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Examining Smoking Cessation in a Community-Based Vs. Clinic-Based Intervention Using Community-Based Participatory Research

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Abstract

Background—Tobacco use remains a major public health problem in the U.S. disproportionately affecting underserved communities. The Communities Engaged and Advocating for a Smoke-free Environment (CEASE) initiative is an intervention to address the problem using a community-based participatory research (CBPR) approach.

Objective—This study compares quit rates in a peer-led community-based intervention with those achieved in a clinical setting.

Methods—The intervention consisted of three Phases. Phase I (n= 404) was a clinic-based trial comparing two types of counseling. Phase II (n= 398) and Phase III (n=163) interventions were conducted in community venues by trained Peer Motivators.

Results—Quit rates at 12-week follow-up increased from 9.4% in Phase I (clinic-based) to an average of 23.7% in Phases II and III combined (community-based). The main predictor of smoking cessation was delivery of services in community settings (OR=2.6, 95% CI=, 1.7–4.2) while controlling for possible confounders.

Conclusion—A community-based approach can significantly guide and improve effectiveness and acceptability of smoking cessation services designed for low-income urban populations. In addition, CBPR can result in better recruitment and retention of the participants.

Keywords

Smoking cessation; CBPR; Peer-based approach; low-income population

INTRODUCTION

Smoking cigarettes causes multiple chronic diseases including cardiovascular disease, emphysema, and 13 types of cancer. For many years smoking has been the leading preventable cause of death in the United States. The Healthy People initiative aims to reduce smoking rates among adults to less than 12.0% by 2020,¹ far less than the current national rate of 16.8%.² To achieve this goal and limit the physical, social and financial burdens of tobacco, effective and efficient methods to help smokers quit and prevent nonsmokers from starting must be identified and implemented.

Many smoking cessation interventions have been employed in the U.S., including counseling and support groups, cessation medications, quit-line services and more recently, the use of text messaging, web-based and social media interventions.³ However, few of these interventions focus on poor and underserved populations who are more significantly affected by smoking than their wealthier counterparts. Research shows that 22.9% of persons with less than a high school diploma smoke, compared to only 5.4% of those with a graduate degree; 26.3% of persons below the poverty level use tobacco, compared to 15.2% of those above the poverty line. Unfortunately, while poorer and less educated populations suffer from greater tobacco-related illnesses, they are also less likely to have health insurance.²

Baltimore City is one of 24 administrative regions and the largest city in the state of Maryland, with a population of about 622,000. Baltimore City's demographic profile shows that 63.1% of its population are African American, 27.7% of its residents have attained a bachelor's degree or higher, 12.8% have no health insurance, and 23.3% live in poverty.⁴ With a mortality rate 34% higher than the rest of Maryland, Baltimore City reflects the same health disparities that characterize other major urban areas in the US. Within Baltimore, people with only a high school education or GED have a lung cancer mortality rate that is 4.2 times higher than those with a college education or higher.⁵

Community-based Participatory Research (CBPR), based on equal partnerships with and continuous feedback from underserved communities, has proven to be a promising approach to reducing health disparities. Communities Engaged and Advocating for a Smoke-free Environment (CEASE) is a CBPR initiative designed to reduce tobacco use in low-income, underserved communities. The CEASE intervention in Baltimore has developed and improved through three phases based on continuous evaluation and feedback from the community it serves. In the first phase, cessation services were provided in a health clinic; in Phases II and III, services were provided in community venues. This study compares smoking cessation rates achieved in the clinic-based phase to those of the community-based

phases while adjusting for potential confounders. Additional lessons learned from implementation of the CEASE CBPR model are also discussed.

METHODS

Background and Setting

CEASE is a partnership between university-based public health researchers and two low-income communities of Baltimore City that aims to reduce the high prevalence of smoking through cessation and prevention interventions.⁶ The partnership has designed and implemented three phases of this intervention. In Phase I cessation classes were conducted at a community health center in the target community. In Phase II, classes were conducted in neighborhood venues of one community including churches, schools and other community organizations. Phase III was also conducted in neighborhood venues in two communities with similar profiles. The populations in the target communities are 75% African American; more than 40% of the households there earn less than \$25,000 a year. At the beginning of this intervention almost 70% of the men and 50% of the women over the age of 18 reported smoking regularly.⁷ In Phases II and III a peer-based group counseling approach was employed that evolved with feedback from community partners and the evaluation of prior phases.

Study Design and Participants

A total of 965 participants were enrolled in all three phases of the intervention. In Phase I (n=404), participants were randomly assigned to receive either individual counseling from a medical doctor, or group counseling facilitated by a nurse or social worker. In Phase II, trained Peer Motivators delivered the intervention to participants (n=398) in community settings. One arm in Phase II included only monetary incentives; the other arm combined monetary incentives with points and certificates for achieving milestones. Phase III was a dissemination and implementation observational study using a modified version of the Phase II curriculum. Phase III was implemented with a diverse group of participants (n=163) in settings including drug recovery centers, faith-based organizations and mental health facilities. At baseline, all participants were 18 years and older and were current smokers (defined as smoking at least three cigarettes per day in the past week). Participants who were recruited but did not show up for any of the sessions were excluded from the study.

The Phase I intervention for both the individual and group counseling arms consisted of: the American Cancer Society's four-week Fresh Start smoking cessation curriculum expanded to 12 weeks;⁸ access to nicotine replacement therapy (NRT) and/or prescription medications if indicated and desired; financial incentives for participating in classes and achieving specific milestones (e.g., setting a quit day, quitting for one week, quitting for one month, etc.) The intervention lasted 12 weeks and participants were followed for nine months after graduating from the program.

In Phase II, group counseling was conducted in community venues rather than a clinic and the groups were facilitated by trained Peer Motivators. This transition was based on initial analysis showing that group counseling was more cost-effective than individual counseling,

and that community venues were more comfortable and convenient for participants than a health clinic. Peer Motivators were selected based on criteria including living or working in the same community that they served, having at least a high school diploma or equivalent education, having quit their own tobacco habits and remaining smoke-free for at least one year. They were hired as CEASE employees and trained on the curriculum, in facilitating the classes and documenting activities. Peer Motivators were also responsible for recruiting smokers to the classes. The Phase II curriculum consisted of a six-week smoking cessation module (two weeks for preparation and motivation and four weeks for quitting), followed by a six-week relapse prevention module (three weekly sessions were required and three were optional). Graduates of the cessation classes were followed-up at three and six months after completion.

Most of the components of Phase II were retained in Phase III. However, new approaches and activities were added to make the intervention more flexible and attractive for the participants served. Phase III was implemented in recovery centers, mental health clinics and at organizations serving the homeless. Phase III's curriculum added a "toolbox" that allowed the Peer Motivators to tailor class content to meet individual participants' needs and readiness to quit smoking. Phase III consisted of six cessation classes and six optional relapse-prevention sessions, with follow-up at three and six months. The relapse prevention module included different tracks designed for self-improvement such as healthy eating, relationship and life skills, financial management and physical activities. Participants were able to choose which relapse prevention classes they attended.

Sampling and Recruitment

Participants were recruited through word of mouth, personal referrals, fliers, collaborations with community organizations and community surveys. Sites for the intervention were selected on the basis of relationships with community partners, accessibility to the target audience and the facility's willingness to support smoking cessation services.

Questionnaires

A baseline questionnaire was developed to capture information on demographics, physical and behavioral health, smoking history, barriers to quitting, stages of change and other variables. Participants completed an exit form at the end of each weekly class to document smoking status and provide information on motivators and barriers to quitting and aids for success. At three months and six months after the intervention, follow-up questionnaires similar to the exit forms captured information on smoking cessation and barriers to quitting.

Measures

The Fagerstrom Nicotine Dependency Test was used at baseline to assess participants' intensity of physical addiction to nicotine. Scores on the Fagerstrom Test range from 0 (low) to 10 (high dependence).¹⁰ Smoking status was assessed at completion of the smoking cessation program and at all regular follow-up visits. The primary outcome of interest for this study was smoking status at 12-week follow-up. Participants were categorized as "quit" or "didn't quit" based on self-reported smoking abstinence verified by expired-air carbon monoxide (CO) levels.⁹ Participants who did not complete the program and were not

available for follow-up testing were classified as “didn’t quit” in one scenario and as “missing,” in another scenario where they were excluded from the analysis. Socio-demographic characteristics including race, age, gender, employment status and educational attainment were also examined. Retention was defined as attending six or more of the 12 total smoking cessation and relapse prevention classes offered in each Phase. Participants were categorized as “not retained” if they attended fewer than six classes.

Statistical Analysis

Data were entered into EpiData version 3.1¹¹ without personal identifiers and exported into STATA 11¹² for cleaning and analysis. A descriptive univariate analysis was done to review each variable and summarize demographic information. A bivariate analysis was done to compare quit rates with potential predictor variables using chi-square tests of independence for categorical variables (phase, gender, race, education and employment status), and Student’s t-test for continuous variables (age and Fagerstrom score). A multivariate logistic regression model was used to compare the odds of quitting in Phase I (clinical setting) with Phases II and III combined (community settings). A second multivariate logistic regression model was used to compare the odds of quitting in Phase II with Phase III. Odds ratios and 95% confidence intervals are reported after adjusting for gender, age, race, education, employment status and Fagerstrom score. P-values of less than 0.05 were considered statistically significant.

Ethical Considerations

The proposals for each phase of this intervention were approved by Morgan State University’s Institutional Review Board (IRB) and the CEASE Community Action Board. Each participant signed an informed consent prior to being enrolled in the study. To avoid the potential risk of breach of confidentiality, participants were assigned unique identity numbers that were separated from the contact information for data analysis.

RESULTS

Data from a total of 965 individuals (404, 398 and 163 from Phases I, II and III, respectively) were used for this analysis. The total population consisted of 60.6% males, with a mean age of 46.5 years (standard deviation = 10.7 years). African Americans constituted 73.5% of the total study population; 37.5% of participants had not graduated from high school; 71.7% of the participants were unemployed at the time of the intervention. The mean Fagerstrom score for all participants was 4.1 (standard deviation = 2.7).

Table 1 shows the bivariate analysis of quit rates and potential predictors. Smoking cessation increased significantly from 9.4% in Phase I to 21.1% in Phase II, and 30.1% in Phase III. Older age (above 48 years), African American race, and having a lower level of nicotine dependence (lower Fagerstrom score) were all associated with higher quit rates. Gender, education and employment were not found to be significantly associated with smoking cessation.

Table 2 shows the association between quit rates and having the intervention in a community setting (Phases II and III) versus a clinical setting (Phase I). The community-based

intervention was associated with significantly higher quit rates, with an OR (95% CI) of 3.0 (2.0–4.4). After adjusting for gender and age, this association remained strong and significant with an OR (95% CI) of 3.1 (2.0–4.4). After further adjustments for race, education, employment and Fagerstrom score, the positive association between community-based intervention (Phases II and III) and quit rates remained statistically significant with an OR (95% CI) of 2.6 (1.7–4.2), while all other variables lost their significance.

Table 3 shows differences in the odds of quitting across the three phases of the intervention. Phases II and III were associated with higher odds compared to Phase I, with adjusted OR's of 2.1 (1.3–3.5) and 3.7 (2.1–6.3) respectively. The odds of quitting in Phase III significantly improved compared to Phase II (both were in community settings), with an adjusted OR (95% CI) of 1.7 (1.1–2.9).

Table 4 shows a bivariate logistic regression of retention and the odds of quitting smoking. In the unadjusted analysis, retention – defined as attending six or more sessions – was significantly associated with higher chances of quitting (OR [95% CI] of 7.3 [5.0–10.7]). After adjusting for the phase of intervention, results remained significant, with OR (95% CI) of 6.1 (4.0–9.3).

A second logistic regression was run after excluding participants categorized as “missing” – i.e., “no response at 12 weeks.” The results (not included in Table 4) still showed a significant association between retention and the odds of quitting with an unadjusted OR (95% CI) of 3.4 (2.3–5.1) and an adjusted OR (95%) of 2.3 (1.5–3.7).

DISCUSSION

This study compared success in quitting smoking achieved through a CBPR initiative that involved three phases. The study identified the intervention setting as one of the main factors associated with successful cessation. The odds of quitting increased significantly when the setting was moved from a health clinic to the community and the intervention was modified. Further analyses showed a significant improvement in smoking cessation even within the community setting as the intervention transitioned from Phase II to Phase III. Changes introduced in Phase III were based on feedback from participants, Peer Motivators, the Community Action Board and other stakeholders. These changes included: modifying the curriculum; revisiting the type and amount of incentives; changing the duration of the intervention and the timing of follow-ups; and changing the structure of the groups to ensure more peer support. The smoking cessation intervention evolved gradually through active involvement of the community at every step. This highlights the important role that community involvement plays in improving health services and achieving successful outcomes.^{17,18,22}

In their systematic review, Andrews et al. showed that CBPR is an effective approach for achieving smoking cessation.¹³ Their work highlights the value of engaging community stakeholders in planning, implementing and evaluating smoking cessation interventions. In their qualitative study, Wallen et al. solicited suggestions from smokers for designing cessation interventions that focused largely on the principles of community-based

interventions.¹⁴ In a randomized trial, Spencer et al. showed how community health workers supported and educated African American and Latino adults in the community to achieve improvement in Hemoglobin A1c values (an indicator of diabetes control).¹⁵ These studies and others show that participants are more comfortable in familiar community settings where they can access the intervention more easily, feel more involved in decision-making and are better able to establish trust with the researchers. These factors increase participation and retention. Community-based interventions are also less costly.^{16–20}

Other characteristics of the intervention changed as the services were moved into community settings. A key improvement was the use of former smokers as Peer Motivators to drive the intervention in the community. Participants were better able to identify with their peers in the community than with health professionals in the clinic, which increased compliance with the program. The curriculum also benefited from important adaptations between phases I, II and III, achieving a more tailored approach to meet the specific needs of the participants in a respectful and supportive environment.

This study also highlighted several challenges in conducting community-based interventions. These included: defining the community; involving partners in every step of the research; adhering to the ideal CBPR model; investing the time necessary for developing trust and nurturing partnerships; and navigating the complex IRB requirements for community interventions.¹³ Fortunately, CEASE benefited from the long-term community-campus partnership that started in 2002 and has been overseen by a strong Community Action Board comprised of community residents, leaders, and representatives of schools and faith-based organizations. The application for funding this study was jointly prepared by the partnership. Decisions were made and challenges were addressed through the collective wisdom of the CAB. As shown by the results, the benefits of transitioning smoking cessation interventions from clinic to community settings using a CBPR model outweigh the challenges and can significantly improve the outcomes.

Retention of participants increased significantly when this work moved to the community and this was an important factor in improving the quit rate. Other studies confirm the important role that retention plays in achieving health improvements.^{17,21}

In the unadjusted logistic regression of factors affecting the odds of quitting, White participants had lower odds of quitting than did African Americans. Participants with higher Fagerstrom scores (indicating greater nicotine addiction) were also less likely to quit smoking. After adjusting for all other factors in the model however, these associations were no longer significant. Likewise, no associations were found in this study between gender, age, education and employment status and smoking cessation although other studies have found associations between smoking cessation and these demographic factors.^{23–28}

The main limitation in this study was the unavailability of data for some participants at the 12-week follow-up period and beyond. This was addressed by applying the worst case scenario, i.e., assuming that all those with missing data did *not* quit smoking. When analyzed with and without this assumption the data yielded the same results although, as expected, with different strengths of association for each assumption.

The strengths of this study included a fairly large sample size and the fact that it was done in an underserved community where smoking prevalence is high and the need for services is great. In addition, the study retained the same group of researchers from inception through Phase III, thereby limiting variability.

CONCLUSION

This study showed that smoking cessation rates improved significantly when the intervention was moved from a health clinic to the community and adopted a CBPR approach. The main driver of improvement was increased retention of participants. Delivering the intervention in the community and using Peer Motivators as service providers increased participants' involvement and access to services. Modifying the incentives and improving the curriculum were based on community feedback. It is clear that providing cessation services in community settings and involving the community in every aspect of the intervention improves retention and achieves better smoking cessation outcomes.

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Table 1

Bivariate analyses of factors predicting quitting.

Variables	All n	Quit yes n (row %)	Quit no n (row %)	P value
Phases				
Phase I Trial	404	38 (9.4)	366 (90.6)	
Phase II Trial	398	84 (21.1)	314 (78.9)	
Phase III Trial	163	49 (30.1)	114 (69.9)	<0.001
Gender				
Female	366	65 (17.8)	301 (82.2)	
Male	562	99 (17.6)	463 (82.4)	0.955
Age				
Mean (SD)		48.8 (11.6)	46.1 (10.5)	0.0102
< 48 years	377	50 (13.3)	327 (86.7)	
> 48 years	409	78 (19.1)	331 (80.9)	0.028
Race				
Black	597	111 (18.6)	486 (81.4)	
White	147	16 (10.9)	131 (89.1)	
Other	68	5 (7.4)	63 (92.7)	0.009
Education				
Completed High school	491	86 (17.5)	405 (82.5)	
Less than High school	294	40 (13.6)	254 (86.4)	0.149
Employment				
Not employed	531	96 (18.1)	435 (81.9)	
Employed (full time/part time)	210	26 (12.4)	184 (87.6)	0.059
Fagerstrom				
mean (SD)		3.5 (2.7)	4.3 (2.6)	0.0009
<5	484	103 (21.3)	381 (78.7)	
>5	481	68 (14.1)	413 (85.9)	0.004

A chi-square test of independence was performed for categorical variables (phase, gender, race, education and employment). An independent-samples t-test was performed for continuous variables (age and Fagerstrom score)

Table 2

Multivariate logistic regression analyses of quit and factors predicting quit

Variables	Quit yes (%)	Quit no (%)	Unadjusted OR (95% CI)	Gender/age Adjusted* OR (95% CI)	all Adjusted** OR (95% CI)
Setting					
Clinical (n=404)	38 (9.4)	366 (90.6)	Ref		
Community (n=561)	133 (23.7)	428 (76.3)	3.0 (2.0–4.4)	3.1 (2.0–4.7)	2.6 (1.7–4.2)
Gender					
Female	65 (17.8)	301 (82.2)	Ref		
Male	99 (17.6)	463 (82.4)	1.0 (0.7–1.4)	1.0 (0.7–1.5)	1.1 (0.7–1.6)
Age ***					
< 48 years	50 (13.3)	327 (86.7)	Ref		
48 years	78 (19.1)	331 (80.9)	1.5 (1.0–2.3)	1.5 (1.0–2.3)	1.2 (0.8–1.9)
Race					
Black	111 (18.6)	486 (81.4)	Ref		
White	16 (10.9)	131 (89.1)	0.5 (0.3–0.9)	0.6 (0.3–1.1)	0.6 (0.3–1.2)
Others	5 (7.4)	63 (92.7)	0.3 (0.1–0.9)	0.4 (0.2–1.0)	0.6 (0.2–1.7)
Education					
Completed High school	86 (17.5)	405 (82.5)	Ref		
Less than High school	40 (13.6)	254 (86.4)	0.7 (0.5–1.1)	0.8 (0.5–1.2)	0.8 (0.5–1.2)
Employment					
Not employed	96 (18.1)	435 (81.9)	Ref		
Employed (full time/part time)	26 (12.4)	184 (87.6)	0.6 (0.4–1.0)	0.7 (0.4–1.1)	0.8 (0.5–1.3)
Fagerstrom ***					
< 5	103 (21.3)	381 (78.7)	Ref		

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Variables	Quit yes (%)	Quit no (%)	Unadjusted OR (95% CI)	Gender/age Adjusted* OR (95% CI)	all Adjusted** OR (95% CI)
5	68 (14.1)	413 (85.9)	0.6 (0.4–0.9)	0.7 (0.5–1.1)	0.7 (0.5–1.1)

* Adjusted for gender and age (gender and age were adjusted for only age and gender respectively)

** Adjusted for every other variable in the model (setting, gender, race, age, education, employment and Fagerstrom score)

*** Age and Fagerstrom score were dichotomized at 48 and 5, the respective medians for these variables.

Table 3

Logistic regression comparing Phases I, II, and III with odds of quitting.

Phases	Quit	
	Unadjusted OR (95% CI)	Adjusted* OR (95% CI)
Phase I (n=404)	Ref	
Phase II (n=398)	2.6 (1.7–3.9)	2.1 (1.3–3.5)
Phase III (n=163)	4.1 (2.6–6.6)	3.7 (2.1–6.3)
Phase II	Ref	
Phase III	1.6 (1.1–2.4)	1.7 (1.1–2.9)

* Adjusted for gender, race, age, education, employment and Fagerstrom score

Table 4

Logistic regression comparing odds of quitting to retention

Retention	Quit			
	yes (%)	no (%)	Unadjusted OR (95% CI)	Adjusted* OR (95% CI)
Not retained (n=223)	40 (17.9)	183 (82.1)	Ref	
Retained (n=300)	128 (42.7)	172 (57.3)	7.3 (5.0–10.7)	6.1 (4.0–9.3)

* Adjusted for phase