

# Evaluation of an Internet-based smoking cessation program: Lessons learned from a pilot study

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The potential contribution of the Internet to smoking cessation seems huge, given that a majority of Americans now have both computers and telephones. Despite the proliferation of Web sites offering smoking cessation support, there is little empirical evidence regarding the efficacy of Internet-delivered cessation programs. We developed a cessation Web site and conducted a short-term evaluation of it, examining recruitment approaches, Web site use patterns, alternative retention incentives and re-contact modes, satisfaction, and cessation rate. The intervention included modules on social support and cognitive-behavioral coping skills configured to take advantage of the interactive and multimedia capabilities of the Internet. Cessation and satisfaction data were obtained from a subsample of 370 subjects followed for 3 months. The program was rated as easy to use, and the social support group component was used most frequently. The cessation rate (abstinence for the previous 7 days) at 3 months was 18%, with nonrespondents ( $n=161$ ) considered smokers. Among a variety of traditional and Internet-based recruitment strategies, the most successful made use of Internet user groups and search engines. Methodological and procedural issues posed in conducting research on the Internet are discussed.

## Introduction

Improvements in Internet technologies and their availability, paired with a dramatic drop in the cost of connecting to the Internet, have created the potential to provide 24-h on-demand comprehensive smoking cessation support to the more than 100 million households with computers and telephone lines (National Telecommunications and Information Administration, 2000; Nielsen NetRatings, 2002). The degree to which this potential will result in abstinent smokers remains in question. Nonetheless, a large number of Web sites now offer smoking cessation support, with many sites, such as QuitNet.org and QuitSmoking.com, being devoted entirely to cessation. There is evidence that such sites can attract large numbers of smokers. For example, one site, www.QuitSmokingSupport.com, reported that from 1994 through 2001 the site had more than 50 million

visitors and more than 1,000,000 page views per month (current site data are available through the *View Our Stats* link on the site's home page). No data are available, however, on the effectiveness of the smoking cessation help offered by these sites.

To evaluate such Web sites, we determined that a first logical investigative step was to see if those smokers who access a specific smoking cessation intervention Web site have cessation rates high enough to indicate some degree of effectiveness. In the absence of such evidence, there would be little reason to pursue a more in-depth investigation. We also wanted to investigate the feasibility of recruiting and maintaining contact with subjects through the Internet, testing E-mail vs. US postal mail follow-up contact, and monitoring the effects of two different levels of response incentives.

## Method

We developed a smoking cessation Web site and conducted a series of pilot tests to test recruitment and retention strategies. To test for the influence of incentives, we randomly assigned the follow-up

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subjects to receive either US\$10 or US\$20 for completing the 3-month follow-up assessment. In addition, to determine if those subjects who did not respond to electronic prompts at 3 months could be reached more effectively by US postal mail rather than by repeated E-mails, we randomly assigned those subjects who did not respond to an E-mail prompt at 3 months to receive further follow-up prompts by either E-mail or US mail. See Figure 1 for a flow diagram of enrollment and subject disposition.

The 3-month survey was initiated with an E-mail request to access a Web site and provide follow-up information. Participants who failed to respond to the E-mail, but who subsequently accessed the Web site, received an automatic prompt at sign-in asking them to complete the survey. If a participant did not complete the 3-month assessment within 3 weeks of the due date, the survey was sent within either an E-mail message or a letter by US mail, depending on the follow-up condition to which the subject had been

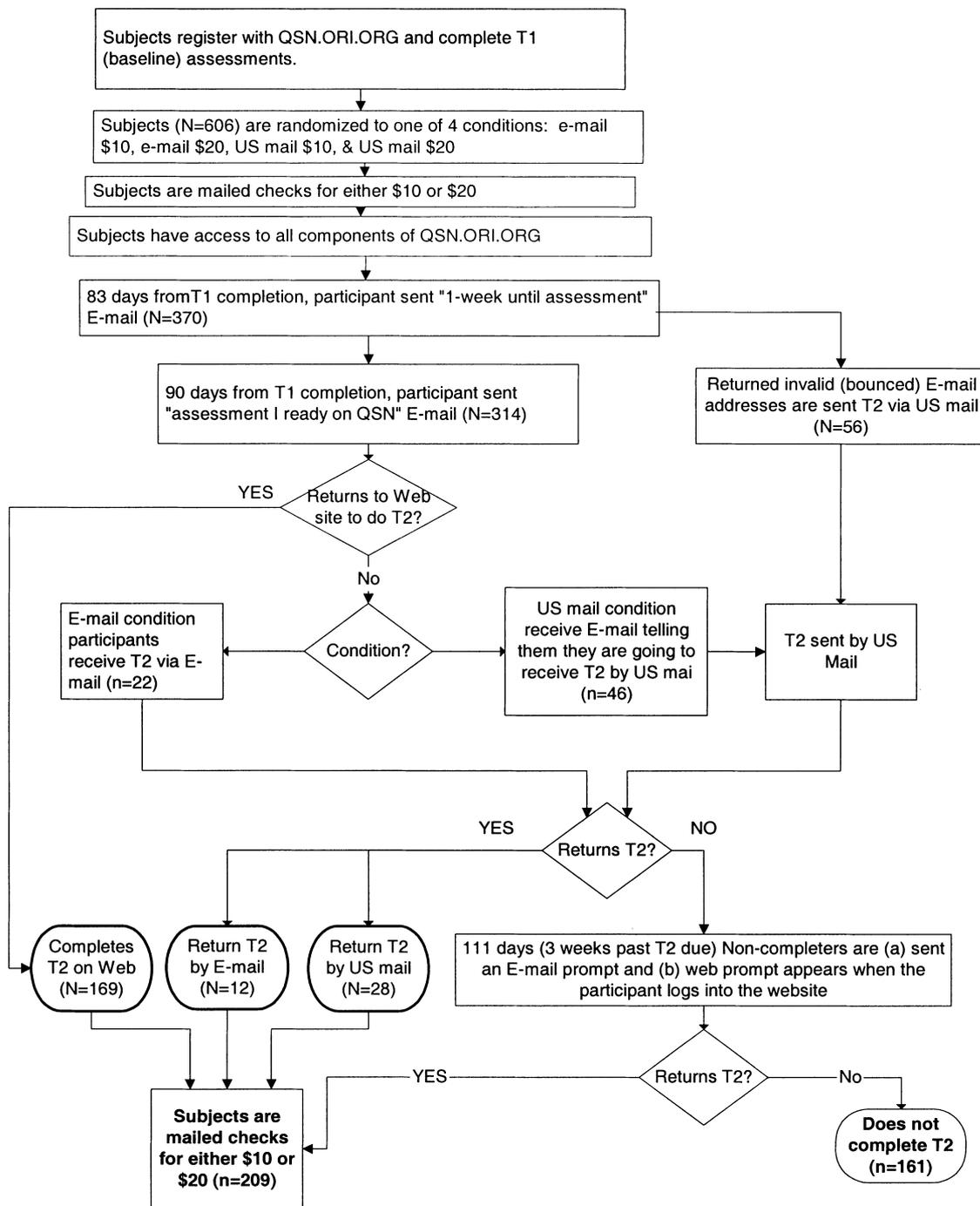


Figure 1. Quit smoking network enrollment and subject disposition flow diagram.

assigned. Upon completion of the follow-up assessment, subjects were mailed checks for either US\$10 or US\$20, depending on the condition to which the subject had been assigned.

### *Setting*

The Web server was mounted on the open Internet at Oregon Research Institute via a shared T1 (high-bandwidth) connection that was accessible throughout the world. People with Internet access (e.g., home, work, or community setting such as library) and Web browser software could view the home page.

### *Participants*

The four criteria for participation were: (a) age 18 years or older; (b) being at least in the contemplator stage of quitting smoking (i.e., "interested in quitting in the next 6 months"), based on the Transtheoretical Model of Prochaska and colleagues (Prochaska, 1994; Prochaska & DiClemente, 1983, 1984, 1985; Prochaska & Velicer, 1997); (c) having a valid E-mail address; and (d) being a resident of the United States or Canada (to facilitate payment, which was in US dollars). Anyone who arrived at the Web site, asserted that they fulfilled the four participation criteria, provided us with a valid address in the United States or Canada to which incentive checks could be mailed, and provided an E-mail address was accepted for enrollment. Qualified participants were then asked to provide informed consent via a Web-based process, which previously had been reviewed and approved by the Institutional Review Board of Oregon Research Institute. Access to the Web site was controlled through the use of unique login names and passwords. Participants were free to access the site as much and as often as desired, and were encouraged to do so.

Recruitment was accomplished by a wide variety of methods. Internet recruitment included: (a) submitting our Web site to major Web search engines (e.g., Lycos, Excite, and Yahoo) and confirming its appearance in searches, (b) purchasing banner advertisement displays at a major commercial search engine site, and (c) postings to Internet discussion groups related to smoking cessation (e.g., alt.quit.smoking.support and an AOL support group for smoking cessation). Non-Internet recruitment methods included announcements of our Web site address with supporting information in a newspaper display advertisement, a newspaper feature article, brochures distributed at community dental clinics and doctors' offices, and a radio interview.

A total of 606 smokers were enrolled over a period of 6 months. Self-report indicated that of these, 72% were female and 81% were white; 77% smoked 16 or more cigarettes per day, 85% were between 25 and 54

years old, and most had either some college (46%) or were college graduates (34%). The initial 370 subjects enrolled were followed for a period of 3 months, at which time we attempted to recontact them to request a follow-up assessment. These participants were not significantly different demographically from the overall sample.

### *Web site design and intervention development*

The Web site we developed (the Quit-Smoking-Network) included several major components: a structured intervention that guides development of a cessation quit plan, interpersonal support (both peer-peer and professional-peer support in postings forum and E-mail response formats), and a library of a wide variety of cessation resources (e.g., online pamphlets, motivations materials, and links to other sites). The intention was to create a reasonably full-featured, extensive Web site based on theoretically grounded and empirically validated intervention approaches (Lichtenstein & Glasgow, 1992).

Formative research suggested that the Web site needed to be accessible and functional for users accessing the Web with different platforms (PC and Macintosh), different browsers, and various bandwidth connections; therefore, use of audio and video was kept to a minimum. Based on reviews of the literature (e.g., US Department of Health and Human Services, 1996) and direct experience in other smoking cessation projects, we identified specific components for inclusion: a personalized quit plan, a social support component with a bulletin board service and chat feature, informational resources for quitting (e.g., an HTML version of *Clearing the Air*; National Cancer Institute, 1993), links to other relevant Web sites (e.g., American Cancer Society, www.cancer.org), tobacco-related news, and antitobacco entertainment (e.g., puzzles and videos of 1950s cigarette advertising, featuring stars who later died of smoking-related causes).

The quit plan consisted of five key elements, beginning with a motivational introduction designed to emphasize benefits. The subsequent sections of the program offered guidance in avoiding cravings while quitting, dealing with cravings that do occur, and the value of enlisting social support while quitting. The last major section encouraged setting a specific quit date with a quit calendar. The program concluded with motivational messages designed to increase self-efficacy. The social support component was moderated by a paraprofessional ex-smoker. Our forum host welcomed new members and provided encouragement for cessation efforts via E-mail. The Ask-an-Expert option provided responses from a team, including one of the authors of this report, a psychologist (Dr. Lichtenstein) with extensive clinical and research experience in smoking cessation and counseling.

### Measurements

Assessment was accomplished on the Web site at baseline and, for the initial 370 enrollees, at the 3-month follow-up. Both baseline and follow-up surveys were kept brief to minimize response burden and, presumably, reduce attrition. After the baseline survey was completed, participants received immediate access to the entire Web site. Baseline measures included smoking behaviors (e.g., frequency and time of first use in day), cessation self-efficacy, prior use of cessation aides (e.g., NRT), current social support, and a report of how they first were directed to the Web site. The mean times for completing the baseline and follow-up assessments were 5 and 6 min, respectively. All subjects who completed the baseline survey were mailed checks for US\$10.

### Results

The analyses of recruitment and Web site use are based on the entire set of 606 subjects over the 6-month pilot test. Outcome analyses (sample retention, cessation rate, incentive impact, contact mode response, and satisfaction) were based on data from the 370 follow-up subjects (participants enrolled for 3 months by the end of the pilot test); these subjects did not differ significantly from the overall sample on any demographic variable.

#### Recruitment results and Web site use

The total number of persons recruited through each method is shown in Table 1. The most successful recruitment strategies, as reported by participants upon registration, were through the search engines and user groups (the first two items listed in Table 1). The newspaper recruitment methods brought in a number of users but were very effective for only a short time period (occurring on only 25 days of the 180-day duration of the pilot test).

The Web site recorded 24,252 logins (i.e., instances when a participant used a username and password to gain access to the Web site), with an average of 108

logins per day over the 6-month period. Most activity occurred immediately after completion of baseline assessment and on weekdays, rather than weekends. Sixty-three percent of the 606 participants accessed the personalized Quit-Plan segment. The social support group component was used most frequently; the library resource area was the second most popular. Women (logins mean  $\pm$ SD of  $8.3 \pm 39.2$ ) tended to participate more frequently than men (mean of  $6.7 \pm 41.5$  logins), with female participation most pronounced for messages posted in social support (mean of  $4.4 \pm 34.6$  postings) compared with men (mean of  $1.8 \pm 14.2$  postings). Considerable variation in the number of logins was noted, with 10% of the participants accounting for 79% of logins. While the gender differences and participation rates might indicate trends, these results were not statistically significant.

#### Sample retention

In response to the 370 3-month follow-up assessment reminders, 209 subjects (56%) completed 3-month assessments (Figure 1). Fifteen percent (56) of the messages "bounced" (were returned because of invalid E-mail addresses or disruption in E-mail service), and 29% (107) did not result in any response (may or may not have been received by the addressee). Of the 209 subjects completing the survey, 81% did so via the Web, 5.5% by E-mail, and 13.5% by US mail. We noted no significant differences at baseline on any demographic or smoking behavior variable between those who completed the follow-up assessment and those who did not.

#### Cessation

Of the 209 participants who provided follow-up data, 67 subjects reported abstinence ("no cigarettes, not even a puff, in the last 7 days"), for a cessation rate of 32% (30% for women and 34% for men). Using intent-to-treat criterion (i.e., nonrespondents are considered to be smokers), the cessation rate was 18%. Gender differences were nonsignificant. The only baseline variable predictive of cessation was the way in which the participant learned of the Web site (i.e., via the Internet vs. some other method). Participants recruited via the Internet (the first two groups listed in Table 1) were significantly more likely to quit than those recruited through other means,  $n=140$  67% vs.  $n=69$  33%,  $\chi^2=9.60$ ,  $df=1$ ,  $p<.01$ . None of the remaining baseline or process variables, including gender, smoking rate, or frequency of participation were significant predictors of cessation.

**Table 1.** Recruitment method as reported by participants at enrollment

Recruitment method	Persons recruited
Internet search	325 (53.7%)
Internet group	113 (18.7%)
"Other" (unspecified)	91 (15.0%)
Newspaper	67 (11.0%)
Pamphlet from doctor's office	3 (0.5%)
National organization referral	3 (0.5%)
Radio interview	2 (0.3%)
Pamphlet in other location	2 (0.3%)
Total	606 (100%)

### *Incentive and contact mode response*

Although the group offered the US\$20 survey completion incentive had a higher completion rate (60%) than those receiving the US\$10 incentive (55%), the difference was not significant. Similarly, the response rate did not differ for the contact modes, with 55% responding to repeated E-mails and 60% responding to letters sent via US mail.

### *Convenience*

Overall, participants rated the intervention components highly. On a six-point scale from *very easy* (0) to *very difficult* (5), 63% rated the Web site as *easy* or *very easy* to use (mean =  $1.11 \pm 1.00$ ). The Ask-an-Expert section was rated most highly ( $.80 \pm 1.30$ ). All other components had an overall rating of *easy*, except the Information Sections, which received a rating of  $1.97 \pm 1.38$ , or *somewhat easy*.

In conclusion, the rate of smoking cessation reported by users of the Web site, even on an intent-to-treat basis, is encouraging. Recruitment was most successful through the Internet, and incentives did not ameliorate attrition for a 3-month follow-up. Smoking cessation outcomes were assessed only by self-report, but the demand characteristics for false reporting in this context are limited (Velicer, Prochaska, Rossi, & Snow, 1992). We conclude that these results provide reason for further evaluations of comprehensive Internet-based smoking cessation interventions. However, given the lack of a control condition, we cannot conclude that quitting was a function of our Web site rather than other factors. Determining the relative contribution of a specific Web site presents difficult challenges, given that typical Internet users appear to sample various sites.

Although we were able to recruit hundreds of subjects over the Internet itself, it is not clear that this will continue to be a viable approach. The largest single group found our site via search engines. Indeed, the typical Internet user appears to access numerous sites when searching for information or support pertaining to a specific topic (Pastore, 2001). If one artificially restricts access to a single site, it raises questions about the impact of that site under more typical conditions, in which the user accesses a number of sites for the same reason. Unless the participant is somehow prevented from using any other computer, there is no way to be assured that the participant did not use alternative sites, even if monitoring software is used to track which Web sites have been accessed from a specific computer. A true open-Internet sample has a high degree of anonymity. That may be part of the appeal of Web-based programs; however, anonymity makes tracking participants difficult. It also can be difficult to be certain that participants are who they claim to be.

Although requesting postal addresses or government-issued identification numbers (e.g., US Social Security number or driver's license number) may provide alternative means of validating identity, this request could result in many people not participating, and may thus bias the sample. Electronic identities such as E-mail addresses are not stable. The fact that 15% of the previously valid E-mail addresses were not valid 3 months later, and that we were able to track and elicit responses from only 56% of our sample at 3 months, poses a distinct threat to interpretation of results. A telephone follow-up might be more productive in reducing attrition; we have found this method useful in other outcome studies (e.g., Lee, Lichtenstein, Andrews, Glasgow, & Hampson, 1999). These methodological issues will require consideration for researchers studying behavior-change Web sites.

Future research on Web-based interventions also must include component-level analyses to determine which aspects of Web-based intervention are effective for specific kinds of people. In our study, the social support module, in particular, was heavily used, and many positive comments about it were received. We believe that the popularity of the social support module was due in large part to the presence of the ex-smoker staff member assigned to moderate the bulletin board and chat room. A question to address is whether an effective program requires human moderation or can be effective if it is fully automated (thus potentially having a much lower cost).

The existence of the large proportion of women in our sample (72%) seems to follow current Internet-use trends, with increasing numbers of women online (Rickert & Sakarow, 2000). Indeed, the shifting demographics of the typical Internet user base may also pose a threat to the long-term validity of research findings. However, the potential to reach into the homes of millions of smokers with a program they can use any time, night or day, will continue to be attractive. The challenges of making certain that effective programs are available must be met.

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