PROGRAM ABSTRACTS/ALGORITHMS

A tracking program to schedule subjects across multipanel longitudinal research

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Longitudinal research on complex human behavior often uses elaborate designs in which data collection is undertaken every few weeks or months, sometimes extending over a period of several years. As an example, a project is currently under way in Miami in which people being treated for alcohol abuse are assessed on a number of variables at the time they enter a treatment center, as they are released from the center, and periodically over the succeeding year, with the goal of determining what factors enhance resistance to relapse. In research of this type, each assessment "panel" occurs as a function of time elapsed since some key event, commonly entry into the research project. (In the case of the relapse study, the key event is the subject's release from the treatment center.) Because subjects typically enter such research one at a time (and thus on different dates), the timing of each succeeding assessment also must be individualized.

In multipanel research involving large numbers of subjects, the scheduling problem that develops as the project moves forward can become overwhelming. The problem is further exaggerated if the project has other scheduling requirements. For example, some projects may require that subjects not be interviewed twice in a row by the same interviewer. As another example, sometimes assessment panels vary greatly in the amount of information collected, and thus in the amount of time and effort that must be invested by the interviewer. In such a case, it becomes desirable to balance assignments made to the multiple interviewers, so that work loads are at least roughly equated.

These various problems, of course, all reduce to the need for management of several different kinds of information, and thus are amenable to resolution by use of a computer program. This article describes a program that was developed for this purpose, and is hereafter referred to as a subject "tracking" system. It has been in use for over 2 years in the relapse project mentioned above, and

it has since been modified for use in a project studying adaptation to surgery for breast cancer. In the following paragraphs, we outline the system's operating features, using the relapse project to illustrate how it can be adapted to varying needs.¹

Operating Characteristics of the Tracking System

The program, written in GW BASIC, was developed for use on any IBM-compatible personal computer. The version used in the relapse project requires two disk drives (the second drive is used to store the data entered into the system) and a printer. The system requires a minimum of 256K of RAM to operate.

The tracking system is menu driven. When the system is booted, the main menu permits the user to choose from among the following options: *subject screens*, *interviewer screen*, *weight and assign*, and *reports*. The interviewer screen permits the entry of names of individuals who collect data for the project. This screen also assigns each interviewer a numeric code. The weight and assign screen displays information about what weights are attached to the various interview tasks that the system assigns. The weighting of tasks can be modified via this screen if experience indicates that any weights are inappropriately high or low.

Entry of Information Needed to Track Subjects. Entry of information about the subjects is channeled through the subject screens option. Choosing this option displays another menu, which in turn lists one option corresponding to each interview in the project. The *intake* option (which corresponds to the initial interview) is used to enter subjects into the system.² Choice of this option leads the system to ask whether the user wants to *find* a preexisting subject or *add* a new subject. Choosing *add* causes an information screen to be displayed. This screen contains an identification code number for the new subject (which the system automatically assigns) and a similar code to indicate assignment of an interviewer to do the intake interview (which the system automatically does on the basis of distribution of the work load to date). The user enters the subject's name, and this subject is now active on the system.

This screen also contains a variety of other (labeled) blank spaces. When the intake interview has been completed, the interviewer reenters this screen (by choosing *find* rather than *add*, and then entering the code number of the desired subject) and enters a set of demographic information, including address and phone number for subsequent contact. This information may be modified at any time (e.g., if a subject moves to a new address or changes phone numbers) by reentering the intake screen and changing the relevant line.

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Because it is desirable in alcohol treatment follow-ups to obtain collateral information concerning subsequent drinking (typically from the subject's spouse), the version of the tracking program used in the relapse project also permits the entry and modification of information pertaining to the subject's collateral. This variation in the system results in the automatic scheduling of collateral interviews, as well as subject interviews, if the subject has a collateral who is willing to participate. If there is no willing collateral, a code is simply entered to that effect.

In many applications, scheduling of subsequent interviews is based on the date on which the subject completed the initial interview. In the case of the relapse study, however, entry into the project occurred during treatment, and there was no firm timetable for release from treatment. As a consequence, scheduling of subsequent interviews in this study is not based on the date of the initial interview, but on the date of the second interview. Subjects who are active in the system but who have not yet been released from treatment fall into a special category, in which interviewers are asked weekly to find out whether the subject is due to be released soon. If so, the second interview is to be conducted immediately prior to that scheduled release date.

When the second interview is conducted, the interviewer chooses the second interview from the subject screens menu, requests the system to *find*, enters the subject number, and then enters codes to indicate (1) that the interview has been successfully conducted (or, alternatively, that the subject has dropped out of treatment), (2) which interviewer conducted the interview (the system allows someone other than the assigned interviewer to conduct the session, and adjusts work load credits accordingly), and (3) the date on which the interview took place. This date then serves as the date from which all other subject contact is timed by the system.

All subsequent interviews are handled in much the same way as the second one; however, the scheduling continues to be based on the date of the second interview. After each interview has been completed, the interviewer enters the appropriate interview screen, indicates the result of the interview attempt (in the relapse project, there are several options, corresponding to several potential outcomes of an attempt to interview), indicates who did the interview, and so on. An option is available at each contact point to indicate that the interview could not be conducted successfully within the appropriate time frame, and that the system should bypass that interview for that subject and schedule the subsequent interview at the appropriate time. The system will not permit a subsequent interview to be scheduled until an appropriate code is entered into the screen for the prior interview. The system also has safeguards to prevent the user from entering interview-outcome codes into a too-advanced screen by mistake.

Scheduling Interviews and Assigning Tasks. As indicated, the tracking system uses the date of some specific interview as the date from which all subsequent interviews

are timed. When the code indicating completion of that interview is entered (in the case of the relapse study, the interview marking release from the treatment program), all subsequent contacts are scheduled automatically. The research teams are informed about the need to complete specific interviews with specific subjects by means of printed reports. The relapse project generates reports weekly, but reports can be generated as frequently (or as infrequently) as the user desires to do so.

These reports serve several functions. Most obviously, they provide information about what specific tasks are to be done during the upcoming period. They are, however, useful in additional ways to the project's administrator. Because the interview status of any given subject is updated only when the interviewer actively enters the relevant codes into the system, it is easy to tell when interviewers are falling behind in completing their assignments. Quick and easy detection of problems can foster quick resolution of the problems.

As with information entry, report production is menu driven. From the main menu, the user chooses the reports option and then, in response to a prompt, enters a date that represents the end of the period to be covered by the reports. The system then displays another menu, listing report options. The version of the system used in the relapse study has several print options, each of which results in immediate printing of some report. Choosing one option yields a list of all interviews that are to be conducted from the present date through the date entered as the end date of the report (including any carry-over interviews from the previous report). Choosing another option yields a similar list that is specific to each interviewer. Each entry in these lists includes the name of the person to be contacted, the phone number that is currently in the subject's intake record, the date at which the interview is due, and a code that indicates which interview is to be conducted. Another option yields a separate list of subjects whose release from treatment is imminent, indicating the need to determine their release status. Finally, another option lists each subject in the project, indicating his/her current status and what interviews have been completed on the subject.

Conclusion

The tracking system outlined here allows a research team engaged in a large-scale project to keep track of a large number of subjects who are at various stages of completion of the research protocol. The system transforms scheduling into an automatic and painless process, rather than a process requiring constant monitoring. It should be apparent that this system does not resolve all scheduling problems. That is, knowing when a person is due to be interviewed does not ensure that the person can be contacted on time. But freeing resources from the task of determining who is to be contacted, when, and with what interview, permits the researchers to focus more completely on the task of primary importance: data collection.

Availability

A copy of the program (in the form in which it is being used in the research project described herein) is available free of charge if you send a formatted diskette to Charles S. Carver, Department of Psychology, University of Miami, Coral Gables, FL 33124. We will supply a disk with the program at cost. A user's manual will be supplied in either case. If you wish to have the program modified professionally to suit your research application, contact Morry W. Spitzer, Pygmy Computer Systems, Inc., 13501 SW 128th Street, Suite 204, Miami, FL 33186.

NOTES

1. Our focus here is on the tracking system per se. We should note in passing, however, that the version of the tracking system used in the

relapse project has complexities that go beyond those described here. That version of the program also interfaces with an automated data collection system, specifying to the latter system what questions are to be asked of any given subject during any given stage of data collection for that subject. For additional information on this feature, contact the third author.

2. Subject recruitment into the relapse study is somewhat more complex than would be the case in most applications. It involves obtaining (by phone) a list of potential subjects (not all of whom will turn out to be suitable), entering them into the system for assignment of an interviewer, and then conducting the initial interview that will determine their appropriateness for the study. This complexity, as well as the desire to equate work loads, was why this application of the tracking system involves two steps at intake.

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