

**INCREASING PARTICIPATION IN
COMMUNITY-BASED
QUIT-SMOKING PROGRAMS:
A META-ANALYSIS OF
COMMUNICATION VARIABLES**

Working Paper Series No. 38

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SEPTEMBER 1998

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ABSTRACT

Background: Attempts to reduce the prevalence of smoking through quit smoking programs have been unsuccessful because they have not attracted large numbers of smokers to participate in them.

Method: An analytic review of the literature was conducted to identify potential communication variables that might enhance recruitment for community-based quit smoking programs. Recruitment was defined as the number of smokers who enroll in a quit smoking program divided by the estimated number of smokers in the target population.

Results: Thirty three publications reporting the results of 40 recruitment campaigns were located. The median recruitment rate was 2.0 per cent. Logistic regression was used to examine the effect of six variables on recruitment rate: the type of program sponsor, the type of program, program costs, use of participation incentives, whether messages were segmented by stage of change, and the type of channel used to send messages. The only significant predictor of recruitment rate was channel type (i.e., the method used to deliver a message). Studies that used interactive recruitment channels (telephone, interpersonal communication) were 66.5 times more effective than those using passive recruitment strategies (mass media, direct mail). Results examining the segmentation of messages by stage of change on recruitment were inconclusive.

Conclusions: Results suggest that researchers and practitioners interested in population-based smoking cessation programs should pay more attention to recruitment methods. The use of interpersonal channels has been under-used and appears to be particularly promising for improving the population impact of quit smoking programs.

ACKNOWLEDGMENTS

The assistance of Drs. Roy Cameron, Richard Cook, Anita Myers, Ron McCarville and two anonymous reviewers in preparation of this manuscript is gratefully acknowledged. The present work was based, in part, on the author's doctoral dissertation. Funding was provided by the Windsor-Essex County Health Unit, and the Health Promotion Branch of the Ontario Ministry of Health.

BACKGROUND

A cornerstone of population-based control strategies is to help smokers quit smoking and remain smoke free.^{1,2} The inclusion of smoking cessation in population health strategies is generally based on three important sets of evidence. First, despite tobacco's highly addictive nature, it is possible for people to quit smoking and remain smoke free.³ Second, carefully designed smoking cessation interventions increase the likelihood that a smoker will quit and remain smoke free.^{4,5} Finally, a reduction in the population prevalence of smoking is associated with improvements in population health.⁶

While this evidence is necessary to justify the inclusion of smoking cessation programs in a population-based tobacco control strategy, it is insufficient for doing so. Specifically, it is not yet clear what impact smoking cessation programs can have on the population prevalence of tobacco use. Some have argued that the population impact of quit smoking programs is negligible and should therefore be dropped as a population health strategy.⁷ For example, large trials such as the Minnesota Heart Health Project^{8,9} and COMMIT¹⁰ have failed to significantly reduce the population prevalence of smoking. However, the population impact of smoking cessation programs depends on both the long term effectiveness of the programs being offered as well as the number of people who participate in them.^{11,12} While the efficacy of programs to help adults quit smoking has been well studied, little is known about the factors that enhance recruitment into smoking cessation programs, particularly those aimed at general adult populations.^{11,12}

Low recruitment rates in smoking cessation programs can account for the disappointing results obtained in community trials. This has prompted a number of commentators to suggest that increased efforts should be directed toward enhancing the dissemination of smoking cessation programs.¹¹⁻¹⁵

The Dissemination of Smoking Cessation Innovations

Orlandi and his colleagues have suggested that, in addition to being effective, quit smoking programs must overcome three potential challenges before a population will widely benefit from them.¹⁶ The first challenge, communication, is to make potential users aware of the program, provide information about it and increase the motivation of potential users to adopt it. Once the decision to adopt the innovation has been made, the challenge is to assist adopters to implement the innovation in a suitable way. This is the implementation stage and involves providing adopters with the necessary information, skills, and resources to use the innovation to maximize benefits and minimize costs. The third challenge, maintenance, is the decision to continue or discontinue using the innovation. A combination of feedback and incentives are typically used to reinforce the innovation in a manner that leads to its continued use.

Various reviews of the literature suggest that the majority of studies on smoking cessation programs are aimed at the development new programs.^{13,14,17} However, the ability to improve the population impact of smoking cessation programs through further innovation may be limited.¹⁵ This has led a number of researchers to study issues of implementation and maintenance.¹⁸⁻²⁴ On the other hand, despite rapid progress in the use of communication theory to promote other types of behavior change

little work has examined how to enhance population impact of smoking cessation programs through better communication.

Enhancing Communication for Smoking Cessation Programs

According to McGuire, there are five sets of “input” or independent variables that may be manipulated in communication campaigns to promote health services such as smoking cessation programs: source, destination, message, receiver, and channel.^{25,26} Source variables refer to the characteristics of the person or group sending a message. Issues such as the credibility, attractiveness, power, and homophily of the perceived source determine how persuasive a communication is.²⁷⁻²⁹ Destination factors include variables having to do with the type of target behavior that the communication is aimed at (e.g., short term versus long term change, change of behavior versus change in attitude, change in eating habits versus change in tobacco use, etc.). Message factors include how the message is delivered and organized, its length, pace, and degree of repetition. Channel factors are the methods by which messages are transmitted to potential adopters.

In general, two types of channels have been identified: interpersonal and mass media. Interpersonal communication generally involves the direct and real time exchange of information between two people or between members of a small group. Most often this is done in a face to face manner although it can also be mediated through devices such as the telephone or computer.^{30,31} A variation of mass media that can also reach large numbers of people over brief periods of time with more

detailed information than traditional broadcast and print media are selective communication strategies.³² The principal technique of selective communication is direct mail.³³

McGuire's final set of input variables, receiver factors, concern the extent to which the communication is consistent with the characteristics of the intended audience. This is related to the notion of audience segmentation, the most widely used tool in social and commercial marketing.³⁴

One segmentation variable, stage of change, has recently generated considerable attention among researchers and providers of smoking cessation programs.^{13,14,35} According to the model, individuals may be classified into five stages of readiness to quit smoking (precontemplation, contemplation, preparation, action, maintenance).³⁶ The notion that segmenting audiences by stage of change and then tailoring messages to enhance recruitment for smoking cessation programs gains support from several sources. First, by matching interventions to stage of change, Prochaska and his colleagues have shown that it is possible to enhance the long term effectiveness of smoking cessation interventions.³⁷ Second, although the largest proportion of smokers are in precontemplation and contemplation,^{38,39} virtually all recruitment campaigns are aimed at and successful with persons in the preparation and action stages.^{12, 40} In a study comparing the characteristics of smokers who participated versus those who did not participate in a quit smoking program delivered over the television in Chicago, Kviz, Crittenden, and Warnecke found that non-participants were significantly more likely to be in the earlier stages of change.⁴¹ Hence, there is great potential for improving the

population impact of quit smoking programs by attempting to recruit smokers in the early stages of change as well as those already highly motivated to quit and ex-smokers at risk of relapse.

The Present Review

Despite increasing awareness of the importance of recruitment in enhancing the population impact of quit smoking programs¹¹⁻¹⁵ this is the first known attempt to broadly review the recruitment strategies used in community-based trials of quit smoking programs. Previous reviews have limited themselves to quit smoking programs delivered through worksites,^{42,43} or looked at the utility of a single strategy for improving community-based participation in quit smoking programs.⁴⁴

Determining the average recruitment rate of smokers into population based smoking cessation programs would be useful for estimating sample sizes in future recruitment studies involving population based quit smoking programs. Moreover, an examination of the variance associated with the mean may provide an initial indication as to the feasibility of improving recruitment rates. If the review reveals that recruitment success has been consistently low with little variance despite the application of a wide variety of strategies, it would provide evidence in support of Chapman's⁷ proposition that we should abandon attempts to improve population health through community based quit smoking programs. On the other hand, if recruitment rates vary substantially between trials employing different strategies, it would help to generate specific testable hypotheses regarding how population based recruitment for smoking cessation may be improved.

METHOD

Search Strategy

Potential studies were identified by searching three electronic databases: MEDLINE, compiled by the National Library of Medicine in the United States for the period January, 1983 to January 30, 1997; Psychlit compiled by the American Psychological Association for the period of January 1, 1990 to December 31, 1996; and CINAHL a cumulative index of the nursing and health literature for the period January 1, 1982 and January 30, 1997. MEDLINE accesses the worldwide biomedical literature. Psychlit records the world wide literature in psychology. CINAHL references English-language journals in nursing, allied and consumer health.

Combinations of the following keywords were employed during the search: smoking cessation, participation, consumer participation, patient participation, promotion, recruitment, marketing of health services. Non-English language abstracts were excluded from the search. Potential studies prior to 1986 were also identified by reviewing Schwartz's compilation of smoking cessation programs in the United States and Canada published between 1978 and 1985.⁴⁵ Finally, studies were identified by searching the reference lists of key articles. With two exceptions, only published papers were included in the analysis.

Using the above techniques a total of 236 studies were located. The abstracts, and full texts where necessary, were reviewed to determine if they were appropriate for inclusion in the analysis. Appropriate studies were defined as published trials in which (i) a group of adult smokers from a

general population were offered a smoking cessation intervention, and (ii) the percentage of adult smokers in the target population that enrolled in the program was reported (i.e., the recruitment rate) or sufficient data were reported in the study or a companion study to permit the calculation of recruitment rate. Studies principally aimed at adolescents, worksites, schools, universities, clinical, or other highly specialized populations were excluded from the review. Studies conducted with large, managed care populations that draw clients from general populations were included. Finally, care was taken to account for multiple reports of a single recruitment campaign conducted with a single population. Data from these multiple publications were treated in the analysis as a single recruitment campaign. On occasion a single publication reported results from multiple recruitment campaigns. In these cases, each recruitment campaign was independently entered into the analysis. To be considered independent a campaign had to be aimed at a distinct target group, use distinct promotional methods and/or employ substantially different messages.

Results of the Search

A total of 33 studies contained sufficient data to determine recruitment rates from 40 independent recruitment campaigns (Table 1). Thirty of the campaigns were conducted in the United States (75%), four were implemented in Canada (10%), two in Finland (5%), and one each in Australia, Sweden, and the Netherlands. One study reported the collective results of campaigns conducted in 11 American and Canadian cities.⁷³ Thirty-three campaigns attempted to recruit smokers from geographically defined areas such as cities or counties. Seven attempted to recruit subjects from large managed health care agencies (HMOs). Two of the recruitment samples were restricted to

female adult smokers; all others targeted both men and women. One study included persons aged 16 and over. The minimum age in all other studies was 18.

Variables and Coding

The dependent measure was recruitment rate, defined as the number of persons who enrolled in a program divided by the estimated total number of smokers in the target population. Where studies reported some other denominator, such as the number of smokers reached by an intervention (i.e., recruitment efficiency), or the number of homes containing a smoker, an attempt was made to adjust the data to estimate all smokers in the target population. Where a shortage of necessary information prevented this adjustment, the study was excluded from the analysis. An individual was considered to have enrolled if they returned a registration card, consented to receive program materials, or consented to participate in the program. In cases where the program was delivered through the media, individuals were considered to have enrolled only if they requested supplemental material. To avoid confounding communication variables with issues of implementation (program fidelity) and/or maintenance, attendance at a first class, the *use* of self help material or an actual quit attempt were not used to indicate enrolment. While use of program materials or attendance at a program also determine the population impact of quit smoking interventions, program attendance or material use become relevant only if a potential participant is first made aware of the intervention and they show at least an elementary interest in the program by registering in it.¹⁶ In other words, it is reasonable to use registration as a recruitment criteria because implementation and maintenance are dependent upon registration.

Unlike previous reviews which limited themselves to only one type of communication factor in isolation of others,⁴²⁻⁴⁴ the present study selected independent variables to correspond to each of McGuire's^{25,26} five communication inputs: source (the organization or person sponsoring the smoking cessation program being offered); destination (the type of program; the cost of the program and/or whether an incentive was offered to participate); message (the length of the campaign); receiver (whether the recruitment campaign was segmented by stage of change), and channel (the principle method or methods used to deliver the campaign message). The relative paucity of detail routinely reported in study results prevented the inclusion of additional variables.

The program sponsor was categorized as a health care provider, a researcher/academic, or a non-government agency (NGO)/other. Where there were multiple sponsors from different categories, an attempt was made to ascertain who the principal sponsor was and who the intended audience would most likely perceive the sponsor to be. Researchers included persons with academic affiliations or where subjects were explicitly told that the project was part of a research trial. Providers included physicians, health departments, managed health care agencies, and the National Cancer Institute. The NGO/other category included volunteer foundations such as the Lung Association, the Heart Foundation, the Cancer Society, newspapers, and civic groups.

Program type was entered as a categorical variable and included group programs or classes, self-help materials, quit and win contests, and other programs (e.g., individual counseling, telephone support

lines, etc.). Where a program was described as having a principal component supplemented by one or more adjuvant interventions, only the principal strategy was entered into the analysis.

Incentive was entered into the analysis as a dichotomous variable, with zero representing a recruitment campaign that did not offer an enrollment incentive and one representing a campaign that did (e.g., a draw for a trip, cash prizes, merchandise, etc., or payment for participation in a program or research study). Program cost was also entered as a dichotomous variable with zero representing programs that were offered at no cost and one representing programs that charged either a flat fee or required a refundable deposit.

Segmentation was entered as a dichotomous variable where one represented a campaign with messages designed to appeal to smokers in more than one stage of change, and zero represented a campaign that did not attempt to segment its audience by stage of change. Studies that failed to explicitly mention stage of change or level of readiness as a variable of interest were coded as a zero.

Recruitment channel was coded categorically as mass media (including television, radio, newspaper and magazine advertisements and public service announcements, feature news stories and educational pieces, the distribution of flyers, presentations with limited interaction, and posters); mail packages that were specifically addressed to a household or an individual; telephone contact including requests to complete RDD surveys and telemarketing inquiries; interpersonal contacts including individual messages delivered by physicians and other health care providers, and/or small

interactive group presentations and display booths staffed by an individual recruiter; a combination of media plus interpersonal channels; or a combination of media, mail and/or telephone.

Finally, campaign length was entered into the analysis as a continuous variable and represented the number of months over which potential subjects were actively recruited . Population size was entered as a continuous variable based on estimates provided in the studies under review. In some cases the population of smokers was estimated by utilizing the known number of participants and the reported recruitment rate (i.e., number of smokers in the population equaled the number of participants divided by the recruitment rate).

RESULTS

Coding reliability

All studies in the analysis were initially coded by the author. To check the reliability of the reported variables, half of the studies were randomly selected and coded by a second rater blind with respect to the purpose of the study. Kappas, an estimate of inter-rater reliability that adjusts for chance agreement, ranged from .69 to .84 suggesting an acceptable degree of consistency. Since the second rater only examined half of the studies, no attempt was made to reconcile differences.

Statistical analysis

The mean percentage of smokers recruited across the 40 studies examined was 10.8 ($SD = 19.9$) with a range of .08 to 85.0. The median recruitment rate was 2.0 per cent.

Campaigns were aimed at an average of 153,264 smokers ($SD = 420,959$) and had a mean length of 5.4 months ($SD = 7.9$; range of one week to 33 months). Fifty-eight percent of the campaigns were sponsored by health care providers, 20 percent were offered by NGOs, and 22.6 percent were offered by researchers.

Several types of programs were represented in the studies. Forty percent of the studies were promoting a self-help manual or quit kit while another 42.5 percent of the studies were based at least in part on a quit and win contest. None of the programs being offered could be described as individual counseling. Only 12.5 percent offered group programs either alone or in combination with self-help programs. A telephone help line was a principal object of recruitment in three of the 40 campaigns, while two others advertised programs that were delivered via television. In addition to the 17 quit and win campaigns identified, there were five other reports of campaigns offering enrollment incentives to smokers. Two studies asked participants to make a refundable deposit in order to participate in the program. Another three gave participants a choice of a refundable deposit or paying a flat fee. Interestingly, 95 percent of participants in the latter study opted for the flat fee.⁷² Only one study required participants to pay a fee. In all cases where fees or deposits were levied, with one exception, the amount was less than \$60.

The most frequent channel employed to deliver messages was media, either alone (51% of campaigns) or in combination with at least one other strategy (18 % of campaigns). Seven of the 39 campaigns that reported details about channel relied primarily on the telephone. Only two studies

reported using interpersonal recruitment methods alone, but another four reported that interpersonal methods were systematically used in combination with media. Two studies used direct mail as their primary recruitment strategy. However, four other studies used mail in combination with media. Finally, despite considerable recent speculation about the potential value of segmenting audiences and gearing messages based on stage of change, only three of the 40 campaigns made explicit reference to such a practice.

Logistic regression was used to examine the relationship between recruitment and the predictor variables. Since data on campaign length was not available on 17.5 percent of the campaigns they were not included in the regression analysis. To create the proportion type response required for a logistic analysis, a dichotomous dependent variable, called success, was created. A second variable, called caseweight was also created to express the number of persons per thousand population that were either recruited or failed to be recruited in each campaign. Hence, it was necessary to enter each campaign into the data base twice and weight each case by the caseweight variable. For each pair of cases related to a specific recruitment campaign, one case was assigned a success value of 1 to denote recruitment success while the other case was assigned a success value of 0 to denote recruitment failure. Caseweight was assigned the following values:

$$\text{If success} = 1, \text{ then caseweight} = \frac{S_i}{S_i + F_i} \times 10000$$

$$\text{If success} = 0, \text{ then caseweight} = \frac{F_i}{S_i + F_i} \times 10000$$

where: S_i = estimated number of smokers successfully recruited in campaign i ;

F_i = est. no. of smokers that were targeted by campaign i but not recruited

Caseweight was expressed as a rate per ten thousand in order to avoid having to round off any recruitment estimates. For example, Cummings et al. reported the lowest recruitment rate of any study reviewed, 0.08 per cent of smokers.⁴⁸ Therefore, in this study when success was equal to 1, caseweight was set at 8. When success was equal to 0, caseweight was equal to 9992. Except for success and caseweight, all other variables for each pair of cases related to a specific recruitment campaign were identical. In essence, this procedure is equivalent to creating 10,000 individual cases for each campaign with each case differentiated only by whether the smoker was successfully recruited or not.

Normally in analytic reviews the weighting of studies depends on their relative sample size with the largest samples carrying the most weight in the overall analysis. This is done because increasing a sample size reduces variance and results in a more stable estimate. However, in the present analysis each campaign was re-scaled to a common weight for three principle reasons. First, there is no compelling reason to believe that recruitment campaigns conducted in large metropolitan areas are any more valid than those conducted with more modest populations. Indeed, it may be argued that implementation and data collection can be done more accurately with smaller studies. Second, sample size is potentially confounded with channel type. Campaigns targeted at the largest populations relied almost exclusively on mass media while campaigns using telephone, interpersonal

contact, or mail were conducted with relatively small target populations. Hence, without re-scaling, the analysis would have been overwhelmingly dominated by campaigns that sent messages by mass media while results using other channels would have been largely obscured. Finally, although it was possible to calculate recruitment rates for all campaigns, not all studies reported enough information to estimate the size of their population of smokers.

It should be noted, however, that a substantial disadvantage of re-scaling studies down in size is that the precision of the estimates obtained from them may be significantly reduced thereby increasing the likelihood of a type II error. For example, instead of an aggregate population of more than 5,670,868 smokers, the present analysis was effectively based on a sample of 10,000 x 36 studies = 360,000. Moreover, the loss of precision would be greatest for the largest studies. Therefore, the effects associated with large trials that used media to deliver messages have the greatest probability of being overlooked.

Following the suggestions of Hosmer and Lemeshow,⁷⁹ the analysis began with a univariate examination of the potential effect of each predictor variable (campaign sponsorship, program type, use of incentives, program costs, message channel, message segmentation by stage of change) on the probability of being successfully recruited into a smoking cessation program. Table 2 presents the (a) estimated slope of the coefficient(s) for the univariate logistic regression model containing only the variable shown in the left hand column of the table, (b) the estimated standard error of the estimated slope coefficient, (c) the estimated odds ratio which was obtained by exponentiating the

estimated β coefficient, (d) the 95 per cent confidence interval for the odds ratio, (e) the Wald statistic for the hypothesis that the slope of the coefficient is zero, and (f) the associated probability associated with obtaining the Wald statistic. An examination of the confidence interval estimates for the odds ratios revealed that only two variables have at least one level with values that exceed one (channel and sponsor). These two variables also have one or more levels with statistically significant Wald tests indicating coefficients that differ significantly from zero. Moreover, univariate analyses using channel ($\chi^2 (5) = 80.03, p < .001$), or sponsor ($\chi^2 (2) = 62.91, p < .025$) significantly improved the goodness of fit relative to a model containing the constant only.

Two variables had at least one level where the lower bound of the confidence level approached one (program type and segmentation). The Wald test for segmentation is significant ($p < .001$) while one of the three levels of program type had a coefficient that differed significantly from zero. An examination of the goodness of fit for univariate models using segmentation (χ^2 with 1 df = 64.76, $p < .001$) or program type (χ^2 with 3 df = 22.84, $p < .001$) revealed that both resulted in significant improvements relative to a model containing a constant only.

In contrast to the other variables, univariate analyses with cost (χ^2 with 1 df = 0.61, $p = .433$) or incentive (χ^2 with 1 df = 0.32, $p = .569$) did not significantly improve the goodness of fit. Moreover, the lower bound of the confidence interval for the odds ratios associated with cost and the presence of an incentive did not approach one. Finally, neither cost or incentive had coefficients that differed significantly from zero.

These results suggest that cost or the use of incentives are not associated with the probability of successfully recruiting smokers into smoking cessation programs. On the other hand, channel type, program sponsor, program type and message segmentation may influence the probability of recruitment success. To further test this possibility, an attempt was made to build a multivariate model.

The first step in building a multivariate model was to check for the presence of significant interactions among channel, sponsor, program type and segmentation. Since the variables being considered had between two and five levels each, the decision was made to limit the number of interactions to those with the greatest plausibility. Moreover, missing data in some cells prevented the inclusion of some interactions (e.g., segmentation and channel). Since researchers tended to rely on telephone recruitment in order to conduct random surveys and providers tend to rely on media, an interaction between sponsor and channel was a possibility. Moreover, quit and win programs tend to rely heavily on the media so an interaction between program type and channel also seemed plausible. Finally, a three way interaction between channel, sponsor and program type was also checked.

In addition to the aforementioned interactions, channel, program type, sponsor and segmentation were entered as categorical predictors of recruitment success. Once again, each campaign was entered into the model twice with each pair weighted by the proportion of successes and failures respectively. Results indicated that none of the interactions appeared to significantly improve the

model. For example, none of the β coefficients for the interaction terms were significant (p 's > .578). Moreover, none of the odds ratios for the interaction terms were significant.

The next step in building a multivariate model consisted of entering the variables channel, program type, sponsor, and segmentation into a stepwise logistic regression procedure using forward selection. Rather than selecting variables based on the Wald statistic, a likelihood-ratio test was employed whereby the change in log likelihood for the model is examined after the systematic entry of each variable. In order to ensure that the model is as stable as possible, the selected screening criteria was set at $p < .15$.

Using 74 cases, the stepwise procedure included only one variable in the model, channel. Overall, the model correctly classified 93.9 per cent of cases and produced -2 log likelihood estimate of 136.425. The model chi square, which tests the null hypothesis that the coefficients for all of the terms of the model except the constant are equal to zero, was also highly significant (χ^2 with 5 df = 33.22, $p < .001$).

Table 3 provides the odds ratios and associated confidence intervals for recruitment success using each combination of channels in the analysis. Detailed inspection shows use of the telephone significantly improves the odds of successfully recruiting smokers for smoking cessation programs relative to any other channel. Indeed, the odds of success are 5.17 (95% C.I. = 3.31 to 8.07) times greater than the next most effective strategy, interpersonal channels, and nearly 45 (95% C.I. = 30.58

to 65.07) times more effective than media. Interpersonal channels appear to increase the odds of recruitment success relative to media and mail, whether used independently or in combination. However, the effectiveness of interpersonal recruitment appears to be improved when it is used in combination with media (OR = 4.50; 95% C.I. = 2.22 to 9.11). The odds of recruitment success also appear to improve when mail and media are used in combination with each other rather than on their own (see Table 3). The odds of successfully recruiting smokers appears to be approximately equal for media relative to mail based strategies (OR = 1.49; 95% C.I. = 0.38 to 5.92).

Since campaign length and the size of the population of smokers associated with each campaign were not included in the logistic regression analysis, a simple correlational analysis was performed. Correlations between the percentage of smokers recruited and campaign length ($r = .294; p = .090$), as well as between the percentage of smokers recruited and the number of smokers in the target population ($r = -.159; p = .348$) were both non-significant. Since the impact of campaigns delivered through the media and interpersonal channels are more likely to be sensitive to campaign length than mail and telephone based strategies,³⁷ the relationship between recruitment and campaign length was examined only for those delivered through the media or interpersonal channels. Once again, however, no relationship was found ($r = .291, p = .130$).

DISCUSSION

This review was the first known attempt to systematically compare recruitment methods for smoking cessation programs aimed at large, general communities of smokers. It improves our understanding

of recruitment in several important ways. First, most community-based studies and programs have been unable to recruit more than two per cent of targeted smokers. This should assist decision makers who must decide whether to put resources into community-based smoking cessation programs or other population-based tobacco control strategies. Second, and perhaps the most important finding of the review is that a few community-based trials have been able to obtain recruitment rates of over 10 per cent (more than five times the median recruitment rate). This suggests that while low recruitment rates are typical of community trials, they are not inevitable. Indeed, just as previous reviews have shown how improvements in recruitment can enhance the impact of quit-smoking programs delivered through worksites^{42,43} the present review demonstrates that the impact of community based smoking cessation programs may be significantly enhanced by focusing more attention on how potential participants are recruited.

A third major finding of the present review is that the communication variable with the greatest potential for improving population-based recruitment of smokers is the channel used to send messages. Telephone and other interpersonal recruitment strategies consistently produce results superior to media or mail, whether used independently or in combination with one another. Moreover, the relative size of this advantage is quite notable. For example, the mean recruitment rate obtained in campaigns involving telephone recruitment was 42.5 per cent. No telephone based campaign produced a recruitment rate of less than 10 per cent of smokers. Campaigns that employed interpersonal methods either alone or in combination with other strategies produced a mean recruitment rate of 6.2 per cent. The worst performance for a campaign involving interpersonal

methods was a recruitment rate of 1.9 per cent. In comparison, campaigns that relied on mass media or direct mail had a mean recruitment rate of 2.2 per cent. Hence, telephone based recruitment was 19 times more effective on average than mass media and direct mail, while the average advantage for face to face methods was 280 per cent higher than media and mail.

Results of the present review were consistent with studies conducted in schools and worksites. Peltier, Telch and Coates attempted to recruit teen smokers in two California high schools whose students had similar characteristics. The school that utilized interpersonal recruitment reported a participation rate six times higher than a similar school that relied on posters and public announcements.⁸⁰ Similarly, Lowe, Windsor and Post randomly assigned employees in a single large worksite in Birmingham, Alabama into two treatments. One group received a personal letter inviting smokers to participate in an onsite smoking cessation clinic. The other group received an invitation through a telephone call from a health educator employed by the company. None of the smokers receiving the letter registered for the program, but 19.8 per cent of smokers receiving the telephone call did so. Excluding smokers who were unable to be contacted are dropped from the recruitment formula, a total of 51.4% of those who received the message enrolled.⁸¹

Results showing the relative utility of interpersonal methods for recruiting smokers into community-based quit smoking programs are significant because the vast majority of trials and campaigns to date have relied on mass media, the strategy that produces one of the lowest recruitment rates. The tendency to rely on mass media may come from its efficiency in reaching large numbers of people.³²

However, successful recruitment depends on reaching the target audience *and* persuading them to enroll. Simply exposing someone to a message is not sufficient.²⁶ All other things being equal, a campaign that only reaches 10,000 smokers but persuades 25 per cent of the target group to enroll in a quit smoking program will have a greater population impact than a campaign that reaches 1,000,000 smokers but only persuades two per cent of them to enroll. The present results are consistent with communication models which predict that, except for a relatively small group of innovators and early adopters, the vast majority of people find interpersonal channels to be more persuasive than mass media.^{27,82} Indeed, based on the present results a mass media campaign would have to reach over 40 times as many smokers in order to be as effective as smokers recruited through telemarketing.

A number of recent commentators have suggested that the persuasiveness of recruitment messages (whether delivered by interpersonal and/or mass media) might be enhanced by matching them to smoker's level of readiness to quit smoking (stage of change).^{12,35} However, results of the present study suggest that calls to segment recruitment messages according to prospective participant's stage of change are premature. Of the forty campaigns reviewed, only three reported segmenting their messages by stage of change. Most importantly, an examination of these campaigns also reveals the presence of a confound. Specifically, whenever messages were staged, they were delivered either by telephone or by telephone in combination with mail. Since telemarketing is the most effective recruitment strategy, with or without segmenting messages by stage of change, it is not possible to determine what the independent effect of segmentation was (if any).

Other reviews have suggested that program providers may improve program recruitment by offering incentives such as the chance to win a prize.^{83,84} In contrast, the present results did not show an advantage for campaigns that offered incentives to improve recruitment. However, it should be noted that incentives may impact on outcomes other than recruitment. For example, in some campaigns smokers had to remain smoke free for some period of time in order to remain eligible to receive the incentive. Therefore, although incentives may not improve recruitment rates, they may impact on program compliance, and/or improve program efficacy. This in turn would improve the population impact of a program independent of recruitment factors.

The present review did not find any evidence to support the notion that charging a program fee reduces recruitment. However, the failure to find a relationship between cost and recruitment may be because the few studies that levied program fee did so in a very modest way. For example, three studies charged a fee of only five dollars. Therefore, results should be interpreted with caution since the marketing literature has a plethora of data demonstrating that, in general, cost plays a significant role in whether or not an innovation will be adopted.^{32,35}

The finding that the length of campaigns was unrelated to recruitment rates is, at first blush, counter-intuitive (longer campaigns should increase both reach and persuasiveness). However, there are at least two plausible explanations why no relationship was found in the present review. First, the impact of recruitment campaigns is likely the result of both the length of the campaign and its intensity.^{32,85} Therefore, the lack of an observed relationship between campaign length may have

been due to confounding differences in campaign intensity. Unfortunately, most studies do not provide sufficient detail in order to assess campaign intensity. Hence the present study could not take this into account. A second plausible explanation is that the marginal utility of continuing a campaign diminishes over time. Several studies that tracked enrollment over time noted this trend. For example, in a quit and win contest that was run over a period of eight months, Lando et al. reported that nearly 30 per cent of the total number of participants sent in their registration within the first month of the campaign.⁶¹ Glasgow and his colleagues reported that over 60 per cent of participants in a year long smoking cessation program conducted in nine worksites collectively employing over 700 smokers registered in the first month of the campaign.⁸⁶

While results of the present review are suggestive, they should be interpreted with caution. A potential source of error is the inclusion of program participants in the numerator of the recruitment fraction who are not included in the denominator. This occurs, for example, when smokers enroll in the program from outside the geographic area used for estimating the number of smokers in the target population. This may result in an overestimation of the recruitment rate. For example, Shipley et al. reported the results of one quit and win contest in which 30 per cent of participants were from outside the target geographic region.⁷³ A related concern is that the methods used to estimate the number of smokers also varied. While reported studies generally used some form of random sampling to estimate their smoking populations, they varied substantially in their methodology. For example, some included both daily and occasional smokers, while others included

more rigorous criteria such as a minimum consumption level. Likewise, the programs being offered also tended to have slightly different inclusion criteria.

The present review also did not examine cost efficiency. This may be an important consideration for program providers with small or fixed budgets. Instead of attempting to recruit the greatest number of smokers into a program, the goal of sponsors with fixed budgets should be to recruit as many smokers as possible for the resources available. The strategy that produces the most recruits may not be the most cost efficient.

Review results have several important implications for both program providers and researchers concerned with improving the impact of community-based quit-smoking programs. First, both providers and researchers must pay more attention and care to recruitment as a means of improving the population impact of quit-smoking programs. Most evaluations and studies to date have regarded recruitment as a means to an end (i.e., studying program efficacy) rather than a variable of interest in its own right. Provided that smokers registering in a program can be encouraged to complete the intervention, doubling or tripling recruitment rates would effectively double or triple a program's population impact.^{11,17} While the ability to improve the efficacy of quit smoking programs appears to be limited,¹⁵ there is a significant opportunity to improve the population impact of quit-smoking programs by increasing recruitment by several hundred per cent. Previous attempts to increase recruitment have included offering incentives for participating in a program, or eliminating program user fees. While these strategies can not be ruled out, this review suggests that

the variable with the greatest potential for improving recruitment is the selection of the channel used to transmit messages. Moreover, the large and efficient reach associated with mass media or direct mail does not necessarily mean it is the best method for recruiting participants. Rather, program providers and researchers should carefully consider the use of interpersonal strategies, especially telemarketing.

In order to have a more precise understanding of the factors and conditions that consistently lead to improvements recruitment rates it will be necessary to conduct controlled studies that systematically manipulate a limited number of independent variables while holding other factors as constant as possible. Only one study could be located that reported the effects of systematically manipulating channel type on population based recruitment rates for smoking cessation.⁷² Hence, this represents a promising field of research.

Among the questions that future studies need to address is the utility of combining channels for message delivery. Schmid and his colleagues found that combining media with direct mail offered little additional benefit relative to the use of mail alone.⁷² These results may be explained by the fact that both media and direct mail are passive recruitment strategies. On the other hand, Bandura's dual link hypothesis suggests that dissemination of an innovation will be enhanced when mass media is used to reach early adopters and is then followed by interpersonal strategies to engage middle and late adopters.²⁷ While results of the present review support this view, controlled trials are required to confirm it.

Given that the vast majority of smokers are not interested in quitting,³⁸ and the high relapse rates associated with smoking,^{4,19,36} it stands to reason smoking cessation programs will not have a population level effect until recruitment rates with smokers who are unmotivated to quit and recent ex-smokers at risk of relapse are improved. It is noteworthy, therefore, that despite considerable speculation about the potential benefits that segmenting messages by stage of change might have on population recruitment, the present review was unable to find even a single study with sufficient controls that systematically examined this hypothesis. There is a need to conduct a population-based study of recruitment that directly compares the effect of segmenting messages by stage of change relative to standard, unsegmented messages.

In summary, the present results suggest that the recruitment of participants into community-based quit smoking programs have significant potential for improvement. Additional research utilizing appropriate controls and procedures are required to identify precisely how recruitment can be improved on a consistent basis. Program providers and researchers alike should revisit their assumptions and common practices regarding about the use of mass media to send messages, the effect of charging modest program fees, message segmentation about stage of change, the use of incentives, and other variables on recruitment for quit smoking programs. Until this is done, the impact of large community trials will continue to be modest and calls to abandon population based quit smoking programs as a tobacco control strategy premature.

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TABLE 1

List of studies included in the analysis

Author, Year	Population description	No. of smokers	Prog. sponsor	Prog. descr.	Incentive	Prog. Cost	Recruit. channel	Segment by stage?	Campaign length (months)	Recruit. rate (% of smokers)
Chapman, Smith, et al. (46)	Newcastle, Australia	101,277	Provider	Quit & win	Yes	None	Media	No	1	1.2
Cummings, Kelly, et al. (47)	Buffalo, N.Y.	256,000	Provider/civic grp	Quit & win	Yes	None	Media	No	1.5	1.0
Cummings, Sciandra, et al. (48)	7 cities in NY and Pennsylvania		Provider	Telephone help line	No	None	Media	No	6.5	mean =0.08
Cummings, Sciandra and Markello (49)	Buffalo, NY	239,252	Provider	Manual (kit)	No	None	Media	No	0.25	0.8
Curry, Wagner and Grothaus (50)	HMO in Puget Sound, Washington	67,900	Provider	Manual	No	None	Media	No	4	1.8
Elder, Campbell, et al. (51)	San Diego, CA	500,000	NGO	Manual (kit)	Yes	None	Media	No	2	0.2
Elder, McGraw, et al. (52)	Pawtucket, RI	23,000	Provider	Group	Yes	None	Media	No	1	0.5
Elder, McGraw, et al. (52)	Pawtucket, RI	18,000 age 18-64	Provider	Quit & win	Yes	None	Interpersonal + media	No	2	1.9
Fava, Velicer and Prochaska (53)	Rhode Island	11,360	Research	Manual	Yes	None	Telephone	Yes	8	36.5
Fortmann and Killen (54,55)	Fremont & Newark, CA	7,135 age 18-65	Research	Quit & win	Yes	None	Telephone	No	24	26.4
Glasgow, Lando, Hollis, et al. (56)	HMO in Portland, OR	2,148	Provider	Telephone help line	Yes	None	Media + mail	No	33	14.2
Gritz, Berman, et al. (57)	HMO in Los Angeles Females age 18-60	7,176	Provider	Manual	Yes	None	Telephone	No		19.5
King, Flora, et al. (58)	2 cities in Northern California	25,000	Research	Quit & win	Yes	None	Media	No	1	2.0
Korhonen, Niemensivu, et al. (59)	North Karelia, Finland	31,000	NGO	Quit & win	Yes	None	Media + interpersonal	No		3.2
Korhonen, Niemensivu, et al. (59)	Turku, Finland	53,000	NGO	Quit & win	Yes	None	Media	No		1.6

Author, Year	Population description	No. of smokers	Prog. sponsor	Prog. descr.	Incentive	Prog. Cost	Recruit. channel	Segment by stage?	Campaign length (months)	Recruit. rate (% of smokers)
Lando (60)	Des Moines & Ames, Iowa	65,250	Provider	Group	No	None	Media	No	2	0.4 ¹
Lando, Hellerstedt et al. (61)	Bloomington, MN (1988)	13,500 ²	Provider	Quit & win	Yes	None	Media + mail	No	8	7.0
Lando, Loken, et al. (62)	Bloomington, MN	13,500 ²	NGO	Quit & win	Yes	None	Media + mail	No	3	1.1
Leinweber, Macdonald and Campbell (63)	Medicine Hat, AB	8,500	NGO	Quit & win	Yes	None	Media	No	1	0.9
Litchenstein and Hollis (64)	HMO in Portland OR age 19-70	1,387	Provider	Manual	No	None	Interpersonal	No		11.0
Millar and Naegele (65)	Winnipeg, MB age 25-44	54,825	Provider	Manual	No	None		No	6	39.0
Muddle, de Vrie, and Strecher (40)	Den Bosh, Netherlands age 25-64	16,800	Provider	Manual or group	No	None	Media + interpersonal	No	12	2.5
Ossip-Klein, Giovino, et al. (66)	10 counties in western NY state	137,300	NGO	Manual + telephone help	No	\$5 deposit	Media	No	24	1.3
Pechacek, Lando, et al. (67)	Mankato, MN (1983 - 1986)	6,393	Provider	Quit & win	Yes	None	Media	No	1	3.2 ⁵
Pechacek, Lando, et al. (67)	Fargo-Moorehead (1984 - 1986)	15,532	Provider	Quit & win	Yes	None	Media + interpersonal	No	1	4.7 ⁵
Pechacek, Lando, et al. (67)	Bloomington, MN (1985 - 1988)	8,714	Provider	Quit & win	Yes	None	Media	No	1	3.9 ⁵
Pickett, Bains, et al. (68)	Kingston & Frontenac, ON	28,900	Provider	Quit & win + kit	Yes	None	Media	No	1	0.8
Pickett, Bains, et al. (68)	Hastings & Prince Edward County, ON	27,200	Provider	Quit & win	Yes	None	Media	No	1	0.8
Pirie, McBride, et al. (69)	Bloomington, MN women age 20-64	2,631	NGO	Group	No	\$100 deposit	Telephone	No		10.0
Prochaska, Velicer, Fava and Laforge (70)			Research	Manuals			Telephone	Yes		82.0
Prochaska, Velicer, Fava and Rossi (71)			Research	Manuals			Telephone	Yes		85.0

Author, Year	Population description	No. of smokers	Prog. sponsor	Prog. descr.	Incentive	Prog. Cost	Recruit. channel	Segment by stage?	Campaign length (months)	Recruit. rate (% of smokers)
Schmid, Jeffery, and Hellerstedt (72)	Mankato, MN	2,592 ³	Research	Manual/newsletter	No	\$5 fee or \$60 deposit	Mail	No	.5	1.1
Schmid, Jeffery, and Hellerstedt (72)	Fargo-Moorehead, NM/ND	17,064 ³	Research	Manual/newsletter	No	\$5 fee or \$60 deposit	Mail + media	No	.5	0.7
Schmid, Jeffery, and Hellerstedt (72)	Bloomington, MN	13,565 ³	Research	Manual/newsletter	No	\$5 fee or \$60 deposit	Mail	No	.5	1.1
Shipley, Hartwell, et al. (73)	11 North American intervention cities in COMMIT trial	232,914	Provider/NGO/Research	Quit & win	Yes	None	Media	No	1 (average campaign)	mean = 1.3 Range: 0.3-3.1
Sussman, Dent, et al. (74)	5 cities in California	5,184 ³	Research	TV Program	No	None	Telephone	No	1	38.3
Thompson, Michnich, et al. (75)	HMO in Puget Sound, Washington	369	NGO	Group	No	\$30 fee	Interpersonal	No	12	14.0
Tillgren, Haglund, et al. (76)	Sweden age 16+	2,167,000	Provider	Quit & win	Yes	None	Media	No	12	0.6
Wagner, Schoenbach, et al. (77)	HMO in Puget Sound, Washington	49,500	Provider	Manuals	No	None	Media	No	3	4.1
Warnecke, Flay, et al. (78)	Chicago, IL	1,440,000	Provider	Manuals + TV prog.	No	None	Media	No	1	5.2 ⁴

Notes:

1. Assumes a smoking prevalence rate of 20 per cent of adult population.
2. Estimated from data given in Schmid, Jeffery & Hellerstedt, 1989. Also see note 3.
3. Recruitment was originally given by household. To convert rate based on individual smokers it was assumed that each household had an average of 1.6 adults and that smoking prevalence was 27 per cent of the adult population.
4. Per cent of smokers that received a self help manual.
5. In order to maintain independent samples in the analysis, the recruitment rate shown is the mean for that population obtained over multiple contests using similar methodology.

TABLE 2

Results of the univariate logistic regression models predicting the probability of recruitment success.

Predictor Variable	n	β	SE(β)	Wald (df = 1)	<i>p</i>	Odds Ratio	95% CI for OR
Channel (media)	78	-1.2127	0.6345	3.653	.056	0.30	0.09, 1.03
Channel (mail)	78	-1.6214	1.8026	0.809	.368	0.20	0.01, 6.76
Channel (telephone)	78	2.5762	0.4742	29.511	.000	13.15	5.19, 33.30
Channel (interpersonal)	78	0.9314	0.7005	1.768	.184	2.54	0.64, 10.02
Channel (media+interp.)	78	-0.7540	0.8464	0.794	.373	0.47	0.02, 1.07
Sponsor (researcher)	76	0.8301	0.3173	6.843	.009	2.29	1.23, 4.27
Sponsor (hlth. provider)	76	-0.3468	0.3010	1.327	.249	0.71	0.39, 1.28
Program type (quit/win)	80	-1.1597	0.3658	10.037	.002	0.32	0.15, 0.64
Program type (group)	80	-0.7395	0.5278	1.963	.161	0.48	0.17, 1.34
Program type (self help)	80	0.4022	0.2917	1.901	.168	1.50	0.84, 2.65
Segmentation	80	-1.7356	0.2234	60.372	.000	0.18	0.11, 3.66
Cost	76	0.2392	0.3232	0.548	.459	1.27	0.67, 2.39
Incentive	76	0.1146	0.2018	0.323	.570	1.12	0.75, 1.67

TABLE 3

**Odds ratios for successfully recruiting smokers into smoking cessation programs using various communication channels.
95 per cent confidence intervals are shown in parentheses.**

	Media	Mail	Telephone	Interpersonal	Media + Interpersonal	Media + Mail
Media vs.	-	1.49 (0.38, 5.92)	0.02 (0.01, 0.03)	0.12 (0.07, 0.21)	0.52 (0.27, 1.01)	0.27 (0.16, 0.47)
Mail vs.	0.67 (0.17, 2.66)	-	0.02 (0.01, 0.08)	0.08 (0.02, 0.32)	0.35 (0.08, 1.48)	0.18 (0.04, 0.73)
Telephone vs.	44.61 (30.58, 65.07)	66.45 (17.45, 253.08)	-	5.17 (3.31, 8.07)	23.30 (12.95, 41.92)	12.12 (7.75, 18.95)
Interpersonal vs.	8.62 (5.01, 14.84)	12.84 (3.19, 51.72)	0.19 (0.12, 0.30)	-	0.22 (0.11, 0.45)	2.34 (1.29, 4.24)
Media + Interpersonal vs.	1.91 (0.98, 3.71)	2.85 (0.67, 12.09)	0.04 (0.02, 0.07)	4.50 (2.22, 9.11)	-	1.93 (0.95, 3.91)
Media + Mail vs.	3.68 (2.13, 6.35)	5.49 (1.36, 22.12)	0.08 (0.05, 0.13)	0.43 (0.12, 0.78)	0.52 (0.26, 1.05)	-

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