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## Patterns and Predictors of Smoking Cessation Among Users of a Telephone Hotline

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### Synopsis .....

*Most former cigarette smokers in the United States have stopped without formal assistance. However, a large proportion of smokers desire and seek help other than by attending formal programs. It is important to recognize what factors are likely to influence the effectiveness of smoking cessation attempts among these persons.*

*The authors report results of a prospective cohort study of 1,552 smokers who called a stop smoking hotline to request self-help smoking cessation information. The participants were classified into three groups based on reports at the 6-month followup: 242 quitters, 497 recidivists, and 813 nonquitters. Baseline and followup data were used to evaluate three comparisons: quitters versus nonquitters, quitters versus recidivists, and recidivists versus nonquitters.*

*Nonquitters appear to be less motivated and more doubtful of their abilities to quit successfully compared with the other two groups. Quitters appear to live in a supportive environment for smoking cessation. Heavier smokers are more hesitant to try to quit, but once they make an attempt they are as likely to succeed as lighter smokers, when other factors are kept constant.*

*Efforts to promote environments supportive of smoking cessation are likely to result in a larger number of successful quitters. Similarly, efforts to strengthen motivation and belief in personal ability to quit are likely to encourage more nonquitters to attempt to stop smoking. Finally, it appears that some smokers need a previous quit attempt before they are able to maintain cessation successfully.*

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EVERY YEAR MILLIONS OF AMERICANS attempt to stop smoking cigarettes, but only a fraction are successful in maintaining their newly acquired non-smoking status (1,2). What distinguishes those who are successful from those who try and fail or those who do not try? Answers to this question are likely to help all those interested in improving the effectiveness of smoking cessation interventions. Most of what we know about stopping smoking is derived from research on subjects attending formal treatment programs, despite the fact that 92 percent of ex-smokers have quit on their own (3). Among those who quit on their own, there is a group of smokers who ask for help without necessarily attending formal cessation programs. Little is known about this group of help-seekers. It has

been found that the majority of smokers who are motivated to stop smoking are less interested in formal programs than in do-it-yourself methods (3-5). Thus, there is a need to investigate smoking cessation among those outside formal treatment programs.

One approach to studying smoking cessation is to compare successful quitters, recidivists, and nonstoppers in terms of factors that are potentially associated with smoking cessation. Ockene and colleagues made this comparison in a sample of 169 smokers enrolled in the Multiple Risk Factor Intervention Trial (MRFIT) (6). They evaluated stress, personal security, belief in personal control, social support, demographic variables, and smoking rate as potential factors. Successful quitters had higher

initial expectations of success, had easier prior cessation attempts, and had a higher degree of personal security than recidivists and nonstoppers (6). The middle-age, male smokers involved in MRFIT are not directly comparable to the general population of smokers. Thus, research that would compare successful quitters, recidivists, and nonstoppers in a larger and more heterogeneous population of smokers is needed.

The purpose of this study was to identify demographic, attitudinal, socioenvironmental, health status, smoking history, and use-of-cessation-help factors that distinguish between successful quitters, recidivists, and nonstoppers in a population of smokers who asked for help during their smoking cessation attempt.

## Methods

A prospective cohort study design was used. The 1,895 subjects were recruited from callers to the toll-free Roswell Park Stop Smoking Hotline in Buffalo, NY. The subjects were enrolled in the study from August 1, 1984 to November 22, 1985. They were smokers (one or more cigarettes a day) who requested self-help smoking cessation information. On average, these smokers smoked 28 cigarettes a day. These subjects were also enrolled in a randomized trial testing the efficacy of five different self-help smoking cessation booklets. This trial tested format (high structure versus low structure) and quitting instructions (cold-turkey versus gradual reduction) as factors affecting effectiveness of self-help booklets. Extensive evaluations of this trial have been published elsewhere (7,8). In short, at followup, there were no differences between the groups in terms of quit attempts, proportion of quitters, use of the booklets, and multiple compliance measures.

Trained hotline operators collected information on demographic, attitudinal, smoking history, and health status variables at initial contact. At the 6-month followup 1,552 (82 percent) were interviewed by telephone to obtain information on smoking status and socioenvironmental and use-of-cessation-help variables. The 343 persons not completing followup interviews included 33 who refused and 310 who either moved to an unknown address or changed to an unlisted telephone number. Unless otherwise specified, results reported are based on the 1,552 participants.

**Independent variables.** Demographic variables measured included age, sex, race, education, and mari-

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tal status. Attitudinal variables were measured using four-item Likert's scales. These attitudinal variables included perceived threat from smoking, perceived benefit from quitting, perceived ease or difficulty quitting, and perceived likelihood of quitting 6 months from baseline. Socioenvironmental variables included presence of smokers at home, number of smokers among five closest associates, helpful support during quitting, and nagging during quitting. Perceived health status at baseline was measured by asking subjects to rate their present health as excellent, good, fair, or poor.

Smoking history variables measured included number of cigarettes smoked daily, nicotine content of brand smoked, amount of nicotine smoked daily, duration of cigarette use, presence of a previous quit attempt, and duration of the longest previous abstinence from smoking. Amount of nicotine smoked daily was calculated by multiplying number of cigarettes smoked daily by the nicotine content of the brand smoked. Use-of-cessation-help variables included enrollment in a stop smoking clinic during the study, use of nicotine gum, and group assignment for the randomized trial (7,8).

**Dependent variables.** Subjects were divided into three mutually exclusive categories based on their self-described smoking behavior during the study. The 813 nonquitters (52 percent) were those who reported that their behavior is best described by the statement: "Have not tried to quit smoking" or "Have tried to quit, but was not able to stay off cigarettes more than one day." One-third of this group (254 persons) reported not trying to quit during the study. The 497 recidivists (32 percent) chose the statement "Quit smoking for more than a day, but smoking again now" or described themselves as nonsmokers at followup but their self-reported quit period was less than 30 days before the interview. The 242 quitters (16 percent) described themselves as nonsmokers at followup and their self-reported quit date was at least 30 days before the interview. On the average, these

Table 1. General comparison of demographic and attitudinal variables by smoking status

Variable	Mean or percent			Total	P-value
	Nonquitters (N = 813)	Recidivists (N = 497)	Quitters (N = 242)		
<i>Demographic</i>					
Age (years) .....	44.5	43.2	44.0	44.0	0.326
Sex: female .....	64.5	68.2	64.0	65.6	0.345
Race: nonwhite <sup>1</sup> .....	7.8	12.6	5.4	9.0	0.002
Education: college graduate <sup>1,2</sup> .....	17.8	18.7	29.4	19.9	0.011
Marital status: married .....	60.9	60.5	59.3	60.5	0.969
<i>Attitudinal</i>					
Perceived threat from smoking: very likely ....	59.3	62.7	59.2	60.4	0.557
Perceived benefit from quitting: very likely <sup>1,3</sup> ..	63.3	71.3	72.0	67.2	0.017
Perceived ease or difficulty quitting: very difficult <sup>1,2,3</sup> .....	60.2	47.1	39.6	52.8	<0.001
Perceived likelihood of quitting in 6 months: very likely <sup>1,2,3</sup> .....	25.2	35.3	43.2	31.3	<0.001

<sup>1</sup> P<0.05 for nonquitters versus quitters.<sup>2</sup> P<0.05 for recidivists versus quitters.<sup>3</sup> P<0.05 for nonquitters versus recidivists.

Table 2. General comparison of socioenvironmental and health status variables by smoking status

Variable	Mean or percent			Total	P-value
	Nonquitter (N = 813)	Recidivists (N = 497)	Quitters (N = 242)		
<i>Socioenvironmental</i>					
Smokers at home <sup>1,2</sup> .....	46.1	43.2	29.1	42.5	<0.001
Number of smokers among 5 closest friends...	2.7	2.7	2.5	2.7	0.197
Helpful support during quitting <sup>1,3</sup> .....	31.4	51.5	55.3	41.5	<0.001
Nagging during quitting <sup>1,3</sup> .....	11.5	7.8	4.2	9.2	0.001
<i>Health status</i>					
Perceived status at baseline: excellent <sup>1,3</sup> .....	13.5	17.9	22.7	16.3	0.014

<sup>1</sup> P<0.05 for nonquitters versus quitters.<sup>2</sup> P<0.05 for recidivists versus quitters.<sup>3</sup> P<0.05 for nonquitters versus recidivists.

Table 3. General comparison of smoking history and use-of-cessation-help variables by smoking status

Variable	Mean or percent				P-value
	Nonquitter (N = 813)	Recidivists (N = 497)	Quitters (N = 242)	Total	
<i>Smoking history</i>					
Amount smoked (cigarettes per day) . . . . .	29.9	25.6	26.2	27.9	<0.001
Nicotine content (mg per cigarette) . . . . .	0.87	0.88	0.86	0.87	0.732
Daily nicotine use (mg per day) . . . . .	26.3	22.4	22.7	24.5	<0.001
Years of cigarette use <sup>1</sup> . . . . .	25.1	23.0	23.4	24.1	0.012
Ever quit smoking <sup>1,2</sup> . . . . .	87.4	92.9	93.0	90.0	0.001
More than 30 days of previous abstinence . . . .	33.3	46.2	49.8	40.0	<0.001
<i>Use of cessation help</i>					
Self-help booklet group:					0.017
High-structure, cold turkey . . . . .	17.5	17.0	13.1	16.6	...
High-structure, gradual reduction . . . . .	18.2	15.8	13.9	16.8	...
Low structure, cold turkey . . . . .	14.9	19.4	25.0	17.9	...
Low structure, gradual reduction . . . . .	16.9	17.6	13.9	16.6	...
Control . . . . .	32.6	30.2	34.0	32.0	...
Clinic attendance <sup>1,2,3</sup> . . . . .	3.1	6.0	12.2	5.4	<0.001
Use of nicotine gum <sup>1</sup> . . . . .	11.9	15.8	10.1	12.9	0.047

<sup>1</sup> P<0.05 for nonquitters versus recidivists.<sup>2</sup> P<0.05 for nonquitters versus quitters.<sup>3</sup> P<0.05 for recidivists versus quitters.

subjects were off cigarettes for 4 1/2 months (mean = 20 weeks, median = 22 weeks).

**Analysis plan.** All analyses were performed using SPSS and FRENDS software packages. The 343 nonresponders were compared to the 1,552 responders in terms of variables collected at baseline using analysis of variance and chi-square tests. During the first step of the analysis of responders, each potential predictor was compared over the three outcome groups using chi-square or analysis of variance. Factors were considered to be significantly associated with outcome if the P-value was less than 0.05. If there were no significant associations, the variable was not considered further.

The next step involved contrasts between each of the pairs of outcome variables, that is, quitters versus nonquitters, quitters versus recidivists, and recidivists versus nonquitters. These contrasts were evaluated in two ways. First by bivariate analysis and then by multiple logistic regression analysis for each contrast. It was assumed that subjects in the study were members of a cohort with a finite probability of moving to the next step of quitting. The outcome in the risk analysis was the step which represented greatest progress in the quitting process. The exposure (predictor variable) category was presented in a way that would produce an estimate greater than 1. This was done in order to allow for direct comparisons of the relative effects of each of the factors evaluated.

In order to make the risk estimates obtained in the logistic regression analyses comparable, all variables found to be significant in the three-group comparisons were included in the models for each of the contrasts. Because three comparisons were made using the regression models, in a 95 percent confidence interval a 98.3 percent level was used to take into account the effect of multiple comparisons ( $100 \text{ percent} - [5 \text{ percent} \div 3] = 98.3 \text{ percent}$ ) (9). Each stratum of categorical variables was introduced as an independent regression variable (dummy variable). Coefficient and standard error estimates derived from logistic regression models were utilized to calculate odds ratios and 95 percent confidence intervals (10). This analysis allowed the evaluation of the effect of each potential predictor in the presence of all other potential predictors.

## Results

Compared to responders, nonresponders were more likely to be younger (mean age = 38 versus

Table 4. Significant predictors of quitters versus nonquitters in logistic regression analysis

Variable <sup>1</sup>	Risk ratio	Confidence interval <sup>2</sup>
<i>Demographic</i>		
Education:		
Less than college .....	1.0	...
College graduate .....	1.8	1.1,2.8
<i>Attitudinal</i>		
Perceived ease or difficulty quitting:		
Very difficult .....	1.0	...
Other .....	2.1	1.4,3.2
Perceived likelihood of quitting in 6 months:		
Unlikely .....	1.0	...
Likely .....	1.7	1.1,2.7
Very likely .....	2.9	1.5,5.8
<i>Socioenvironmental</i>		
Presence of smokers at home:		
Yes .....	1.0	...
No .....	2.3	1.3,3.8
Helpful support during quitting:		
No .....	1.0	...
Yes .....	2.0	1.3,3.1
<i>Health status</i>		
Perceived status at baseline:		
Other .....	1.0	...
Excellent .....	1.6	1.1,2.8
<i>Smoking history</i>		
Longest previous abstinence:		
None .....	1.0	...
1-30 days .....	1.6	1.1,2.3
More than 30 days .....	1.8	1.2,2.8
<i>Use-of-cessation-help</i>		
Cessation clinic attendance:		
No .....	1.0	...
Yes .....	4.4	1.9,10.1

<sup>1</sup> In addition to these variables the logistic regression model included race, perceived benefit from quitting, nagging during quitting, amount smoked, duration of cigarette use, ever quit smoking, booklet group assignment, and use of nicotine gum.

<sup>2</sup> 95 percent confidence interval using 98.3 percent level to take into account multiple comparisons.

44 years), nonwhite (16.3 percent versus 8.9 percent), male (41.2 percent versus 34.4 percent), and slightly less experienced with cigarettes (years of smoking = 20 versus 24). In these comparisons age and number of years smoking were highly correlated (Pearson's  $r = 0.872$ ).

Table 1 shows the three-group comparison of demographic and attitudinal variables. Four factors were eliminated at this stage of the analysis: age, sex, marital status, and perceived threat from smoking. Quitters were less likely to report their race as nonwhite compared with nonquitters. Quitters were more likely to be college graduates compared with recidivists and nonquitters. Quitters were more likely to perceive benefit from quitting and more confident of their ability to be off cigarettes 6 months from baseline compared with nonquitters and recidivists. These two factors dis-

Table 5. Significant predictors of quitters versus recidivists in logistic regression analysis

Variable <sup>1</sup>	Risk ratio	Confidence interval <sup>2</sup>
<i>Demographic</i>		
Education:		
Other .....	1.0	...
College graduate .....	1.8	1.1,2.9
Race:		
Nonwhite .....	1.0	...
White .....	2.4	1.1,5.6
<i>Socioenvironmental</i>		
Presence of smokers at home:		
Yes .....	1.0	...
No .....	1.8	1.1,2.7

<sup>1</sup> In addition to these variables, the logistic regression model included perceived benefit from quitting, perceived ease or difficulty quitting, perceived likelihood of quitting in 6 months, helpful support during quitting, nagging during quitting, perceived health status at baseline, amount smoked, duration of cigarette use, ever quit smoking, longest previous abstinence, booklet group assignment, cessation clinic attendance, and use of nicotine gum.

<sup>2</sup> 95 percent confidence interval using 98.3 percent level to take into account multiple comparisons.

Table 6. Significant predictors of recidivists versus nonquitters in logistic regression analysis

Variable <sup>1</sup>	Risk ratio	Confidence interval <sup>2</sup>
<i>Attitudinal</i>		
Perceived likelihood of quitting in 6 months:		
Unlikely .....	1.0	...
Likely .....	1.5	1.0,2.1
Very likely .....	1.5	1.0,2.4
<i>Smoking history</i>		
Amount smoked (per pack) <sup>3</sup> .....	1.5	1.2,2.0
<i>Socioenvironmental</i>		
Helpful support during quitting:		
Yes .....	1.0	...
No .....	2.1	1.5,2.9

<sup>1</sup> In addition to these variables, the logistic regression model included education, race, perceived benefit from quitting, perceived ease or difficulty quitting, perceived likelihood of quitting in 6 months, helpful support during quitting, nagging during quitting, perceived health status at baseline, duration of cigarette use, ever quit smoking, longest previous abstinence, booklet group assignment, cessation clinic attendance, and use of nicotine gum.

<sup>2</sup> 95 percent confidence interval using a 98.3 percent level to take into account multiple comparisons.

<sup>3</sup> For this calculation amount smoked in cigarettes per day were grouped in packs per day (20 cigarettes per pack) to evaluate the effect of each additional pack of cigarettes smoked.

tinguished recidivists from nonquitters in the same direction of effect. There was a dose-response relationship for the expected extreme difficulty of quitting (nonquitters 60 percent, recidivists 47 percent, and quitters 40 percent) .

Table 2 compares the socioenvironmental and health status variables of the three groups. Only one variable, the number of smokers among the respondent's five closest associates, was not differentially distributed among the three groups. Nonquitters reported less helpful support and more

nagging during a quit attempt compared with quitters and recidivists. For example, 12 percent of nonquitters reported nagging during quitting whereas only 4 percent of quitters reported this perception.

Compared with quitters, nonquitters and recidivists were more likely to have other smokers at home. Compared with nonquitters, quitters and recidivists were more likely to perceive their health status as excellent at baseline.

In table 3 smoking history and use-of-cessation-help variables of the three groups are compared. The nicotine content of the brand of cigarettes smoked was not associated with a differential distribution between the groups. Nonquitters reported less experience with smoking cessation in terms of previous quit attempts and previous days of abstinence compared with quitters and recidivists. Although 5 percent of study subjects attended a formal cessation program during the period of observation, there was a dose-response effect with formal cessation clinic attendance and quit status (quitters 12 percent, recidivists 6 percent, and nonquitters 3 percent).

Table 4 shows variables that were able to discriminate between quitters and nonquitters in the multivariate analysis and the strength of these associations. Table 5 shows similar comparisons between quitters and recidivists, and table 6 compares recidivists and nonquitters.

## Discussion

Participants in this study are not a representative sample of the general population of smokers. Nevertheless, they differ from persons who are involved in formal cessation programs since very little effort was required on their part to be included and remain in the study. They represent a sample of help-seekers who are likely to participate in public health programs for smoking cessation. Subjects in this study needed only to call a stop smoking hotline and identify themselves as smokers. Since participants needed to acknowledge smoking as a problem and take the steps to seek help, they may be similar to the help-seekers seen by primary care providers (11). This sample has a relatively high percentage of women (65.6 percent) and a relatively high percentage of college graduates (19.9 percent). At baseline, only 8.8 percent reported their health status as poor, 51.2 percent reported their health status as good, and 16.4 percent as excellent.

Attitudes seem to distinguish between nonquitters

and the other two groups. Nonquitters appear more fearful of the difficulty of smoking cessation and more doubtful of their abilities to quit successfully than the other two groups. The construct of being more or less doubtful of one's ability to quit is similar to self-efficacy about cessation. Several workers have reported a strong effect for self-efficacy in predicting smoking cessation (6, 12-15).

Those who did not quit live in a social environment less supportive of smoking cessation. Quitters appear to be different from recidivists and nonquitters in terms of their socioenvironmental variables: presence of smokers at home, helpful support during quitting, race, and education. Others have reported similar results (12,16,17). Smoking is more common among those who are black and less educated (18). Perceived helpful support during quitting appears to be a stronger predictor of success than nagging. These two variables are related and likely to be influenced by the outcome of the cessation effort. Nevertheless, results support a strong influence of the immediate environment in the outcome of cessation attempts.

Amount smoked discriminated between nonquitters and recidivists but not between quitters and recidivists. Thus, it appears that heavier smokers are more hesitant to try to quit, but once they make the attempt, they are as likely to succeed as lighter smokers, when other factors are kept constant. Length of previous abstinence was a factor that discriminated between quitters and recidivists. Similar results have been reported for other groups (6,19). Perhaps, some amount of success in quitting is necessary for some smokers before they are successful at becoming nonsmokers.

Health status at baseline discriminated between nonquitters and quitters. Those who perceived their health status as excellent were more likely than the others to be quitters. This finding emphasizes the need for early intervention, before the negative health consequences of smoking are apparent.

Cessation clinic participants were more likely than others to be quitters. Clinic attendance probably represents a measure of motivation and addiction combined. When clinic attenders were compared with nonattenders, they were found to be heavier smokers and to perceive a greater health threat from smoking (7). In contrast, Fiore and colleagues reported that those using cessation programs, a sample of the U.S. population, had lower rates of success than those quitting on their own (3). A likely explanation is that participants in this study represent a different population of smokers. They represent help-seekers who would benefit

*'Heavy smokers can be told with confidence that they are as likely to succeed as light smokers, when other factors are kept constant. Finally, it appears that a previous quit attempt is needed for some smokers before they are able to maintain cessation successfully.'*

more from an intensive cessation program.

In summary, this study demonstrates the utility of separating smokers into groups according to the stage of smoking cessation that they experience during the intervention. Findings from this study substantiate the notion that efforts to promote environments supportive of smoking cessation are likely to result in a larger number of successful quitters. Similarly, efforts to strengthen motivation and belief in personal ability to quit are likely to encourage more nonquitters to attempt to stop smoking. Heavy smokers can be told with confidence that they are as likely to succeed as light smokers, when other factors are kept constant. Finally, it appears that a previous quit attempt is needed for some smokers before they are able to maintain cessation successfully. This information is likely to benefit all health practitioners promoting smoking cessation.

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