

# Measuring Smoking Cessation: Problems with Recall in the 1990 California Tobacco Survey<sup>1</sup>

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## Abstract

Measures of quitting activity are important both to evaluate public health interventions and to predict the likelihood of future quitting in the individual smoker. In population surveys, such measures are generally based on recall and thus may lack validity. In this article, we present the results of a 1-year quitting history of 8924 persons from a random-digit dialed population survey conducted in California in 1990. Respondents often forgot dates of quit attempts other than the most recent. Also, our results suggest that respondents may not recall short quit attempts at all, especially if they took place more than a few months before the interview. Thus, accurate population measures of relapse rates or quitting activity should rely on recall only for the last few months before the interview. Using data from quit attempts that took place within 4 months of the interview, actuarial analysis showed that 71.1% of attempts lasted at least 2 days, 58.5% at least 3 days, but only 39.2% lasted a week or more; this rate dropped to 19.6% at 1 month and to 14.1% at 3 months. As a predictive measure, a quit attempt that lasted a week or longer in the last year appears less biased by recall than any attempt of a day or longer in the last year.

## Introduction

Successfully quitting smoking is the behavior most likely to improve the health prospects of smokers (1, 2). Several studies indicate that most smokers have tried to quit and would prefer not to be addicted to cigarettes (3). While the rate of accrual of smokers to successful quitters is small (approximately 1%/year), population surveys of the United States indicate that more than one-third of smokers make a serious attempt to quit smoking each year (2, 3). Thus, if it were not for the high failure rate, the prevalence of smoking would decline precipitously.

Population measures of quitting activity and quitting success have relied on smoking prevalence, the quit ratio, and recall of past quit attempts. The first two measures may

be useful for evaluating long-term trends but it is the information that can be derived from the history of quit attempts that can allow monitoring of the immediate effectiveness of public health interventions designed to encourage quitting. In addition, appropriate measures of past quitting activity may help predict future quitting activity. For instance, the model developed and refined by DiClemente *et al.* (4) divides the quitting process into five stages; smokers in the preparation stage plan to quit within the next month and have made at least one attempt to stop smoking in the last year. Recent studies have also related quitting history to future quitting success. In the Multiple Risk Factor Intervention Trial (MRFIT) study, a previous quit attempt was associated with long-term abstinence from cigarettes (5). Another study of self-initiated quitters showed that the duration of the longest previous quit attempt, but not the number of attempts, was positively related to the duration of the new attempt (6). Since these measures are based on recall by the smoker, their validity becomes an issue if they are to be used in predictive models or for the evaluation of interventions.

Previous population surveys of smoking behavior have asked smokers only about their most recent quit attempt (3, 7). To our knowledge, no effort has been made to reconstruct a quitting history of all attempts made within a given time. However, questions to reconstruct such a history were asked in the 1990 California Tobacco Surveys. This article examines the recent quitting history of smokers interviewed in this survey and explores the effect of recall on measures of quitting activity and continued abstinence.

## Subjects and Methods

**Survey Methods.** Between June 1990 and March 1991, 24,296 adults were interviewed as part of the California Tobacco Surveys. These telephone surveys were commissioned by the California Department of Health Services and the Los Angeles Department of Health Services to establish a baseline for the evaluation of the California Tobacco Tax Initiative. Interviews were conducted by Westat, Inc. using a stratified Waksberg random-digit dial method (8). A screener interview obtained information on the smoking status of all household members in 57,246 California households (response rate, 75.1%). The screener interview identified all adults ( $\geq 18$  years) who had smoked in the last 5 years and 28% of all other adults to be scheduled for an extended interview. The response rate for the extended interview was 75%.

Each respondent was assigned a base weight that reflected his or her probability of being selected for interview. The base weights were then adjusted to California population totals derived from census data so that population estimates could be computed from the data. Sampling and weighting procedures are described in detail elsewhere (9).

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The 14-minute (average time) extended interview included questions on recent and lifetime smoking history and current and past use of other tobacco products. The interview also asked questions concerning health beliefs, social attitudes and policy related opinions, workplace smoking restrictions, physician advice to stop smoking, nonsmoker activism, and exposure to media messages regarding smoking.

**Questions Analyzed.** Smoking status was assessed according to the standard questions, "Have you smoked at least 100 cigarettes in your entire life?" and "Do you smoke cigarettes now?" (2, 3). Those responding yes to both questions were considered current smokers, those responding yes to the first question and no to the second one were considered former smokers, and the remainder were considered never smokers. Former smokers were asked to provide a date when they last smoked regularly and another date for when they had last puffed on a cigarette.

All current and former smokers who had quit in the last 5 years were asked, "Were you smoking at all around this time 12 months ago?" If the respondent answered yes, the interviewer asked about the short-term quitting history. Respondents were asked, "During the past 12 months, have you quit smoking intentionally for one day or longer?" If the respondent answered yes, the interviewer ascertained the day, month, and year of the start of the most recent quit attempt, as well as its duration. The respondent was then asked, "Did you quit smoking intentionally for at least a day any time before that within the past 12 months?" Again, an affirmative response was followed by the questions that elicited the date and duration of the quit attempt. These three questions (attempt, start date, and duration) were asked for each previous attempt until the respondent answered no to whether there had been a previous quit attempt.

**Statistics.** Confidence intervals were derived by a variant of the jackknife procedure (10). In this survey 33 subsamples were taken from the full survey file, and sample weights were computed according to the same procedure as for the full sample. Variances were estimated on the basis of the deviations of the subsample percentages from those for the full sample. The computed variances were then used to derive 95% confidence intervals in the usual manner. We computed quitting success by the product-limit survival method (11). Again, we used a jackknife procedure to derive variance estimates. The  $\chi^2$  goodness-of-fit test was used to test the hypothesis that quit attempts of a given duration were uniformly distributed over each of the 12 months before the interview. The observed frequency was taken as the weighted percentage of all quits in a month multiplied by the actual number of quits in the past year, and the expected frequency as the number of actual quits in the past year divided by 12. For 15- to 30-day quit attempts, the most recent month was omitted from the analysis, and the expected frequency was obtained by dividing by 11 instead of 12.

## Results

**Number of Quit Attempts Reported in the Past Year.** Altogether 10,127 respondents who were classified as currently smoking or having smoked in the last 5 years reported smoking 12 months before the interview. At the time of the interview, 8924 (87.4%, weighted percentage) of these re-

Table 1 Number of quit attempts of at least 1 day duration reported in the last year<sup>a</sup>

Attempts	Former smokers	Current smokers
0		4869
1	187 (23.5 ± 1.0)	2787 (76.5 ± 1.0)
2	263 (24.2 ± 1.2)	917 (75.8 ± 1.2)
3	87 (23.5 ± 4.3)	238 (76.5 ± 4.3)
4+	36 (20.5 ± 1.3)	116 (79.5 ± 1.3)

<sup>a</sup> Entries are raw frequencies with weighted row percentages and 95% confidence intervals presented in parentheses.

spondents were smoking and 1203 (12.6%) reported not smoking.

The distribution of the numbers of quit attempts reported in the past year is shown in Table 1 for both current and former smokers (the date when they last smoked regularly was within 1 year of interview). The number of attempts ranged from 0 to 15. Among current smokers, nearly one-half (46.1 ± 0.7%) made at least one quit attempt in the past year. Also, about one-third (31.4 ± 1.2%) of former smokers reported at least one quit attempt previous to their current period of abstinence. Former and current smokers are about equally represented among those reporting multiple quit attempts.

**Recall of Date and Duration of Quit Attempts.** The month for the most recent quit attempt is recalled fairly readily (84.3 ± 0.5%) but the likelihood that it is recalled decreases substantially for earlier attempts (45.2 ± 0.2% for all attempts after the second most recent). Even for the most recent attempt, only 39.9 ± 0.4% recalled the exact day of the quit attempt. However, the respondents readily recalled the duration of the quit attempt, with only a slight decrease from 95.0 ± 0.3% for the most recent attempt to 83.9 ± 0.8% for all attempts made before the second most recent attempt.

If the month of a quit attempt was missing (26.5 ± 0.3% of all reported attempts), we could not compute the time elapsed from the start of the quit attempt to the interview date. If only the day was missing, we assumed that the attempt began on the 1st day of the month (which minimized the chance that an attempt would be classified as inconsistent, see below). If the year was missing, we could impute it from the month given for the quit attempt and the date of the interview. Of the 5698 attempts for which we could compute an elapsed time from the quit attempt to the interview, 5575 (97.8 ± 0.1%) yielded a date for the quit attempt that was consistent with the interview date. A quit date was considered consistent with the interview date if the quit date plus the duration in days of the quit attempt did not exceed the interview date.

**Time Elapsed to Interview and Length of Quit.** In the analysis that follows, we omitted inconsistent (see above) quit attempts and those of unknown duration. Fig. 1 presents for current smokers the distribution of failed quit attempts of a specified duration, according to the elapsed time from the start of the quit attempt to the interview date in months. If recall were perfect, we would expect that quit attempts of any duration would be uniformly distributed over the 12 months before the interview. However, many more quit attempts lasting 1 or 2 days were reported in the 4 months preceding the interview than in any of the earlier months ( $P < 0.005$  and  $P < 0.0001$ , respectively). The uniformity

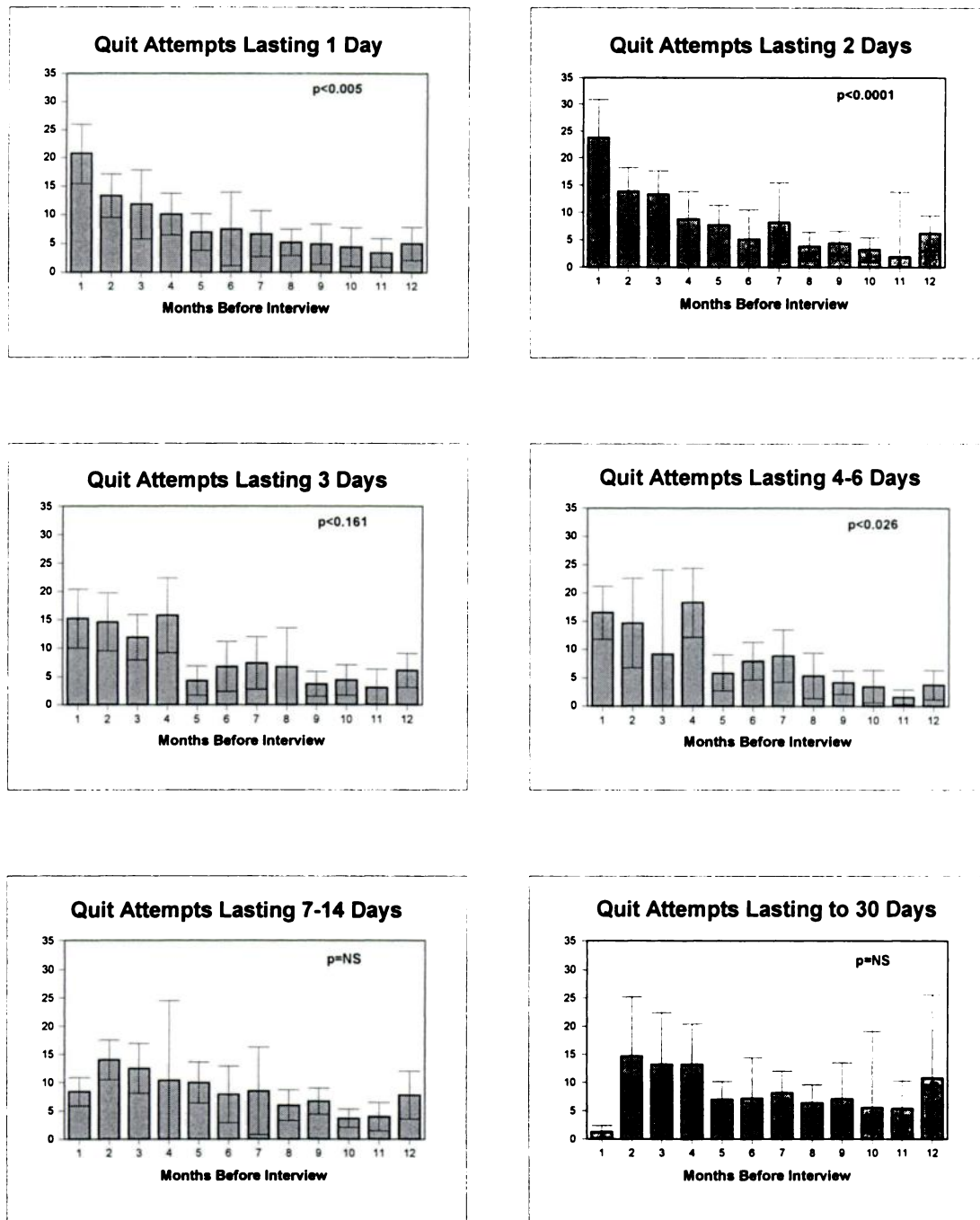


Fig. 1. Percentage of quit attempts of a given length in each month before interview. P values are for the  $\chi^2$  goodness-of-fit test of the hypothesis that quit attempts of a given duration are uniformly distributed over the 12 months before the interview. NS, not statistically significant.

hypothesis could not be rejected for 3-day attempts but could be rejected for 4–7-day attempts ( $P < 0.026$ ). Longer attempts were remembered better, and the hypothesis of uniformity could not be rejected. However, in general, fewer attempts appear to be reported earlier than 4 months before the interview.

**Per Attempt Quitting Success (Abstinence) Rates.** The smoking relapse curves shown in Fig. 2 include information

on all quit attempts reported to have been initiated during the 12-month interval. Thus, the ordinant of the curve gives the percentage of attempts (rather than the percentage of smokers) where the smoker is still abstinent at a given time after the attempt was initiated. The per attempt abstinence rate at 1 month was  $19.6 \pm 3.5\%$  for the curve computed from the quit attempts initiated between 0 and 4 months before interview. This rate was much higher for attempts

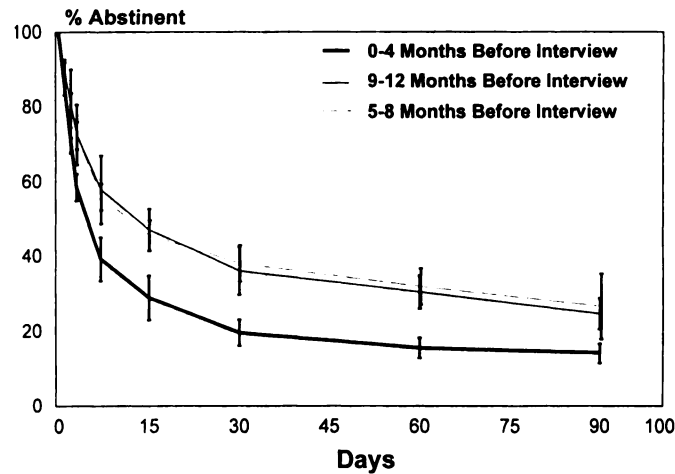


Fig. 2. Relapse curves for quit attempts taking place in different time intervals before interview.

made 5–8 months and 9–12 months before the interview ( $38.0 \pm 4.8\%$  and  $36.5 \pm 6.4\%$ , respectively). Nearly the same degree of difference exists in the 3-month abstinence rates computed from quit attempts initiated immediately before the interview and in the earlier time intervals; for the 0–4-month period before interview, the 3-month abstinence rate was  $14.1 \pm 2.6\%$  but was  $26.5 \pm 8.7\%$  for the 5–8-month period and  $25.0 \pm 4.1\%$  for the 9–12-month period before interview.

### Discussion

When smokers were asked to recall the date of quit attempts made in the last year, they experienced considerable difficulty in providing this information, some even for their most recent quit attempt. Compounding the problem is the observation that respondents may not remember short quit attempts at all, especially if they occurred more than several months before the interview (Fig. 1). These results suggest that for quit attempts of short duration, the interview should only cover the immediate 3- or 4-month period before the interview. However, when asking about attempts lasting a week or longer, it is probably valid to go back as much as 1 year before the interview.

The recall problem is further illustrated by the very different relapse curves computed from quit attempts initiated in the 4 months before interview compared to those computed from attempts initiated earlier (Fig. 2). Forgotten quit attempts of short duration could not be included in the analyses of the earlier time periods.

An instrument that could accurately capture quitting activity would be useful to assess the impact of intervention strategies such as mass media campaigns or legislation restricting smoking in the workplace. Our data show that population-based surveys can provide a snapshot of quitting activity for an interval of several months before the interview but may underestimate earlier quitting activity. Thus, it would be necessary to compare the results from carefully timed, separate waves of a survey conducted before and after an intervention to obtain a meaningful measure of its effect.

**Abstinence Rates.** When quitting behavior in the 4 months before the interview was examined, 71.1% of quit attempts

lasted at least 2 days, 58.5% at least 3 days, but only 39.2% of attempts lasted at least 1 week. This rate dropped to 19.6% for 1-month abstinence and to 14.1% for 3-month abstinence (Fig. 2). The actual 3-month abstinence rate may be slightly lower since inconsistent attempts and those of unknown duration were not analyzed and attempts where the initiation month was not recalled were discarded but may have taken place in the 4 months before the interview.

Despite these limitations, our results are the only population-based estimates reported to include multiple quit attempts during the period of interest. Previous studies have reported on multiple quit attempts but the study subjects were recruited through newspaper advertisements looking for smokers who were trying to quit. One such study of 630 self-quitters showed a 47% abstinence rate at 2 days, 38% at 1 week, 27% at 1 month, and 20% at 3 months (12), a more gradual decline than in our study. In another study reporting short-term quit rates for 235 self-quitters, 68% attempts were still ongoing at 3 days, 49% at 1 week, 22% at 1 month, and 19% at 3 months (6). It is likely that some self-selection bias toward longer-term quitters who answered the advertisements influenced the abstinence rates. Also, if respondents did not recall some of their previous quit attempts that occurred well before they responded to the advertisement, the abstinence rates would be higher. Nevertheless, these studies and our results confirm that the short-term continued abstinence rates are discouraging. Clearly, relapse prevention should focus on the first few critical days and weeks. Pharmacological agents such as the transdermal nicotine patch may play a role during this critical period.

**Potential Limitations Other Than Recall.** The percentage of California smokers who report making a quit attempt in the last year, 46.1%, is higher than that from national population surveys. This finding may be related to the nature of the different questions asked by the two surveys. The 1987 National Health Interview Survey asked current smokers, "Have you ever made a serious attempt to quit smoking?" From those answering yes, it was established that just under one-third of those smoking 12 months before the interview had quit for 1 day or more in the last year (2). This is about the same percentage reporting a quit attempt in the

last year on the 1991 National Health Interview Survey, 36.4%, where the question was, "During the past 12 months, have you quit smoking for one day or longer?" coupled with "quit on purpose" as the reason. Thus, the higher percentage of California smokers with a quit attempt in the last year is probably due to more quitting activity in California rather than the manner in which the quitting history was ascertained. For about two-thirds of the time (June to December 1990) when interviews were being conducted, there was a media campaign aimed at reducing smoking prevalence by discouraging uptake and encouraging quitting.

The question on how long the smoker stayed off cigarettes may have been ambiguous. The respondents could have given the date when they first smoked a cigarette or the date when they had more or less resumed their normal habit. However, studies have shown that many lapses soon lead to a complete relapse to smoking (13, 14). Another problem with the survey methodology was fatigue bias. While monitoring the interviews, we noticed that some smokers became impatient with the "any other attempt" question and may have answered no simply to get on with the interview. Time-line strategies used in alcohol use/abuse research (15, 16) could possibly be adapted for acquiring information about quit attempts; these strategies might improve matters with respect to the two problems noted above as well as improve the recall of dates. The respondent would be informed that this portion of the interview would reconstruct a quitting history for the present month and the past 3 months. The interview could then proceed with a narrative along the following lines. It is now August; please identify dates in August when you intentionally did not smoke. What about July? Now that we have covered July, what about June? Finally, what about May? From the dates mentioned, the beginning and duration of quit attempts can be determined.

In conclusion, since respondents often forget quit attempts of short duration that occur well before the interview, accurate population measures of abstinence rates or quitting activity should rely on recall only for the last few months before the interview. However, as a predictive measure, having a quit attempt that lasted a week or longer in the last year appears less biased by recall. Many smokers are trying to quit but are failing during the first few days; new interventions that can help smokers through this critical period should be designed and evaluated.

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