as the study's Peer Motivators. These individuals were ex-smokers who had remained smoke-free for at least 12 months. They attended a two-day workshop that included training on using the American Cancer Society's (ACS) Freshstart smoking cessation curriculum [18], conducting brief motivational enhancement interviewing, and facilitating group processes. Peer Motivators were responsible for recruiting and enrolling participants, identifying community venues where the smoking cessation classes could be held and formalizing relationships with these venues through signed memoranda of agreement (each venue identified a Community Site Coordinator who served as the point of contact). Peer Motivators also conducted the counseling sessions. To prevent conflicts of interest, Peer Motivators were assigned to groups of participants with whom they had no previous relationships. They were provided a discussion guide that helped them to cover assigned topics and, where necessary, to probe important details that would prompt open conversation.

A Community Action Board (CAB) with representation from different community stakeholders (e.g., non-profit organizations, faith-based organizations, healthcare centers) oversaw the research design, implementation, and dissemination process. In addition, CAB members helped to build relationships with community-based partners and to recruit participants through referrals, word-of-mouth, pamphlets, flyers and marketing materials. The cessation classes were conducted in community venues including non-profit organizations, churches and schools.

Participating community sites hosted two types of intervention using monetary incentives only (Group A) or monetary plus non-monetary incentives (Group B). Contingency Management Theory, devised for reinforcing behavior change in work places and other settings, guided the planning of incentives [19–21]. In addition to the same monetary incentives received by Group A, Group B participants received points for: participating in each session; achieving milestones; joining the CEASE Partnership; and referring other smokers to the program. Group B participants also received certificates for quitting (i.e., being smoke free for one week, one month, three months, six months) and attending eight sessions. After accumulating 1500 points, Group B participants were given the honorary title of "Seeker"; after accumulating 3000 points, they received the honorary title of "Champion".

Weekly sessions of about 90 min to 2 h each were held for a total of 12 weeks; with a maximum of 15 participants per class. Phase II started with a two-week motivation enhancement module to improve participants' desire and preparation for quitting. Materials for this module were selected from evidence-based brief interventions and motivational enhancement techniques. The Freshstart curriculum was used for four weeks in the second module, followed by a six-week module for relapse prevention. Relapse prevention classes were facilitated with a semi-structured agenda designed to allow participants to support each other as they shared their positive and negative experiences. Participants were followed-up at three months after their last session to ascertain their smoking status. Focus group discussions were held with participants after completion of the program's follow-up.

Data Collection

A baseline questionnaire was developed to capture information on participant demographics, smoking history, barriers faced in previous quit attempts (e.g. stress, lack of support, withdrawal and cravings, weight gain, etc.), stages of change as defined by the transtheoretical model of behavior change [22], and other variables related to health problems. At the completion of each class an exit form was used to record information on smoking status, barriers to quitting and aids for success (i.e., motivators for quitting). Follow-up questionnaires similar to the exit forms captured information on smoking cessation and barriers to quitting after completion of all classes. Several attempts were made to reach participants to complete the follow-up survey. For the qualitative assessment, a semi-structured questionnaire was developed by the lead researcher and finalized after discussion with and consensus of the research team and the CAB. The

questionnaire was then adapted to collect experiences and perceptions from Peer Motivators, CEASE participants who completed the program and those who did not, and Community Site Coordinators.

Measures

The primary outcome for this study was smoking status at 12-week follow-up. Participants were said to have "quit" or "not quit" based on self-reported smoking abstinence (did not smoke in the past seven days), verified by expired-air carbon monoxide (CO) levels of seven parts per million (ppm) and below [23, 24]. Another outcome of interest was retention in the program which was defined as attending six or more of the 12 classes.

Other recorded variables included sociodemographic characteristics (race/ethnicity, age and gender), employment status, place of residence and educational attainment. Participants' ages were captured as a continuous variable and later categorized into above the median age of 49 years old and below the median age. A Fagerstrom Nicotine Dependency Test ranging from 0 to 10 (lowest to highest nicotine dependence) was used at baseline [25]. Fagerstrom scores were dichotomized at the median score of three. Variables capturing behavioral health problems including anxiety or depression, alcohol abuse, drug abuse or dependence were based on medical history (i.e., participants reported if they had ever been diagnosed by a doctor as having any of the listed problems). The "intervention arm" variable was based on participation in Group A or B.

In the qualitative assessment, the semi-structured questionnaire for Peer Motivators included items to capture: experiences with CEASE; perceptions of the curriculum and program logistics; assessed impact of CEASE interventions; program challenges; and recommendations for improvement. The questionnaire for CEASE participants included items that addressed: participants' backgrounds and reasons for quitting; how they were recruited to the program; their experience with CEASE and group counseling; challenges; and recommendations for improvement. The Community Site Coordinator questionnaire included items to assess: experience with coordination and program logistics; the quality of their organization's relationship with CEASE; challenges; and recommendations for improvement.

Data Analysis

Data from the questionnaires were entered into Epidata 3.1 [26] and exported to Stata 11 [27] for analyses. The two study arms were compared at baseline using Chi square tests of independence for categorical characteristics and t-tests of differences in group means for quantitative characteristics. Multivariate logistic regression modeling was used to compare the primary and secondary outcomes (quitting and retention) in both intervention arms while adjusting for other covariates. Variables were included in the multivariable model based on their correlation with smoking cessation in the bivariate analyses or in prior research. Participants for whom 12-week follow-up information about quit status was not available were assumed to have continued or relapsed to smoking, and were classified as "did not quit." To test the validity of this assumption, statistical analyses were rerun excluding the missing data.

All focus group discussions and individual in-depth interviews were audio recorded and transcribed. Coding was done using Atlas.ti 6.1 [28]. The initial codebook for analysis was developed and structured according to the questionnaires used in the study. Each transcript was coded separately by two researchers and then cross-checked to verify analysis and form a consensus of the coding for every transcript. Each interview group (CEASE participants, Peer Motivators and Community Site Coordinators) was analyzed separately for emergent themes. Coded transcripts were assessed until no significant new information emerged and the investigators considered the analysis to be saturated.

Ethical Considerations

The proposal for this research, including the methods and instruments for each component, was approved by Morgan State University's Institutional Review Board (IRB) and the CEASE Community Action Board. All participants signed informed consent forms before being enrolled in the study.

Results

Quantitative

The current study presents data for 389 participants out of the 398 originally recruited into the Phase II intervention. Nine participants who were recruited did not enroll in either arm, and were therefore excluded from the data analysis. Participants, whose mean age was 47 years (SD = 10.7), included 40.8% females, 55.5% African Americans, 9.5% Whites and 35.0% other races. A total of 34.4% of these participants had not graduated from high school, and 80.6% of them were unemployed. Table 2 compares the baseline characteristics for the study participants in both intervention arms. Participants in arms A and B were not statistically different in age, race/ethnicity, education, employment, place of residence, health problems or Fagerstrom scores. There were, however, significantly more females enrolled in arm B (46.6%) than in arm A (35.9%) with a P value of 0.034.

In this study, smoking cessation in intervention arm A was 18.8% while in arm B it was 25.0%. This difference

Table 2 Bivariate analyses comparing participants in the two intervention arms

Variable	Group A (N = 213) n (column %)	Group B (N = 176) n (column %)	All (N = 389) n (column %)	p value
Age				
Mean (SD)	47.7 (10.7)	46.9 (10.7)	47.4 (10.7)	0.59
Gender				
Female	74 (35.9)	82 (46.6)	156 (40.8)	
Male	132 (64.1)	94 (53.4)	226 (59.2)	0.034
Race/ethnicity				
African American	127 (59.6)	89 (50.6)	216 (55.5)	
Non-Hispanic White	21 (9.9)	16 (9.1)	37 (9.5)	
Other	65 (30.5)	71 (40.3)	136 (35.0)	0.13
Education				
Some high school or less	51 (33.8)	38 (35.2)	89 (34.4)	
Graduated from high school	100 (66.2)	70 (64.8)	170 (65.6)	0.81
Employment				
Employed (full-time or part-time)	22 (16.5)	22 (23.4)	44 (19.4)	
Unemployed	111 (83.5)	72 (76.6)	183 (80.6)	0.20
Resident of Southwest Baltimore				
Yes	94 (62.7)	65 (60.7)	159 (61.9)	
No	56 (37.3)	42 (39.3)	98 (38.1)	0.76
Behavioral health problems				
Anxiety/depression	84 (63.2)	52 (57.1)	136 (60.7)	0.37
Alcohol abuse/dependence	32 (25.6)	19 (21.6)	51 (23.9)	0.50
Drug addiction/abuse/dependence	50 (38.5)	35 (36.8)	85 (37.8)	0.81
Fagerstrom score				
Mean (SD)	3.2 (2.7)	2.8 (2.7)	3.0 (2.7)	0.11
Retention				
Yes (attended ≥ 6 sessions)	99 (46.5)	103 (58.5)	202 (51.9)	
No (attended ≤ 6 sessions)	114 (53.5)	73 (41.5)	187 (48.1)	0.018

n and column percentages presented for categorical variables

Mean and standard deviation presented for continuous variables

Group A monetary incentives only; *Group B* monetary + point-based incentive*s*

was not statistically significant ($p = 0.138$). However, Group B participants had a significantly higher retention rate of 58.5%, compared to Group A at 46.5% ($p < 0.05$).

Table 3 provides the results of multivariable logistic regression analyses showing factors that predicted quitting while adjusting for potential confounders. Being older (age above the median of 49 years) was significantly associated with lower odds of quitting [OR (95% CI) of 0.4 (0.1–0.9)]. Greater nicotine dependence (i.e., a Fagerstrom score higher than 3) was also significantly associated with lower odds of quitting after controlling for all other variables [OR (95% CI) of 0.3 (0.1–0.8)]. Greater retention (attending six or more of the 12 classes) was significantly associated with higher odds of quitting [OR (95% CI) of 10.1 (3.5–29.2)]. Study arm, gender, race, education, employment, place of residence, anxiety/depression, alcohol dependence and drug abuse were not found to be significantly associated with the odds of quitting.

Qualitative

Participants

A total of 31 participants participated in five focus groups. Most of them were low-income African Americans with long histories of regular smoking. Qualitative analysis revealed four main categories with several subthemes in each category. The main categories were: (1) smoking experience prior to attending CEASE classes; (2) the process of joining the program; (3) overall experience with cessation classes; and (4) overall impact of the program on participants.

Table 3 Multivariable logistic regression analyses of factors predicting quitting

Variables	Quit n (%)	Did not quit n (%)	Unadjusted OR (95% CI)	Adjusted[a] OR (95% CI)	Adjusted[b] OR (95% CI)
Arm					
A	40 (18.8)	173 (81.2)	Ref		
B	44 (25.0)	132 (75.0)	1.4 (0.9–2.3)	0.9 (0.5–1.6)	0.8 (0.3–1.9)
Age[c]					
≤ 49 years	29 (21.3)	107 (78.7)	Ref		
> 49 years	22 (17.3)	105 (82.7)	0.8 (0.4–1.4)	0.8 (0.4–1.5)	0.4 (0.1–0.9)
Fagerstrom					
≤ 3	56 (25.8)	161 (74.2)	Ref		
> 3	28 (16.3)	144 (83.7)	0.6 (0.3–0.9)	0.6 (0.3-1.0)	0.3 (0.1–0.8)
Retention					
No (attended ≤ 6 sessions)	14 (7.5)	173 (92.5)	Ref		
Yes (attended ≥ 6 sessions)	70 (34.7)	132 (65.3)	6.6 (3.5–12.1)	8.4 (3.9–18.4)	10.1 (3.5–29.2)

[a]Adjusted for age and gender (age was adjusted for gender only)

[b]Adjusted for gender, race, education, employment, residency and behavioral health problems (anxiety/depression, alcohol abuse, drug abuse)

[c]Age and Fagerstrom score were dichotomized at 49 and 3, the respective medians for these variables

Participants in these focus groups were mostly heavy, chronic smokers, typified by a 53-year-old African American who said: "I been smoking for about 40 years, probably about since I was about 13 years old." Participants offered various reasons why they had started smoking. One common reason was stress. As highlighted by one participant: "I do a lot of things, I work for myself, I got a lot of stress. Sometimes when I complete a task, I reward myself with a cigarette." Regarding the process of joining the program, most participants said that they had heard about CEASE through a personal contact: "Through a friend of mine … she had told me about it, and I started coming to the group." Participants provided a variety of reasons for wanting to quit smoking, most of which centered on their health, family and finances: "I needed the program myself 'cause I was in bad shape at that time with my lungs…" "My incentive was that I have a 13-year-old that could not stand the smoke and would always make comments about the smoke." "I smoke like half a pack a day. That's $6 a day, that's like $50 a week, $200 a month—that's a lot of money. When you add that up, that makes you wanna stop." Focus group participants reported their quitting experience during the program in terms of reduction, relapse or complete cessation. Some participants quit gradually by reducing the number of cigarettes they smoked per day; a few of them simply quit; others quit initially, but then relapsed.

Participants discussed their mixed experiences with the various quit aids used in the program. "The gum did not give me much help; the patches did and I bought the lozenges also and they helped me." They highlighted challenges that hindered their ability to quit such as socializing with other people who smoke: "When I'm around people that start smoking, the 'Jones' start to kick in, the urge starts coming in and if I don't leave I am going to ask for one." In general, participants found the curriculum to be helpful and informative. They found the use of visual aids, information about the ingredients in cigarettes, learning about smoking alternatives and insights into triggers for smoking to be particularly helpful. "The film that a facilitator showed us helped. Seeing the inside of the organs all messed up, stuff like that, that helped me pretty good." "Once I've seen what was inside of the cigarette… I slowed down."

Participants also discussed the program's impact on lifestyle and how it stimulated them to make other behavioral changes: "So it helps me a lot… I can walk a little longer distance, I breathe better." Most participants agreed that being in a group was instrumental in helping them stay in the program and feel like they were not alone. According to one participant: "Seems like when you get around people that are struggling with the same thing it's kind of a big help." Participants agreed that the incentives encouraged them to continue coming to the classes. The cash rewards, points and certificates were praised as boosting their morale and increasing their motivation: "Yeah like someone else said, it might be the money at first, then you realize you care about your health and noticed it and start making some kind of change."

Peer Motivators

All seven Peer Motivators who had led cessation classes participated in one focus group discussion. Overall, the Peer Motivators described their experiences as positive and rewarding. All of them expressed "real joy" in having an

opportunity to be part of someone else's quitting experience. They found satisfaction in helping participants achieve their goals through education and encouragement. As one Peer Motivator put it: "What I like about CEASE… is that I am helping somebody and for some people you are helping them save their lives, and that's really important…" They also mentioned the benefits of acquiring new knowledge about the harmful effects of smoking: "Being a facilitator, I'm also learning more about the dangers of cigarette smoking. And, it actually really does help me in my own resolve to stay quit." However, Peer Motivators expressed frustration about not being able to continue supporting participants after the program ended.

Peer Motivators recognized that many factors in the participants' social and physical environments, including drug addiction, mental illness, homelessness and unemployment, interacted with their experiences in the cessation program. Peer Motivators felt that they lacked the tools and the capacity to help the participants deal with these additional issues. "They're just venting about what's been going on in their lives and there's not enough time in the session, even with 90 min… So we had talked about having like outside support and bringing in other resources and stuff like that." Some Peer Motivators expressed frustration over the fact that some participants did not quit smoking, or attended the classes only to get the incentives. "Not everybody quit and it felt like I did not do my job and I just want everybody to quit and I just get upset when someone is still struggling…." Despite this, Peer Motivators noted that while some participants came initially only because of the cash incentives, they ended up becoming genuinely interested and eventually quitting.

In general, Peer Motivators found the curriculum easy to use and appropriate for their participants. However, they felt that the curriculum was not comprehensive and could be improved: "I actually think it's a really decent foundation of what the participants are looking for. But for me it's more of a bare bone, it's not complete." On the other hand, some Peer Motivators took advantage of the "incomplete" curriculum to be creative and tailor their activities to the needs of their groups: "I find it to be good. I like it because we can add to it, without taking anything away from the curriculum." They talked about the need to improve training resources including visual aids. "…but I also wish we had like more of a visual that we could show the people, like the damages that cigarette smoke can cause people."

Among the logistical challenges they faced, the lack of a CEASE central venue that could provide stability for the program was reported as a critical issue. Sometimes, due to unforeseen circumstances, groups were displaced from their regular meeting spaces in community venues. Peer Motivators also expressed their insecurity when groups sometimes got "out of control." All Peer Motivators praised the CBPR aspects of the program including interactions with the CEASE leadership, opportunities to participate in other CEASE activities, and their experiences of personal capacity building. But some said that the program could be improved by clarifying each person's role and responsibilities.

Community Site Coordinators

Four individual in-depth interviews were conducted with Community Site Coordinators from the program's community venues. All Community Site Coordinators saw the CEASE program as providing a much needed opportunity for their communities to become and stay healthier. They saw the program as an enviable asset: "It's so popular now that other houses and other substance abuse clinics are trying to copy what you are doing. Other places say they would love to have the CEASE program where they are." One Coordinator said "Families are starting to talk about how the addiction is changing the dynamics of their family and the family system. Now the children are happy because they see that there may be some longevity for their parents and grandparents." Some Coordinators, however, reported feeling generally excluded from the process because of poor communication and little access to information about the progress of participants at their sites. "I think at the end of the program, I didn't even know the number of people that were signing up in the program. I didn't know how many people finished, how many dropped out. I heard that the program was a success, but I didn't have any hard numbers to show that it was successful." Not having a single, identified point person with whom to communicate was a source of confusion and frustration for some Community Site Coordinators. Some Coordinators felt their agency's partnership with CEASE was mutually beneficial, but some felt it was one-sided for the benefit of CEASE: "It's a little strenuous on the organization because they are using the space for no money, so that kind of limits income and we could use income."

While discussing their experiences with the CEASE program, participants, Peer Motivators and Community Site Coordinators made recommendations for improvements based on the perspectives of their specific roles. These recommendations focused on program length and logistics, group formats, curriculum contents and communications. The recommendations are summarized in Table 4.

Discussion

This study found no statistically significant differences in smoking cessation outcomes between intervention arms A and B. Group B participants, however, had a significantly higher retention rate compared to Group A. The addition

Table 4 Summary of recommendations from qualitative research

Peer Motivators	Community Site Coordinators	CEASE participants
Add more visual aids/tools to the curriculum	Designate a single point of contact between each site and the CEASE program	Add more visual, hands-on materials to the curriculum
Include additional topics in the curriculum	Share program information	Use CEASE graduates as volunteers in the next round of classes
Develop a Best Practices guide	Define the role of the Community Site Coordinators	Limit the number of participants in each group
Provide resources to connect with additional outside support	Invite Community Site Coordinators to serve on the CAB	Incorporate gender-specific breakout sessions into the program
Assign security personnel to each group		Modify the program schedule to include flexible class times and/or session lengths
Replicate or expand the CEASE program		Provide follow-up classes or continuing support for program graduates
Create a central office		Change the incentives to cash only
Keep track of participants and maintain participants' connectivity		

of a point system of incentives in Group B might have been responsible for participants staying longer in the program. Across both groups, the combined quit rate and retention in Phase II were 21.6% and 51.9% respectively. Lower nicotine dependence was found to be associated with increased odds of quitting, which is consistent with other studies [29]. In both Groups A and B, retention emerged as a strong predictor of quitting [OR (95% CI) of 10.1 (3.5–29.2)] while controlling for gender, race, education, employment, place of residence and health problems. However, as mentioned earlier, participation in Group B did not result in a significantly higher quit rate compared to Group A. This might be due to the confounding effects of unknown factors resulting from non-random group assignment of the participants.

In the qualitative assessment, some participants attributed their success in quitting to peer support, the use of NRT, the inclusion of visual aids and attending informative counseling sessions. In addition to the benefits of peer support, some Peer Motivators reported that incentives (both monetary and non-monetary) were an important factor in motivating participants to quit. Other studies have found peer and family support and the use of NRT to be predictors of smoking cessation [3, 29–32]. Incentives for participation and contingency management have been explored in prior research on smoking cessation [31]. Findings from these previous studies show that monetary incentives can motivate participants to accomplish short-term goals such as participating in a class and setting a quit date [33]. However, the research is inconclusive on using monetary incentives alone to achieve more complex and long-term goals [33]. Serious social, environmental and physical factors outside of these classes can negatively impact retention in the program. Problems such as drug addiction, mental illness, homelessness and unemployment can lead to dropping out, and the Peer Motivators did not have the ability or resources to address these complex issues. However, in a CBPR approach, powerful partnerships and effective utilization of local assets can address some of these problems. Several studies have shown the benefits of active community engagement on program retention and success [14, 16, 34–39].

Lessons learned from this study indicate that efforts to solve our country's smoking problem would be more powerful if they arise from our communities with support from peers who live and work there [40, 41]. This study adds on to the existing research on community level smoking cessation programs and programs targeted at underserved populations by including community engagement and involvement in an iterative process for improving outcomes [10, 42, 43]. The use of community venues and Peer Motivators increase peer support and provide community members with jobs and opportunities for capacity building. CBPR approaches increase community buy-in and engage more diverse partners than clinic-based approaches. Subsequent interventions can learn from and build on these experiences to improve the quality and effectiveness of interventions for health. It must be noted, however, that conducting CBPR is not easy and presents challenges as well as opportunities. Challenges included the logistics of planning and running classes, ensuring safety and security, maintaining high quality standards and managing communications among all the players. When these challenges were identified in the research reported here, measures were put in place to address them including establishing a central scheduling system, holding weekly staff meetings and making random visits to the participating venues. Despite these challenges, all partners agreed that their common goal of advancing toward smoke-free communities was maintained and the capacity to reach it was increased for all stakeholders during the course of the intervention.

Incentives also affect the outcome of interventions, as observed in this study. The role of incentives for smoking cessation, especially among underserved populations, has been documented in several studies, and comparisons of monetary versus non-monetary incentives have shown variable outcomes [19, 31, 32, 44, 45]. In this study, feedback from participants on the monetary-only incentives

used in the Phase I clinic-based classes led to the expanded incentives used in the community-based approaches. Cash incentives, recognition, certificates and rewards have been reported to be helpful in motivating participants and retaining them in the program [19, 33].

Input from various stakeholders and research partners, including the Peer Motivators and Site Coordinators in this study, helps to improve the quality and effectiveness of services. The feedback obtained from the research partners in the CEASE program led to improved and more effective services from the first phase to the second phase reported in this study. The input obtained in this study was similarly incorporated into the development of an improved third phase [36]. The process of obtaining feedback in community-based research is very important and should not be overlooked.

Study Limitations

As the study progressed the randomization of assignments to groups was broken and participants began to self-select into the two study arms mainly because of scheduling, logistical and ethical challenges. This is not unusual for CBPR interventions where there is often a trade-off between scientific rigor and the realities of community engagement. However, a review of Table 1, which compares the characteristics of participants in both intervention arms, shows no significant sociodemographic differences between the groups except for gender. Another study limitation was the high attrition rate (53%) at 12-week follow-up. This was largely because of some characteristics of the participants chosen for this intervention, including being clients of mental health clinics, being in drug recovery, not having permanent addresses and using inexpensive "prepaid" (i.e. disposable) cell phones. Every attempt was made to locate these participants through their families, friends and partnering organizations. Eventually, 47% of participants were contacted 12 weeks after their completion of the program, which is higher than what has been reported in some other studies [46]. To assess the potential impact of the missing data on the study's results, two hypothetical scenarios were tested and compared. In the first scenario, participants who had dropped out by 12 weeks post-program were excluded from the analysis. In the second scenario, it was assumed that participants who had dropped out by 12 weeks had not quit smoking. The multivariable logistic regressions that were run using both assumptions produced similar results. Although three months after their quit date might not be considered long enough to assume permanent smoking cessation, studies have documented a positive association between short-term (i.e., 1–3 months) and longer-term (6–12 months) smoke-free living [47–50].

Conclusion

A CBPR approach was used to assess the feasibility and impact of a community-based smoking cessation intervention. This intervention was informed by continuous engagement of and feedback from the community it served. The CBPR model may be most valuable for underserved populations because of its relevance and potential for growth and sustainability. However, this approach requires a strong partnership and long-term investment from diverse actors with complementary academic and community-based expertise.

Acknowledgements This research received financial support from the National Institute on Minority Health and Health Disparities (Grants R24MD000217 and R24MD002803), the National Institute on Drug Abuse (Grants DA012390 and DA019805), and Pfizer Inc. In addition, we acknowledge members of the CEASE partnership including the members of the Community Action Board, Peer Motivators, the staff, and other community partners and organizations that supported our planning and hosted CEASE programs.

Author Contributions All authors made substantial contributions to the project and development of this manuscript.

Compliance with Ethical Standards

Conflict of interest The Authors declare that there is no conflict of interest.

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