

Tracking and Attrition in Longitudinal School-Based Smoking Prevention Research¹

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Research in the development of school-based smoking prevention programs has resulted in a set of approaches of known short-term efficacy. Further evaluation of these approaches now requires long-term follow-up of participants. To minimize the problems caused by attrition in these longitudinal studies, investigators have developed techniques for tracking study participants. Based primarily on the use of the telephone, mail, and public documents, these methods require good background information on both the study participants and their parents. This article summarizes the experience of three teams of researchers engaged in such follow-up studies. These investigators have identified the types of background information most useful in long-term follow-up of participants, have developed a set of strategies to obtain such background information, and have developed methods for successfully tracking participants after a lapse of several years. © 1989 Academic Press, Inc.

INTRODUCTION

The Problem

Longitudinal study designs are important for a thorough understanding of the effects of health education programs. Not only may health promotion or health education programs have delayed effects, but the initial effects may be reversed or weakened over time. These potential long-term effects are described by Green (1) as the " sleeper effect," " backsliding effect," and " trigger effect."

In the past decade, researchers have developed school-based smoking prevention programs that, on a short-term basis, have successfully reduced cigarette smoking incidence among schoolchildren (2). In order to investigate the long-term effects of these programs, as well as to document the occurrence of reversals or weakening of initial effects, successful school-based smoking prevention pro-

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grams are being investigated with longitudinal designs. Research has documented that loss to follow-up is a major threat to the validity of longitudinal study designs (3, 4, 5). Also, we know that estimates of smoking rates based only on those students still in school are in error (6). While longitudinal follow-up studies generally report their overall success rates, little detail on follow-up methodology is included. However, investigators in the field of smoking prevention have begun to develop and refine techniques for successfully tracking children and adolescents involved in school-based projects. This article describes the experiences of two longitudinal smoking prevention projects and describes how these experiences are being used to refine the approach to tracking in studies now under way.

Background

The literature describing tracking techniques consists almost entirely of studies of adults (although in several of the studies the subjects were adolescents at baseline). In a review of tracking methods, Eckland (7) provides a fairly comprehensive list of techniques: mail, which includes the use of postal services such as forwarding and record updates; telephone directories; contacting next door neighbors when the respondent has moved; long-distance operators; local and regional coordinators such as alumni offices; local utility companies; high-school records; professional associations, marriage license bureaus, city, county, and state tax rolls; state agencies such as the department of motor vehicles; federal agencies such as the Social Security, Veterans Administration, Bureau of the Census, and Department of Internal Revenue; and, finally, private sources such as credit companies.

In practice, most recent researchers have depended on telephone communication as a primary technique for locating respondents (8, 9). Telephone searches, as described in these sources, include the use of local and long-distance information operators as well as several types of directories, including street directories and reverse directories. Telephone searches may include directly searching for the respondent and for relatives; searching for persons with the same last name who may know the respondent; and use of reverse directories for neighbors of the last known address, who may know where the respondent is. Despite the popularity of the telephone as a primary technique, some researchers have found mail to be a cost-effective initial technique (10). Mail can be used to reach respondents who have no listed telephone. Mailing services can also provide forwarding addresses for the respondent or relatives.

Several authors have used public records in their searches. Most frequently reported are voter registration (11), marriage licenses, real estate records, and wills (10).

All of the above techniques are dependent upon having a base of good background information about study participants. McAlister *et al.* (11) emphasize the importance of gathering crucial background data, such as date of birth and Social Security number, at baseline. Some researchers have also asked the respondent at baseline to provide the names and addresses of several persons who will always know their whereabouts (9); these contact persons can then be searched for using the same techniques as described above. The techniques described by these au-

thors are generally useful in tracking and follow-up studies. There are special problems involved in tracking adolescents, however, which are of concern to investigators following populations involved in school-based programs. Most similar to the problems faced in tracking adolescent samples were the problems faced by Lerman (12), who described the successful tracking effort used in following up respondents in Jessor and Jessor's (13) study of young adults. While most of the techniques used in this follow-up were similar to those described above for adult populations, it is noteworthy that for both the high school and college samples father's name was available or could be located. Directory search procedures could be applied to the parent as well as directly to the respondent.

The next section of this article describes the unique problems and successes encountered by three groups of investigators involved in longitudinal smoking prevention research projects.

METHODS IN ADOLESCENT FOLLOW-UP STUDIES

University of Minnesota, Minneapolis

Investigators at the University of Minnesota have undertaken a follow-up study of 7,124 students who had previously been involved in three junior high school smoking prevention studies (5, 14-17). The school districts involved were suburban and largely middle-class. The entire 7th grade enrollment from 10 junior high schools in these districts had participated in the earlier studies in 1979 and 1980. At the time of this follow-up in 1984-1985, they ranged in age from 15 to 20 years but most were 16 to 18 years old and in 11th or 12th grade. While 5,574 were still enrolled in their original school districts, 1,550 were not. It is the tracking of these 1,550 which is the focus of this article.

Because of the students' and parents' consent to participate in the earlier phases of the study, participating school districts allowed the researchers access to selected information from the participating students, including parent/guardian names, last known address, and the student's birthdate. If school records had been sent to a new school, the location of that school was made available.

Based on previous experience with follow-up studies and on the comments in the literature, as discussed above, the investigators selected telephone calls as the primary method for tracking and follow-up. When telephone searches, including directory searches and the use of local and long-distance operators, failed, mail was used in an attempt to get a forwarding address. Public records were generally not fruitful sources of information for these respondents, with the exception of driver's license records. Telephone tracking of adolescents required several modifications of the usual approach. First, tracking by necessity was concentrated on the parent or guardian. When identifying information on parents or guardians was unavailable, telephone searches were generally unsuccessful. Each parent or guardian was tracked under his or her own name, due to the frequent break-up of families. More difficult cases were sought through the driver's license bureaus of states the respondents or their families may have lived in. Driver's license bureaus generally required full name and birthdate in order to search for current address, but in the case of unusual names they often agreed to search even if no birthdate

was available. Searches were undertaken for both the study participant and the parents. Searches of driver's license bureaus in various states would have been more effective had Social Security numbers been available.

Another data item which was uniquely useful in this adolescent population was information on where school records had been sent; this permitted a search in the new community. If the family could not be located through directory searches in the new community, the new school could sometimes provide information about subsequent transfers.

Using combinations of these techniques, 1,395 of the 1,550 students (90%) were located and interviewed by telephone. This population was a particularly difficult one, consisting of a large number of drop-outs and students who had moved some years previously.

Students enrolled in the longitudinal follow-up study described above are to be interviewed each year through 1989, at which time most will be 4 or 5 years past high school graduation. Additional data which have proven helpful in follow-up are being collected from students each year, to aid in the next year's follow-up effort. The primary pieces of data requested are full name, current address, current telephone number, Social Security number (if any), and birthdate (if not already available). Students are additionally asked (a) to provide the name, address, and telephone number of an adult who will know their whereabouts in the coming year, (b) whether they plan to change their names in the coming year (this has proven useful for both males and females), and (c) where they think they will be living in about 12 months. With these data available on most students, telephone tracking efforts have successfully located about 95% of participating students on a continuing basis during the subsequent 2 years of the study.

University of Waterloo, Waterloo, Ontario

Investigators at the University of Waterloo have been engaged in following 662 students who participated in the first Waterloo Smoking Prevention Project (18, 19) between 1979 and 1982. The students, then in 6th through 8th grades, came from two school districts one of which was predominantly urban and the other was predominantly rural. The project reported here was a 5- and 6-year follow-up in 1985 and 1986, when the majority of subjects were in 11th and 12th grades. Little background information was available on these students, other than date of birth and the high school they planned to attend as they moved from 8th to 9th grade. There had been no contact during the 2.5 years between projects. Failure to obtain cooperation from one of the local school districts hampered the 1985 follow-up. The district had not been involved in the original study, but 259 of the students indicated that they intended to transfer to its schools in the 9th grade. Partial cooperation was secured during the second year, however; the 1986 follow-up was therefore more successful and is described here.

The Waterloo staff located 241 students still attending schools in their original school districts, and 192 in schools of the third (new) district. As in the Minnesota project, they then initiated tracking procedures for the remaining 229 participants who had moved or dropped out of school since last contact, including those who had moved away during the 3 years of the original intervention. Because so little

was known about these students, they were first tracked through school systems. Schools generally provided information on the school to which a student had transferred, or the last known address and a parent's name if the student had dropped out of school. When a subject was located in a school, the school usually provided researchers with a home address and telephone number or agreed to forward a questionnaire to the student.

Once school information had been exhausted, telephone calls were selected as the primary tracking mechanism. This was especially successful in the rural school district, where all listings for a given name in a small exchange could be contacted easily, and where respondents often knew or were related to the person being tracked. In addition to the standard procedures of directory searches, the Waterloo staff used several innovative techniques. For example, cooperative study participants were asked to provide information on the whereabouts of former classmates. Also, staff made use of their knowledge of local institutions to contact jails and hospitals to request permission to send questionnaires to persons they had reason to believe were inmates.

Mail searches were generally not successful, because Canada Post does not provide information on forwarding address. Driver's license searches were similarly not rewarding, as few of the subjects had held licenses at this age.

Cooperation of the schools proved to be the key to success in locating students in the Waterloo study, because so little information about subjects or their families was available. In the school district which provided only partial cooperation, although questionnaires were distributed to students in attendance in its schools, no contact with school staff was allowed. Hence, researchers were unable to obtain key information on the whereabouts of students not located in those schools. Telephone and mail searches were successful in locating only 68% of these subjects. In comparison, 87% of the other tracked subjects were located. Overall, 191 of the 229 participants who required special tracking efforts were located in 1986, a success rate of 83%. This represents the follow-up rate for the most difficult group of students, including drop-outs and the more transient students (as in the Minnesota Study), after a lapse of 2.5 years.

Comparison of Minnesota and Waterloo

Table 1 compares tracking success at varying levels of effort in the Minnesota and Waterloo projects. Both projects first searched for participants in their original school districts; those not found were then assigned to tracking. Minnesota located a larger proportion of subjects in their original districts. Of those assigned to tracking, Minnesota was able to reach nearly half using only one or two sources of information, while Waterloo reached only 14.0% with this level of effort. This difference may be attributed to the Minnesota strategy of directly initiating telephone searches for these participants, while Waterloo first searched local school districts.

While a minimal amount of effort was sufficient to locate the majority of respondents, both projects had a significant subgroup of participants who required substantial effort (more than 10 sources of information) to locate. This group,

TABLE 1
TRACKING SUCCESS BY LEVELS OF EFFORT, MINNESOTA AND WATERLOO STUDIES

	Minnesota (N = 7124)	Waterloo (N = 662)
% Located in original districts	78.2%	36.4%
% Assigned to tracking	21.8%	63.6%
Of those assigned to tracking		
% Located using		
1-2 sources ^a	46.3% ^b	14.0%
3-5 sources	19.7%	55.6%
6-10 sources	10.4%	15.7%
>10 sources	16.2%	5.5%
Not located	7.4%	9.3%

^a A "source" is defined as a unique telephone number or address, or a unique tracking device such as a reverse directory, mailed letter, or driver's license search.

^b These estimates of tracking success in Minnesota are based on a randomly selected subsample of 432 cases and may differ slightly from the tracking success in the entire group of 1,550 persons.

however, included many of the most deviant individuals (drop-outs, runaways, etc.) and hence the estimation of smoking rates in this group is particularly important (6).

Fred Hutchinson Cancer Research Center, Seattle

Investigators at the Fred Hutchinson Cancer Research Center in Seattle are conducting a smoking prevention project involving 8,402 students (initially third graders) in 40 collaborating school districts in Washington state. Plans call for tracking and follow-up of these students at Grades 5, 7, 9, and 12 and 2 years beyond high school. Drawing on the experiences of the follow-up studies described above, investigators at Hutchinson are developing a database of information on their participants that will facilitate future tracking efforts. This includes developing excellent relationships with participating schools as well as building a database of information about each individual participant.

Data are being collected both from the collaborating schools and directly from parents. Schools have been asked to provide information on parents in order that researchers may directly approach parents to obtain further information. Schools have also agreed to update their information on participating students as changes (e.g., transfers) occur. Parents are also being asked to provide additional information on participants, including mother's maiden name, home and work telephone numbers for both parents, and the parents' birthdates, Social Security numbers, and driver's license numbers; moving plans in the next year; and identifying information about a friend or relative who will know the family's whereabouts.

These techniques have proven quite successful in obtaining cooperation to date. All of the schools contacted so far have agreed to provide information. In addition, 7,960 letters have been sent to parents of students enrolled in the participating schools. When parents do not respond to two mailings, telephone contact

is initiated. Overall, 93.8% of parents who received letters have responded, with a total of 88.1% providing the requested information, and 5.7% choosing not to comply. About three-quarters of the responses have been obtained from mailings and another one-quarter from telephone contact.

CONCLUSION

Recognizing the need for long-term follow-up of participants in school-based health promotion programs, investigators have begun to develop a practical set of techniques to facilitate follow-up of adolescents. Experiences of researchers engaged in such projects have highlighted the need for good background data on each student and for long-term cooperation by participating school districts. Specific data items which are particularly useful in tracking younger adolescents include full names of both parents or guardians, birthdate of child, Social Security numbers of parents and child, and information on school transfers. The names of contact persons and future plans of the family are also useful. Teams undertaking school-based programs or beginning follow-up of students from completed programs are designing ways to collect these data in a systematic fashion, which should greatly facilitate future tracking efforts.

Taken together, these experiences demonstrate that long-term follow-up of study participants is feasible, given sufficient effort. Development of an initial database of information on participants appears to be an important strategy for use in other such projects.

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