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Knowing Quitters Predicts Smoking Cessation in a Homeless Population

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Abstract

Objectives—To examine the impact of knowing quitters on cessation among homeless smokers.

Methods—Secondary analysis of data derived from a community-based randomized controlled trial of 430 homeless smokers. We conducted multivariable logistic regression analysis to determine whether knowing quitters impacted the likelihood of cessation (salivary cotinine 20 ng/ml) at 26-week follow-up.

Results—Multivariable logistic regression showed cessation was more likely for smokers who knew 5 quitters compared with those who knew no quitters (Odds Ratio = 3.79, CI = 1.17, 12.27, $p = .008$), adjusting for age, education, income, and time to first cigarette in morning.

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Human Subjects Statement: This study was approved by the Institutional Review Board (IRB code number: 0708M14444) at the University of Minnesota.

Conflict of Interest Statement: None of the authors had a conflict of interest associated with this study.

Conclusions—Knowing former smokers was associated with increased likelihood of achieving smoking abstinence among homeless smokers.

Keywords

smoking cessation; social influence; homeless population

Over the last 30 years, smoking prevalence and levels of consumption have decreased in the general population due to smoke-free ordinances, cigarette taxes, development of smoking cessation interventions, and tobacco industry legislation.¹ Smoking cessation ushers in numerous health benefits. These benefits, however, are not experienced equally by all US population subgroups. Increasingly, smoking in the United States is concentrated among low-SES groups, with 70% of smokers living below the 200% poverty level.² High smoking prevalence, high smoking levels, and low quit ratios persist in certain subpopulations of smokers. Smokers experiencing homelessness compose one such subgroup, with a strikingly high prevalence of smoking (70-80%),³ heavy smoking (mean CPD 25.8),⁴ and a low lifetime quit ratio of 9%, compared to 50% for the general population.⁵ An estimated 3.5 million Americans will experience homelessness annually. Nationally from 2008 to 2009 there was a 26% increase in the demand for homeless services.⁶

Higher smoking rates lead to disproportionate ischemic heart disease and respiratory disease morbidity, mortality, and burden. For homeless adults, the causes of death with the greatest measureable difference from mortality causes in the general population are smoking related (ischemic heart disease and respiratory diseases).⁷ Due to time living and sleeping outside, persons experiencing homelessness are already at increased risk for respiratory illnesses.⁸ Smoking compounds the risk of respiratory illness, worsens symptoms, and delays recovery. Increasing smoking cessation will decrease tobacco-related morbidity, suffering, and mortality in this underserved population.

Homeless persons face multiple barriers to accessing smoking cessation treatments.⁹ However, recent studies show that homeless smokers want to quit smoking and will enroll in and follow through with cessation programs with 6-month follow-up.^{4,5,10} One of the barriers to cessation is the acceptability of smoking around homeless shelters.¹¹ Given the pervasiveness of smoking and the communal living arrangements of homeless shelters, encouraging cessation through social modeling may be particularly effective.

Recent evidence highlights the importance of different types of social relationships—including distant social relationships—for smoking cessation. In the Framingham Heart Study, positive effects of cessation persisted over 3 degrees of separation within networks based on data from 12,067 participants over a 30-year period.¹² Networks of smokers quit together; results showed that odds of being a smoker decreased if smokers knew a social acquaintance who quit. The closer the acquaintance was (eg, spouse vs coworker), the greater the decrease in chances of remaining a smoker. Researchers have not examined the influence of social networks on cessation among homeless persons.

The purpose of this study was to examine whether knowing quitters was associated with cessation outcomes for homeless smokers (N = 430) enrolled in a community-based

randomized controlled trial with 26 weeks follow-up. We hypothesized that cessation would be more likely among participants who knew other people who had quit smoking in their social networks. Our hypothesis is based in social cognitive theory—the reciprocal dynamic between self-efficacy and social modeling to achieve behavior change.¹³ Knowing others who have quit smoking from the same social group provides the experience-near understanding that it is possible to quit smoking despite many challenges. *Experience-near understanding* is the deep familiarity with the worldview of another person. It is gained through social learning techniques such as observation, participant observation, or reflexive talk among members of a similar social group such as the homeless. This enables other smokers to imagine, realize, and achieve quitting. For homeless people facing many challenges in addition to quitting, such an understanding might be more salient to quitting. Results will extend recent evidence that smoking cessation occurs in social networks¹² to a subpopulation of rarely studied yet highly affected smokers.

Methods

Data were derived from a randomized controlled trial (RCT) conducted in collaboration with homeless-serving organizations providing emergency shelter and transitional housing in the Twin Cities area. In the first NIH-funded trial of this kind, the participants were enrolled and followed for 6 months by a community-based research team with mobility to operate the study from multiple shelters (Figure 1). Details of the parent study and a summary of the baseline variables predictive of cessation have been described elsewhere.¹⁰

Study Design

This study used a randomized, 2-group design with final follow-up at 26 weeks after randomization. Participants were recruited from 6 homeless emergency shelters and transitional housing sites in Minneapolis and St. Paul, Minnesota. Participants were randomized to either the intervention arm (nicotine replacement therapy [NRT] + motivational interviewing [MI]) or to the control arm (NRT + standard care counseling). All participants received 8 weeks of 21 mg nicotine patch. MI, a client-centered counseling technique, was administered to intervention-arm participants. In the control arm participants received one session of brief advice to quit based on a modification of the 5 A's (Ask, Advise, Assess, Affirm decision to quit, and Assist). A trained research team was responsible for scheduling and conducting all appointments and included community outreach workers—“community mobilizers”—individuals who had experienced homelessness either personally or via family. All staff was trained to demonstrate high levels of respect through politeness, patience, clear communication, and good listening during all contacts with shelter residents, staff members, and all study participants. They were further trained to be particularly mindful and respectful of the challenges of being homeless and of quitting smoking.

Surveys were administered in person at the homeless shelters. Shelters were compensated for recruitment and study activities. At each of the 15 visits participants received context-relevant incentives such as bus tokens, tote bags with the project logo, or a personal hygiene

kit. With input from the community advisory board, we chose incentives that were meaningful in the context of homeless persons' lives.

Study Sample

Participants were eligible if they were homeless,¹⁴ current cigarette smokers, age 18 years or older, willing to use nicotine patches for 8 weeks and to complete 15 total appointments (6 during NRT treatment, 8 retention contacts, and a final exit interview questionnaire) over the 26-week study period. *Current smoking* was defined as having smoked at least 100 cigarettes in their lifetime and every day in the prior 7 days. An exhaled carbon monoxide (CO) test was used to confirm smoking status (Table 1). Individuals with CO scores above 5 (parts per million) were included in the study, a criterion based on prior studies.¹⁵⁻¹⁷ Participants were determined to be homeless based on the definition established by the Stewart B. McKinney Act, passed by the US Congress in 1987. *Homelessness* was defined as “any individual who lacks a fixed, regular and adequate nighttime residence” or “one whose primary nighttime residence is a supervised publicly or privately operated shelter designed to provide temporary living accommodations, transitional housing, other supportive housing program or a public or private place not meant for human habitation (eg, on the streets or in abandoned buildings, tents, or automobiles).”¹⁸ It was assessed with 2 items, “Where did you sleep last night?” and “How long have you been staying there?” Eligible participants answered they stayed at an emergency overnight shelter, campsite, vehicle, abandoned building/house, parking garage or on the street, transitional or supportive housing, and long-term shelter and that they had been staying at the same place for less than 3 months.

Measures

Sociodemographics, homelessness experience, mental health and drug dependencies—Baseline assessment of demographic information included age, ethnicity, gender, income, education level achieved, marital status, and employment status, duration and number of episodes of homelessness.

Smoking behaviors—Smoking characteristics assessed included the current number of smoked cigarettes per day (CPD), age at which regular smoking began, amount of money spent on cigarettes per week, and whether cigarettes smoked were mentholated or non-mentholated. Nicotine dependence was assessed using one item from the Fagerström Test for Nicotine Dependence (FTND) scale: time to first cigarette of the day after waking (“How soon after you wake up do you smoke your first cigarette?”). Expired air carbon monoxide (< 5ppm) was assessed to confirm smoking status.¹⁶ Cessation was measured as cotinine-verified 7-day point prevalence abstinence.¹⁷

Number of people known in social network that have quit smoking—One item with 3 follow-up questions was used to assess knowing people who have quit. First participants were asked: “How many people do you know that have quit smoking?” Responses were divided into three categories: 0, 1-4, or ≥ 5. This is based on our prior research on social influence and quitting among homeless smokers.¹⁹

Analysis

Baseline variables were summarized using descriptive statistics. Percentages were used to summarize categorical variables whereas means and standard deviations were used to summarize continuous variables. Using intent-to-treat analysis, anyone lost to follow-up was considered still smoking. In univariate analysis, chi-square test or Fisher's exact test for categorical baseline variables and t-tests or ANOVA for continuous variables were used. Among the 428 participants with complete information on the social influence variable "Number of people known who have quit smoking," there were 106 participants with missing values for the week-26 cessation outcome. A chi-square test ($p = .478$) showed that missingness was not significant among the 3 groups of known quitters. Specifically, to examine the association between number of quitters known and cessation outcome, we used Fisher's exact test; and for the analysis of income and smoking cessation, we used chi-square test. A multivariate logistic regression model with variables selected for statistical significance from univariate analyses was used to examine the association between knowing quitters and smoking cessation outcomes. In the model we also controlled for the common predictors of cessation discerned from other prior studies: age, education, and nicotine dependence.

Results

Socio-demographic Characteristics

Of the 839 individuals screened, 430 participants were enrolled in the study; 428 completed the questions on number of quitters known. Of those enrolled, 324 (75.4%) participants returned for the 6-month follow-up. When divided into 3 groups based on the number of people known who had quit (0, 1-4, and 5 or more), the breakdown in terms of gender, ethnicity, education level, marital status, employment, smoking behaviors, type of housing, income, and FTND scores was not significantly different. For example, around 32% of each group had income levels of \$400 or greater. About 60% of each group slept in emergency shelters for most of the time in the last 6 months. The average number of cigarettes smoked per day in each group was 19.

In univariate analysis comparing multiple variables (demographics, homelessness, social influence) with smoking status at week 26, knowing 5 or more people who quit smoking increased the odds of smoking abstinence at week 26 compared to knowing no quitters ($p = .008$) (Table 2). At week 26, 32 participants were quit (7.4%). Of those who achieved smoking cessation, 4 knew no other quitters, 14 knew 1-4 other quitters, and 13 knew 5 or more other quitters. Comparisons among the 3 groups were not statistically significant with one exception: the number of known quitters at baseline was associated with cessation outcomes at 26 weeks.

Second, income was associated with quit status at week 26 ($p = .04$), with those earning more than \$400 a month more likely to quit than those receiving less than \$400 a month.

Different categories of knowing others who quit (0, 1-4, and 5+) were associated with varying proportions of abstinence (4.2, 5.9, and 13.5, respectively). Multivariable logistic regression was conducted using a model that included significant predictors from the

univariate analysis—knowing 5 or more people who quit and income—as well as age, education, and time to first cigarette of day (a measure of nicotine dependence). These variables were added to the model based on prior research on association with quitting. Results are shown in Table 3; participants who knew 5 or more people who had quit smoking compared to those who knew no quitters were nearly 3.8 times (95% CI = 1.17-12.27, $p = .008$) more likely to be abstinent from smoking at 26 weeks in the adjusted model, which was highly significant.

Discussion

In this study, we found that participants who knew 5 or more people who had quit smoking were over 3 times more likely to quit themselves. These findings suggest that knowing a number of quitters may be important for cessation by smokers experiencing homelessness. In prior trials conducted among related populations (eg, substance abuse treatment centers, inner-city low-income), significant predictors of cessation included age,^{20,21} ethnicity/race, income,²⁰ employment or student status,³ marital status,²² and gender.^{20,23} Other predictors included smoking behaviors such as fewer cigarettes per day at baseline or higher measures of nicotine dependence such as less time to first cigarette,^{24,25} and the strength of urges to smoke,²² or higher treatment doses for substance dependencies.²¹⁻²⁴ Psychosocial variables discerned as relevant include self-efficacy to quit,²² stage of change,²³⁻²⁵ and perceived control.²² In our study, a social network variable predicted cessation. Knowing quitters had a larger impact than demographic or socioeconomic variables usually determined predictive of cessation in other related low SES and marginalized populations of smokers. This effect existed even when controlling for other related predictive socio-demographic variables.

For homeless smokers, knowing people who have quit appears relevant to quitting. Guided by social cognitive theory, in which self-efficacy is believed to derive from modeling or socially observing certain behaviors,¹² we hypothesized that knowing people who had quit would be a significant influence on cessation outcomes. This resonates with another study of homeless smoking in which multivariable analysis showed that social support was associated with readiness to quit in the next 6 months (adjusted OR = 5.6, 95% CI = 1.0, 30.0, per point on a 10-point scale).³ Through social modeling of cessation or knowing quitters within their social networks, smokers gain an experienced understanding that it is possible to quit. Extreme social marginalization of homeless persons increases the reliance on their peers and informal sources of support and information.²⁶ Further, experience-near understanding that quitting is possible may be a key precursor to quitting. For a homeless person challenged with quitting while facing the hardships of homelessness, identifying with someone who has quit may help him to imagine quitting for himself.

Social marginalization and limited health care access may combine with communal living settings to make social modeling of cessation effective at increasing quit attempts and smoking abstinence by homeless smokers. Homeless smokers report the high acceptability and pervasiveness of smoking within their social networks as major barriers to quitting.¹¹ It is possible that quitting is stigmatized within homeless social networks, adding to the importance of abstinence modeling in this population. To personally know a substantial number of people who have quit could diminish the stigma of quitting. Given the observed

positive influence of a larger social network of former smokers on cessation, future work targeting cessation among homeless smokers ought to further assess how social networks impact quitting. We lack understanding of how social networks differ in terms of density, smoking status, and co-smoking behaviors between smokers and nonsmokers in the homeless population; how they change over time; and how to best leverage their positive influence of cessation modeling to increase quitting among homeless smokers. It would be interesting to examine how knowing more quitters has implications for remaining smoke free for more time than 6 months.

Given the stress and challenges of homelessness makes cessation more difficult, designing an effective intervention may require using the social milieu of cessation. Improving the quit rate for smokers experiencing homelessness will lessen the disproportionate burden of tobacco-related morbidity and mortality experienced, as well as increase the quality of life and decrease the economic and time costs associated with those morbidities. Quitting will yield direct economic benefits such as money for a deposit on an apartment and may improve psychosocial dimensions of life such as hope and confidence. Because of the social stigma against smoking, quitting may generate social capital and facilitate employment.

Limitations

The analysis included only main effects, not interaction effects, and the sample size was limited. Given the possibility of social desirability bias, the potential for mis-report of known quitters may have occurred. Multiple research staff administered the surveys increasing variation and the potential for bias from staff and participants.

Conclusions

For smokers experiencing homelessness, knowing 5 people or more who quit is associated with a 3-fold increase in the likelihood of quitting, after adjusting for multiple variables. This suggests that social modeling of cessation may have a significant influence on quitting for this population. To increase smoking cessation in the homeless and related low-SES populations, we need programs implemented at the local level of social networks that improve implicit (social modeling) and explicit (direct messages) cessation promotion by peers who have successfully quit themselves.

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Figure 1. CONSORT Flow Diagram for the Study

Table 1
Comparison of Participant Characteristics by Control and Intervention (MI) Study Arms

Variables	Total (N = 428)	Control Group (N = 214)	Intervention Group (N = 216)	p-value
Age, Mean±Std	44.34 (9.94)	44.17 (10.20)	44.52 (9.70)	.714
Race				.241
African American or Black	242 (56.5%)	112 (52.6%)	130 (60.5%)	
White	151 (35.3%)	83 (38.9%)	68 (31.6%)	
Others	35 (8.2%)	18 (8.5%)	17 (7.9%)	
Gender				.374
Male	320 (74.8%)	162 (76.1%)	158 (73.5%)	
Female	108 (25.2%)	51 (23.9%)	57 (26.5%)	
Education Level				.957
< 12 grades	100 (23.4%)	50 (23.5%)	50 (23.3%)	
12 grades	328 (76.6%)	163 (76.5%)	165 (76.7%)	
Income				.865
\$400 a month	137 (32.0%)	69 (32.4%)	68 (31.6%)	
<\$400 a month	291 (68.0%)	144 (67.6%)	147 (68.4%)	
Marital Status				.849
Married or lived with others	21 (4.9%)	10 (4.7%)	11 (5.1%)	
Divorced/Widowed/Separated/Never married	406 (95.1%)	202 (95.3%)	204 (94.9%)	
Employment Status				.370
Unemployed	387 (90.5%)	197 (92.5%)	190 (88.4%)	
Employed full-time	13 (3.0%)	5 (2.3%)	8 (3.7%)	
Employed part-time	28 (6.5%)	11 (5.2%)	17 (7.9%)	
Number of Times Homeless				.406
Just once (this time)	184 (43.2%)	96 (45.1%)	88 (41.3%)	
2 times	107 (25.1%)	49 (23.0%)	58 (27.2%)	
3 times	45 (10.6%)	19 (8.9%)	26 (12.2%)	
4 or more times	90 (21.1%)	49 (23.0%)	41 (19.3%)	
In the last 6 months, where did you sleep most of the time?				.392
Emergency shelter	257 (60.2%)	129 (60.5%)	128 (59.8%)	
Transitional housing unit	65 (15.2%)	37 (17.4%)	28 (13.1%)	
Drug rehab center or halfway house	5 (1.2%)	3 (1.4%)	2 (0.9%)	
Other (on streets, with family/friends)	100 (23.4%)	44 (20.7%)	56 (26.2%)	
CPD, Mean±Std	19.3 (13.7)	19.4 (16.0)	19.1 (11.1)	.750
FTND				.248
0-5 minutes	202 (47.2%)	92 (43.2%)	110 (51.2%)	
6-15 minutes	104 (24.3%)	52 (24.4%)	52 (24.2%)	
16-30 minutes	67 (15.7%)	41 (19.3%)	26 (12.0%)	
31-60 minutes	33 (7.7%)	18 (8.4%)	15 (7.0%)	
61+ minutes	22 (5.1%)	10 (4.7%)	12 (5.6%)	

Table 2
Association Between Smoking and Social Characteristics and Number of Quitters Known
Among 428 Homeless Adults Enrolled in a Smoking Cessation Program

Variables	Knowing 0 Quitters N = 96	Knowing 1-4 Quitters N = 236	Knowing 5 or More Quitters N = 96	p-value
Smoking Cessation (week 26)				
Quitters	4(4.2%)	14(5.9%)	13(13.5%)	.030
Smokers	92(95.8%)	222(94.1%)	83(86.5%)	
Age, Mean±Std	44.63±9.9	43.62±10.1	45.82±9.3	.182
Ethnicity				.334
African American or Black	60 (62.5%)	131 (55.5%)	51 (53.1%)	
White	26 (27.1%)	86 (36.4%)	39 (40.6%)	
Others	10 (10.4%)	19 (8.1%)	6 (6.3%)	
Gender				.356
Male	69 (71.9%)	174 (73.7%)	77 (80.2%)	
Female	27 (28.1%)	62 (26.3%)	19 (19.8%)	
Education Level				.381
< 12 grades	27 (28.1%)	54 (22.9%)	19 (19.8%)	
12 grades	69 (71.9%)	182 (77.1%)	77 (80.2%)	
Income				.938
\$400 a month	31 (32.3%)	74 (31.4%)	32 (33.3%)	
<\$400 a month	65 (67.7%)	162 (68.6%)	64 (66.7%)	
CPD, Mean±Std	18.57±10.8	20.4±61.3	17.24±8.4	.147
Fagerstrom Test of Nicotine Dependence (FTND)				.157
15 minutes	75 (78.1%)	168 (71.2%)	63 (65.6%)	
>15 minutes	21 (21.9%)	68 (28.8%)	33 (34.4%)	
Number of Quit Attempts Last Year				.828
0 attempt	40 (42.1%)	97 (41.3%)	35 (38.0%)	
1 or more attempts	55 (57.9%)	138 (58.7%)	57 (62.0%)	

Table 3
Multivariate Analysis Predicting Smoking Cessation Outcome at 26 Weeks (N = 428)
Among Homeless Adults in a Smoking Cessation Program

Variables	Odds Ratio	95% CI		p value
Age	1.001	0.96	1.04	.96
Education (< 12 grades as reference)	1.625	0.60	4.42	.34
Income (\$400 a month as reference)	<i>0.474</i>	<i>0.22</i>	<i>1.00</i>	<i>.05</i>
Fagerstrom Test of Nicotine Dependence (< 15 mins. as reference)	0.624	0.26	1.52	.30
Number of people known who have quit smoking				
1-4 (0 as reference)	1.548	0.49	4.88	.57
<i>5 or more (0 as reference)</i>	<i>3.793</i>	<i>1.17</i>	<i>12.27</i>	<i>.008</i>