Computer-Assisted Rapid Surveys in Developing Countries

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Synopsis

Health surveys are an important source of population-based data in much of the developing world. Unfortunately, sample surveys often take more time to plan, process, and analyze than is practical, given the information needs of the local decision-makers. Rapid survey methodology (RSM) has been developed to permit health professionals to answer quickly questions about the health status and activities of people at the community level. These answers may be necessary for determining program priorities or for monitoring program activities. Rapid surveys are meant to supplement, rather than replace, information derived from existing sources of vital and health statistics data. RSM combines sample survey methods with contemporary software used in portable, battery-powered microcomputers. The ability to do rapid surveys in developing countries also requires knowledge of how to use appropriate computer hardware and software and how to apply cluster sampling theory in the local environment.

RSM was used for the first time in Hlegu Township, Burma, to conduct a health survey of young children. The survey team started the field work on May 4, 1987. Four days later, while still in the field, the data were processed and rapidly analyzed by portable microcomputers for presentation to the local township medical officer and his staff. Within 10 days of starting the field work, we issued a detailed 50-page report of the study findings.

This paper provides (a) a description of the components of rapid survey methodology, including the sample survey method, computer hardware, and computer software; (b) the general requirements for portable computer hardware in less developed regions of the world; (c) the procedures for doing a rapid survey; and (d) a summary of our experiences with RSM in Burma.

ADMINISTRATORS IN DEVELOPING countries often need answers to questions about the health status of a community or activities of local health workers. For example in a given region or community, what is the level of immunization coverage? Are oral rehydration solutions for the early treatment of diarrhea commonly available in the home? Are children still being breastfed at 1 year of age? Is severe malnutrition common among young children? Are contraceptive methods currently being used by eligible women in the community? Are births being attended by government-trained midwives?

Questions such as these often cannot be answered using data from the existing health information system. Yet answers are necessary for planning and evaluating programmatic activities. Time is usually the greatest enemy. By the time either survey or existing data are processed and analyzed, months or even years may have gone by. For political or other reasons, the busy administrator finds that decisions must be made, even in the absence of detailed information. Without facts on what is actually occurring at the population level, the decisions may be the wrong ones.

Effective health information systems gathering data on all persons in the population are lacking in many less developed regions of the world. Even when quality data exist, the information frequently pertains only to patients in hospitals or other health facilities. For these countries, periodic surveys present the only means for monitoring the impact of programmatic activities or learning what is happening at the community level. The World Health Organization and its member nations have accepted for nearly a decade the Alma Ata declaration of "Health for all by the year 2000." Without valid data, however, it is doubtful that less developed countries can deliver preventive or curative services at an effective and efficient level to all their people.

During May 1987, a team of health professionals conducted a survey using rapid survey methodology (RSM) in Hlegu Township, a rural region in southeastern Burma. RSM uses an abbreviated interview-examination form, recently validated sampling methods, powerful, battery-powered computers and printers, and appropriate computer software to shorten the time gap between when a question is asked and the answer is given. The approach used the speed of the computer to develop a 2-page interview schedule with a limited number of variables, select the sample, design and print the management control forms, process and analyze the data, and present the results in a summary report with both graphs and tables.

Children were the subject of this first RSM survey. More specifically, we selected a scientifically valid sample of 417 of the nearly 5,200 children born during the past 3 years to residents of Hlegu Township. For all births, we learned who were the birth attendants. Were they trained or untrained? For the living children, we found what proportion were immunized with varying doses of DPT (diptheria, pertussis, and tetanus), OPV (poliomyelitis) and BCG (tuberculosis). Had all children over 1 year of age received the complete immunization schedule or was there still room for improvement in coverage? Dietary intake of these young children was also determined. At what age did the mothers stop breast feeding? When are protein-rich foods such as eggs, fish, or meat introduced into the child's diet? Finally, we weighed each child and determined the existing nutritional status based on Burmese weight-for-age charts.

Using RSM, we spent 3 1/2 days in the rural regions of Hlegu Township gathering and entering survey data into a portable computer. Another half-day was spent in the field processing and analyzing the results. The following morning, we made a detailed presentation of the study findings to the local township medical officer and his staff. Five days later, a 50-page report was given to the Director of Public Health in Rangoon with a complete analysis, including detailed tables and graphs of all findings. Thus, within 2 weeks we completed a sample survey and answered questions about young children in Hlegu Township—answers that would have taken months to derive using conventional survey methods.

The findings of the survey represent what has taken place in only one township of Burma. Yet the methods seem applicable for other regions of less developed countries. Using the same approach, investigators can sample populations as large as an entire nation or as small as townships or states. Because of the involved sampling procedure and the need for portable computers, however, we recommend that rapid surveys be limited to those regions for which national-level administrators need immediate information.

In this article we will present the details of rapid survey methodology and describe how the technique was applied in Burma during early May 1987. The spreadsheet programs used for sample selection and initial statistical analysis are presented in the accompanying article (*1*). Specific findings of the health survey in Hlegu Township are presented elsewhere (*2,3*).

Requirements for Performing Rapid Surveys

Rapid survey methodology uses five things: (*a*) a short interview or examination form with clearly defined questions, (*b*) statistically valid sampling theory, (*c*) a portable, battery-powered computer and printer, (*d*) appropriate software for instructing the computer, and (*e*) a mechanism for connecting portable computers with larger desktop computers. The ability to do rapid surveys in developing countries also requires knowledge of how to use the appropriate computer hardware and software and how to apply cluster sampling theory in the local environment. In the following section we will describe each component, offer some general guidelines for selecting the most appropriate computing equipment, and mention what was actually done in Burma. The specific equipment and programs we used in Burma are listed in the box. Since software and hardware change very quickly, the interested reader should confer with a local computer dealer for the most recent model or software update.

Interview-examination form. Each variable to be collected requires time; time to formulate the question and to gather, process, and analyze the data. Further time is needed to create one or more tables and graphs and to write a description of the findings. Thus to be categorized as a "rapid" survey, the questions must be limited to a few key variables. A guiding rule is to limit the interview or examination form to no more than 2–3 pages containing 15–25 variables (that is, questions or observations). Our preference is for questions with

Microcomputer hardware and software used in rapid survey methodology

Portable hardware

Hewlett-Packard (HP) Portable Plus personal computer, 896 kilobytes (K) of internal random access memory, uses MS-DOS operating system but not IBM-compatible, rechargeable battery, 20 hours use per charge, equipped with 220-volt, 50-hz charger

HP Portable Disk Drive (HP 9114A), single drive for 3.5-inch 710 K double-sided disk, interchangeable battery pack, 2 hours continuous use per charge, equipped with 220-volt, 50-hz charger

HP Portable Thinkjet Printer (HP 2225B), inkjet, dot-matrix printer, interchangeable battery pack, 2 hours of continuous use per charge, equipped with 220-volt, 50-hz charger

Toshiba T1100 Portable Personal Computer, 512 K of internal memory, IBM compatible, one drive for 3.5-inch 720 K double-sided disk, rechargeable battery, 6-8 hours use per charge, equipped with 120-volt, 60-hz charger, input load of 25 watts (volt-amps)

Diconix Model 150 Portable Printer, inkjet, dot-matrix, rechargeable batteries, 1 hour continuous use per charge, equipped with 120-volt, 60-hz charger, input load of of 13 watts

Archer (Radio Shack) Model 273-1401A Converter, 220/240 volts AC converted to 110/120 volts AC, maximum load of 50 watts

Computer-linking hardware-software

HP-IL interface card and software linking the HP Portable Plus with the IBM AT (HP 82973A); transfers files between HP and IBM AT

Brooklyn Bridge cable and software linking the Toshiba T1100 to the IBM AT; transfers files through the serial ports of both machines

Software

WordPerfect 4.2 word-processing program (IBM-compatible)

FormTool 2.0 form producing program (IBM-compatible)

Survey Mate, Version 1.5, data entry, editing and analysis program (IBM-compatible)

SuperCalc4 spreadsheet and graphics program (IBM-compatible)

Lotus 1-2-3, Version 1A, spreadsheet and graphics program, included in read-only memory (ROM) chips in the HP Portable Plus computer

simple "yes" or "no" answers or for examination findings that can be classified as "present" or "absent." Variance estimates can then be calculated for these binomial attributes using the procedure described in the accompanying article (*1*).

In Burma, we used a single piece of paper for each subject. The 2-sided interview-examination form contained 26 variables, 7 of which were used to identify the location, person, interviewer, or date of interview.

Sampling theory. Sampling allows for the selection of a small number of persons to learn about all persons in a given geographic area. If the results of a sample survey are to be believed, the investigator must *strictly* adhere to a valid sampling method. The sampling procedure that we used for doing rapid surveys has been used by the World Health Organization (WHO) for the past decade, although it has only recently been validated.

The approach is a two-stage cluster sample with clusters of children selected at the first stage and individuals within the clusters at the second stage. A cluster is usually defined as a village, town, city, or other governmental unit. From a list of all cities, towns, or villages in a geographic area of interest, 30 clusters are chosen, with the probability of selection proportionate to the size of the resident population (PPS or probability proportionate to size). At the second stage, the WHO method deviates from conventional sampling theory. Ideally for each cluster, all children are listed and then a random sample is selected from the list. This ideal, however, is difficult to adhere to in a developing country setting since there is usually no list of the local population, and a full count and listing would be far too expensive and time-consuming. Thus, to select children at the second stage, the WHO method uses a modified approach. The first household to be visited in a community is randomly selected. Thereafter, children are sampled from the next nearest household until seven are selected.

This deviation from conventional sampling theory has only been tested in recent years to determine if the results from such surveys are valid. Since there is no way of learning if the findings from any specific survey represent "truth," the users of information from a survey must have faith that the results are valid. Henderson and Sundaresan (*4*) and Lemeshow and Robinson (*5*) recently published the results of computer simulation studies testing the validity of the estimates derived using the WHO Expanded Program on Immunization (EPI) methodology. The conclusions were that

EPI estimates have greater bias and are more variable than corresponding estimates derived using simple random sampling, the standard method for comparison. Yet the bias was minor. Ninety-five times out of every hundred, the EPI estimate for the parameter of interest was found to be within 10 percentage points of the true value in the computer-simulated population, thus fulfilling the goal set for the approach by the EPI.

In Burma, we used the EPI survey method with some minor modifications. First, we used a computer program to identify the 30 clusters to be sampled with probability proportionate to size. Second, after we went to the center of a selected village, we used a specially designed spinning dial partitioned into eight colored sections to identify randomly the direction to be walked from the center to the periphery of the village. Third, we identified all households along the chosen path and used a random-number table to randomly select the first house to be visited. As is done in EPI surveys, we went to the next closest house in the village and continued from one house to another until we had interviewed the mothers or other relatives of 14 children, born alive during the previous 3 years. We selected 14 instead of 7 because we wanted to have a more detailed view of some of the study parameters. All interviews were done using paper forms. The computers were left in a central village with our other supplies.

Portable computers. During the past few years, portable, battery-powered computers have become widely available. Known primarily as "laptop" computers because of their small size, most use 3.5-inch disks, weigh between 6 and 14 pounds, and have a folding liquid crystal display (LCD) monitor built into the machine. These small machines are ideal for field work in developing countries. Most models operate on direct current (DC); included with the computer is an alternating current (AC) adapter for converting either 120 volt (for use in the United States) or 220 volt (used in much of the developing world) to DC current. If the computer has a 120-volt adapter, it can be easily converted to accepting 220 volts using a voltage converter. An inexpensive converter that works well with portable computers is listed in the box; the manufacturer is cited in the Equipment references (*A*).

Every year, new portable computer models appear which are less expensive and more value-laden than the previous ones. Suggested criteria for evaluating the new models follow:

1. The computer is able to use IBM-compatible software.
2. The flat monitor is easy to read, even in a low-light environment, but requires only a small amount of current.
3. Files can be stored on 3.5-inch disks (covered by a plastic container which protects against fingerprints and dust).
4. The random access memory (RAM) is at least 640 kilobytes (K).
5. The equipment can operate at temperatures of 100–110° and relative humidity of 95–99 percent.
6. The machines can be physically jarred or dropped without internal damage.
7. The equipment is powered by internal batteries which are rechargeable and can easily be replaced with a fresh set, and
8. The computer has ports for connecting a parallel printer and, potentially, for connecting an external black and white or color monitor, a cable for linking the laptop to a desktop computer, and a modem for telecommunication.

Other convenient features:

9. Two disk drives, although single-drive computers are often programmed via internal switching to use the one drive as two,
10. Expanded memory to 1.2 megabytes (MB; 1,200 K) for creating a more rapid, energy efficient, virtual disk (that is an electronic disk),
11. A built-in 20-MB fixed disk, and
12. A weight of less than 10 pounds.

As noted by Berge and co-workers, the most common problem for the larger desktop microcomputers in developing countries is unstable electrical power (*6*). Fortunately, portable battery-operated computers are immune to either dramatic power fluctuations or cessation. When plugged in, current first goes through the internal batteries and then to the computer. If the current is momentarily too high, the batteries will absorb the electrical surge or spike. If the current suddenly goes off, the internal batteries will continue to provide uninterrupted power. The major consumers of electrical power in portable computers are light-emitting monitors ("back-lighted" LCD, electroluminescent, or gas plasma), disk drives, and fixed disks. Thus, a portable computer with these features will, by necessity, have a lower battery life per charge. Two solutions to short battery life are either multiple interchangeable battery packs or inexpensive voltage invertors that use automobile batteries to power the computer. Most portable computers require 25–50 watts for operation (the watt requirement is derived by multiplying the voltage by the amperes). An electrical invertor converts the direct current from a 12-volt automobile battery (some computers can plug directly into the automobile cigarette lighter) to 110/120 volt AC. A small invertor for equipment using up to 100 watts can be purchased from an electrical supply store for less than $100.

In Burma, we used both the Hewlett-Packard (HP) and Toshiba portable computers (*B,C*). Both machines functioned well in the field. The HP portable is very rugged and can be operated on rechargeable batteries for 20–22 hours. Unfortunately, our model was not IBM-compatible and thus did not run some of the more popular software. A spreadsheet program, however, was built into the machine, allowing us to do graphs quickly and easily and some of the field analysis. The Toshiba is IBM-compatible; thus we had no problem running our software. The battery life is far shorter than that of the HP, however, although this was not a great problem in the study we describe. Also available for the HP computer was a portable 3.5-inch disk drive with a removable battery pack.

Portable printers. The requirements for a portable printer are similar to those for the computer. The printer should be small, lightweight, and able to take rough handling. One aspect of RSM is immediate feedback of survey findings to local political and public health officials. It is important, therefore, to have a printer that can print graphs and tables in the field. To work with most software, the internal instructions that control the operation of the printer should be either IBM- or Epson-compatible. In addition, the machine should print text at 10–12 characters per inch (cpi), 16–17 cpi (compressed mode), and graphics. The dot matrix printers used with most desktop computers cannot run effectively on batteries, since they draw too much current. Most portable printers use an AC adapter with requirements of 10–20 watts. Either thermal printers or ink-jet printers can be powered by rechargeable batteries. Some printers have a battery charger built in. Thermal printers require special paper which tends to yellow once it is exposed to sunlight. They are relatively inexpensive, however, requiring no ink and little maintenance. Ink-jet printers use cartridges with enough ink to print 400–500 pages.

In Burma, we used both the HP and Diconix ink jet printers (*B,D*). No problems were experienced with either battery-operated machine. Both printed text and tables in compressed (16–17 cpi) and elite (12 cpi) modes and produced graphs of good quality.

Software. In recent years there have been many changes in software, the instructions that tell a computer what to do. The programs have become easier and more powerful so that even nonprogrammers can analyze survey data sets quickly. RSM uses four types of software: (*a*) a word-processing program for creating the survey instrument, protocol, and preparing the final report; (*b*) a custom form-making program for creating the forms necessary to manage the field study; (*c*) a data entry, editing, and preliminary analysis program for easy use in the field; and (*d*) a multipurpose spreadsheet program for selecting the clusters to be sampled, doing the analysis, and creating tables and graphs.

In a typical rapid survey, many draft copies of the survey instrument are prepared and circulated before the final version is approved. This process can be time-consuming unless it is done quickly, using a word-processing program. In Burma, we used Word Perfect (*E*) because of its power and versatility, including a question-numbering function that automatically renumbers all questions when new ones are inserted or old ones are deleted.

Control forms are necessary to manage any field survey. In Burma, we used FormTool (*F*) which allows you to design a generic set of forms and update them for each study. Most graphics printers will print these forms, including the battery-powered Diconix.

To do a rapid survey, data should quickly be entered into the computer and edited for errors while the survey workers are still in the field. In Burma, we used Survey Mate, a data entry, processing, and preliminary analysis program (*G*). Besides entering and editing data, we ran frequency distributions every evening and used the cross-tabulation routine to prepare data for the final tables. If more extensive statistical analyses are deemed necessary on a larger desktop microcomputer, the program converts the final data into either comma-separated or fixed formats.

Spreadsheet programs are used for conducting rapid survey field activities and for preparing the final report. In Burma, we used both SuperCalc on the Toshiba portable computer and Lotus 1-2-3 on the HP portable computer (*H,I*). Three custom programs were written by RRF for the field activities: (*a*) a program for identifying the 30 clusters to be sampled in the first stage of the selection process; (*b*) a printed table with random numbers used to select the initial household in each cluster; and (*c*) a statistical program for calculating and displaying in graphic form the parameters of interest and confidence intervals for these estimates (see accompanying article; *1*). To prepare the final report, the spreadsheet software was used to present summary data, do table calculations such as rates or percentages, and create graphs of the most important findings.

Portable desktop computer linkage. A final category of software and hardware is important for the preparation and analysis of larger data sets, although rapid surveys can be done without it. Data that are entered into the portable computer in the field may be transferred to desktop computers via special linkage mechanisms for more extensive analyses using advanced statistical programs. Most portable computers use 3.5-inch disks, but many desktop computers use 5.25-inch disks. Thus, the disks used on one machine cannot be used on the other. Several solutions exist. First, a 3.5-inch drive can be installed in the desktop machine to read disks produced on the portable computer. Second, a 5.25-inch drive can be purchased for most portable computers to write files which can then be run on desktop machines. Third, a cable and software package can be purchased to link the portable and desktop computers via either the parallel or serial ports (RS232C) so that they can read and write files on each other's disks. Fourth, an interface card can be installed in the desktop machine with cables linked to the portable computer for direct file transfer between the two machines.

In Burma, we used two methods to link the portable laptop computers to an IBM AT desktop computer. For the HP portable, we used the HP interface card and cables to join the two machines, while with the Toshiba, we used Brooklyn Bridge, a software program with a cable linking the two serial ports (*B,J*).

Procedures for Doing a Rapid Survey

Before doing a rapid survey, two things need to have occurred. First, questions requiring immediate answers about the health of a community need to have been posed by administrators, policy makers, or investigators. Second, the necessary computer hardware and software (cited previously) need to be available along with the necessary funds for a field survey. Given that these conditions are met, a rapid survey is in order. To do a rapid survey, several steps should be followed, either sequentially or concurrently by specially trained staff members. Some steps are routine to any survey, but others are unique to rapid surveys.

Meeting with decision-maker or principal investigator. If a survey is to be administered, processed, and analyzed rapidly, as mentioned previously, it should be limited to a few key variables. The administrator should state the main questions that need to be answered immediately. Next, the staff clarifies the exact activities, steps, or procedures necessary to answer these questions and designs the appropriate survey instrument (that is, questionnaire, interview, examination, or direct observation). Using the computer and a word-processing program, the revisions can made quickly with the knowledge and approval of the administrator or principal investigator.

In Burma, the Director General of Health and the Director of Public Health posed the main questions to be answered. Funds were made available for our pilot effort by the Ministry of Health and the U.S. Agency for International Development (USAID). The persons doing the survey were seven Burmese medical officers and two statisticians, all with positions of national responsibility. Each had participated in earlier workshops on epidemiologic models, microcomputers, statistical analysis software, and rapid survey methodology. These nine health professionals are now training others to do rapid surveys in future years. The most recent rapid survey was done in May 1988, in Hmawbi Township, Rangoon Division, by a team of medical officers and staff of the new survey unit in the Ministry of Health.

Presurvey activities. The survey instrument should be pretested on a nonrandom sample of persons with characteristics similar to those of the survey population. The name and size of each town or village in the area to be sampled is entered into a special spreadsheet program used to select the 30 clusters. Only the areas that can theoretically be reached by a survey team should be included in the spreadsheet program. This program, described in the accompanying article (*1*), can be run on either a desktop or a portable laptop computer. Once the villages have been selected, a meeting needs to be held with the local political and medical leaders to insure a high level of cooperation.

Using Form Tool, the next step is to design the

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study control forms. These control forms include (*a*) a map for the selection of the first household to be interviewed (one form for each of the 30 clusters); (*b*) a household disposition form determining if the household is eligible for inclusion in the study, and if so, the number of respondents and nonrespondents (one form for each of the 30 clusters); (*c*) a study disposition form which summarizes the number of respondents and nonrespondents for all 30 clusters; and (*d*) a table of random numbers for identifying the first household to be visited along the randomly selected path from the center to the periphery of the village.

Once the interview forms are approved by the administrator or investigator, Survey Mate is used to design the data entry and editing screens for the portable computer. The Survey Mate program has many functions, including range checks, logic checks, governing specifications in which the numeric entry for one variable governs the entry for another, and a common group option which enters the same values for all members of a specified group. In addition, the program has a verifying function which permits data to be entered blindly a second time. A side benefit of using Survey Mate is that it helps ensure that the interview forms are coded correctly.

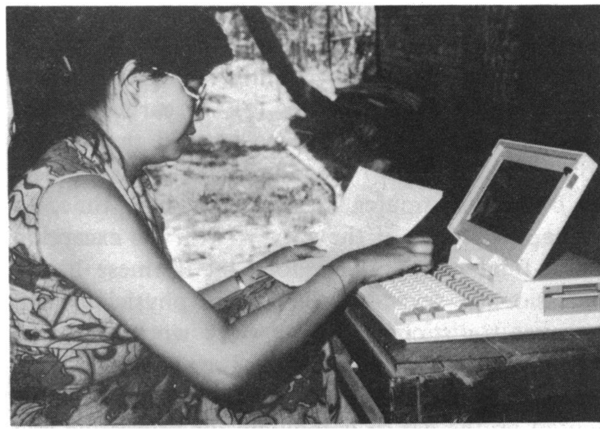
The interviewers need to be trained in the procedures for the survey. We prefer role playing. After discussing the interview and examination procedures, each interviewer is assigned a character with specified responses. The responses should be unusual, with the characters displaying unconventional behavior. This device makes the training session more enjoyable and teaches the interviewers to avoid showing any positive or negative emotions when confronted with an unusual response. Each interviewer is assigned to interview the other members of the team. At the end of the training session, all interviewers are gathered together for a final discussion of problems, and suggestions are made for improvements.

In Burma, we used a 2-page interview schedule with 26 variables. Four revisions were necessary before everyone was satisfied with the final form. The third revision was tested by KTT on 10 mothers in an urban health center in Hlegu. Only a few difficulties were experienced, and these were corrected in the fourth and final revision. Preparing Survey Mate took RRF 5 hours, although some of the time was spent re-learning the various instructions. The nine interviewers were each assigned an unusual character; the actual training session lasted 3 hours followed by an hour of general discussion.

Survey activities. Data can be gathered either in an interview or physical examination. We use paper forms to write down the information. Computers are not brought into the home for direct data entry. There are four main reasons for this. First, it is too costly to issue each interview team a portable computer. Second, a high technology item such as a portable computer would tend to distract the members of the household so that more questions would be asked about the computer than answered about the subject of the interview. Third, when dealing with a computer, all kinds of small problems can arise which may interrupt the flow of the interview. These problems can usually be solved but require time for a more deliberate analysis. Fourth, paper provides a permanent record of the study findings. Since human errors can occur that could quickly destroy all data on a computer disk, it is best to have a permanent record, at least until the final report has been written.

At the end of the day, after the data have been collected, the information is brought to a central location and entered into the portable computer. If inconsistencies or missing observations are noted, the interviewers can be sent back to the respondent for further information. As part of the editing process, frequency distributions are run of selected variables to determine if the findings are reasonable. Thus, by the time the team leaves the field, all the data have been entered, edited, and partially analyzed. Graphs and tables are printed by use of the portable printer. These findings are then presented to the local political officials and medical staff, a procedure that gives local officials rapid feedback and helps ensure future cooperation.

In Burma, we used a mixed design: a historical cohort study of a sample of 417 live births during the past 3 years and a cross-sectional study of all 396 living children less than 3 years of age (21 infants had died). Because the survey was conducted by the government, several local health workers accompanied each interview-examination team. All 417 interviews were completed in 4 days; the daily totals were 72, 112, 120, and 113 for May 4 through 7. The nine interviewers each did between 37 and 73 interviews. Travel time to the clusters varied between 15 minutes and 1.5 hours. After arriving at the center of the cluster community, it took from 1.5 to 2.5 hours to complete one cluster, depending on how many houses had to be visited. The nine interviewers visited a total of 920 households to obtain the 417 interviews. Thus they had to visit 2.2 households per eligible respondent. All data were entered each evening into the Toshiba portable computer using Survey Mate (see photo). Tallies of selected variables were also entered into the HP portable using Lotus 1-2-3. Graphs and tables were printed in the field on the afternoon of the fourth day, using both the HP Thinkjet and Diconix printers. The graphs generated by the computer were translated into Burmese for the next-day presentation to the Hlegu Township Medical Officer, members of his staff, and others, including the Director of Public Health for Burma.



Burmese health professional enters survey data into a portable battery-powered computer

Post-survey activities. While the survey team is in the field, there are three steps to be done in a central computing office. First, if a more detailed statistical analysis is deemed necessary, the statistical package programs on larger desktop microcomputers need to be assembled and programmed to receive the data. Field data can be transferred to most statistical programs as American Standard Code for Information Interchange (ASCII) files if the variable fields are either in a fixed location (that is, fixed field) or are separated by a comma. Survey Mate can create either type of ASCII file. Second, the report format and partial text describing the survey procedures should be entered into a computer using a word-processing program. Third, by use of a multi-purpose spreadsheet program such as SuperCalc or Lotus 1-2-3, formats should be prepared for the various graphs and tables to appear in the final report.

In Burma, all analyses were done using Survey Mate and a special cluster analysis program presented in an accompanying article (*1*). Variance estimates were derived for each parameter and results presented both as confidence intervals and as point estimates. Graphs with three levels of confidence intervals (90, 95, and 99 percent) were included in our presentations of the finding and in our final report. Five days after the field presentation in Hlegu of the study findings, we issued a 50-page report to the Director General of Health and the Director of Public Health in Rangoon. This report was written by RRF in a hotel room on the Toshiba portable computer using Survey Mate, Word Perfect, and SuperCalc. The entire report, including 10 tables and 16 graphs, was printed on the Diconix printer. While there is constant electricity in Rangoon, interruptions of 1–2 hours are not uncommon. Thus, having battery power for the computer and printer was a very useful feature.

Discussion

Rapid surveys are not meant to replace existing health information systems. Nor are they meant to replace large surveys based on a national sample of the population. Instead, they provide decision-makers in developing countries with an effective tool for finding out quickly what is occurring at the community level in geographic regions of immediate interest. We define quickly as within 1 week of the interview-examination team's arrival in the field. Rapid surveys should only be used to answer a limited number of questions; we suggest an interview or examination form no longer than 2–3 pages. The interview questions should be straightforward so that people can answer them without much thought. Mainly, these are questions of a descriptive rather than reflective nature. Fewer variables mean fewer tables and graphs; thus the analysis can be done rapidly. By use of a computer, variance estimates can be easily derived for the main parameters of interest. Most of our variables were attributes which could be coded or recoded as 0 or 1. For these variables, we used laptop computers and a specially designed spreadsheet program to derive confidence intervals quickly (see accompanying article; *1*).

Microcomputers are becoming increasingly common in developing countries (*7*). In earlier experiences in Bangladesh (*8,9*), we learned that health professionals with no prior exposure to computers can become computer literate in a short time. In Burma, all phases of the survey, with the exception of the final report, were done by Burmese health professionals; seven of them were physicians and two were statisticians. Two 1-week workshops had been given by RRF to train the Burmese. The first, conducted in August 1986, during an earlier visit, focused on the use of computers for processing and analyzing data. The second, given in April 1987 shortly before going into the field, focused on rapid survey methodology. Since then, RRF has conducted a similar workshop lasting 2 weeks in Thailand. Included in this workshop were 22 participants from Thailand, Bangladesh, Indonesia, and the United States. The first week was spent learning about RSM and the necessary computer software. During the second week, we went into the field and simultaneously did two rapid surveys. One focused on antenatal care and the second on family planning. Similar to the survey in Burma, the surveys in Thailand were completed in 3 days, followed by 1 day of analysis and then a formal presentation of the findings on the fifth day. A 70-page report on the two Thai surveys with 12 tables and 17 figures was printed 5 days later. The most recent survey was done by the Burmese in May 1988, using the same methods. Included in this survey were 429 births during the prior 3 years to residents of Hmawbi Township, Rangoon Division. Thus we have now had experience with four rapid surveys in developing countries; all were done in a "quick and clean" manner.

Although we have been able to complete surveys in a very short time, not all sample surveys can be done so fast. It usually takes some while to agree on the questions to be asked, write the procedures to be followed, and train the interviewers or examiners. Thereafter, a small pilot or feasibility study is usually done to ensure that questions are understood and that the computer processing and analysis of the data go as intended. Although it is possible to do all of these steps in less than 2 weeks, more likely it will take 3-4 weeks unless standard questions are being asked or if the same forms are being used in multiple sites. Examples of standard questions used in other developing countries are symptom-specific questions on diarrhea or respiratory illnesses, ones addressing functional health status such as restricted-activity days or bed-disability days, and self-diagnosable conditions such as accidents or injuries (*10,11*). Other possibilities for this list might be a series of standard questions being formulated by the World Health Organization to help countries reach their goal of health for all by the year 2000 (*12*).

Conclusions

Rapid survey methodology presents administrators and other decision-makers in developing countries with another option for learning about the health status of a population. Although RSM relies on new technology, neither the cost nor the complexity of the procedure is overly high. As was the case with initially expensive television receivers and video cassette recorders, the price of portable computers is coming down quickly to an affordable level. When these are coupled with the use of appropriate software and an understanding of cluster sampling methods described here and elsewhere (*1,4,5*), health professionals in developing countries could use portable computers to gather quickly population-based data for determining the impact that disease has on the community and to monitor and evaluate intervention or prevention strategies.

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4. Henderson, R. H., and Sundaresan, T.: Cluster sampling to assess immunization coverage: a review of experience with a simplified method. Bull WHO 60: 253-260 (1982).
5. Lemeshow, S., and Robinson, D.: Surveys to measure program coverage and impact: a review of the methodology used by the Expanded Program on Immunization. World Health Stat Q 38: 65-75 (1985).
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followup report. Public Health Rep 101: 616–624, November–December 1986.

10. Kroeger, A.: Health interview surveys in developing countries: a review of the methods and results. Int J Epidemiol 12: 465–481 (1983).

11. Ross, D. A., and Vaughan, J. P.: Health interview surveys in developing countries: a methodological review. Stud Fam Plann 17: 78–94 (1986).

12. World Health Organization: Development of indicators for monitoring progress towards health for all by the year 2000. Geneva, 1981.

Equipment

A. Hewlett-Packard Personal Computer Group, 10520 Ridgeview Ct., Cupertino, CA 95014.

B. Toshiba America Inc., 2441 Michelle Dr., Tustin, CA 92680.

C. Diconix Inc., 3100 Research Blvd., Dayton, OH 45420.

D. Radio Shack, Tandy Corporation, 300 One Tandy Center, Fort Worth, TX 76102.

E. WordPerfect Corporation, 323 North State St., Orem, UT 84057.

F. Form Tool, Bloc Development Corporation, 1301 Dade Blvd., Miami Beach, FL 33139-9990.

G. Survey Mate, Henry Elkins and Associates, Inc., 15 Willow Circle, Bronxville, NY 10708.

H. SuperCalc, Computer Associates International, Inc., 2195 Fortune Dr., San Jose, CA 95131.

I. Lotus 1-2-3, Lotus Development Corporation, Cambridge, MA.

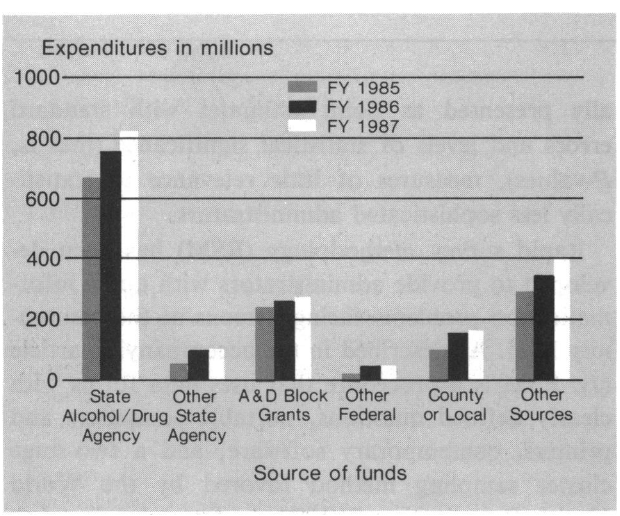
J. Brooklyn Bridge, White Crane Systems, 6889 Peachtree Ind. Blvd., Norcross, GA 30092.

Errata in the "Perspectives on Alcohol Abuse" Issue of PUBLIC HEALTH REPORTS

Because of an accelerated production schedule for the November–December 1988 issue (vol. 103, No. 6) of *Public Health Reports*, two illustrations were incomplete. The correct illustrations appear below.

Figure 3 on page 573 of "Alcohol Research: Delivering on the Promise" by Frederick K. Goodwin, MD, was lacking scale values, as was Figure 2 on page 615 of "Alcohol Problem Resources and Services in State Supported Programs, FY 1987" by William Butynski, PhD, and Diane Canova, JD.

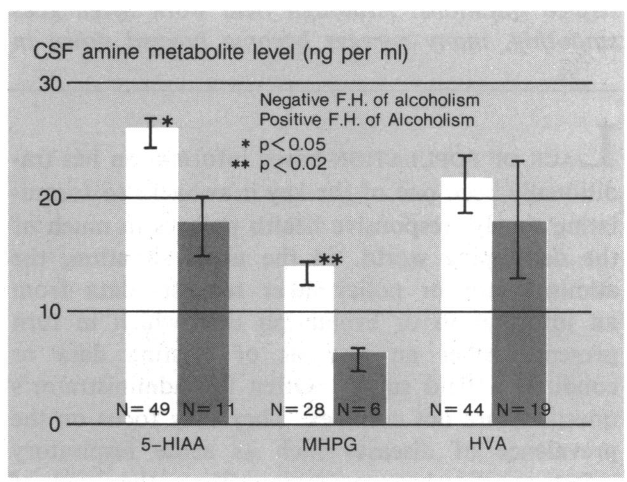
Figure 2. Comparison of expenditures for State-supported alcohol and drug abuse services by funding source for fiscal years 1985, 1986, and 1987



NOTE: Some of the apparent increases in expenditures may be related to an improvement in the State's ability to collect and provide data from different funding sources. The "Other Sources" category includes funding from sources such as client fees, court fines, and reimbursements from private health insurance.

SOURCE: State Alcohol and Drug Abuse Profile, FY 1987; data are included for "only those programs which received at least some funds administered by the State Alcohol/Drug Agency during the State's Fiscal Year 1987."

Figure 3. CSF monoamine metabolites in depressive subgroups



NOTE: CSF = cerebrospinal fluid; FH = family history; ng per ml = nanograms per milliliter; 5-HIAA = 5-Hydroxyindoleacetic acid; MHPG = 3-methoxy-4-hydroxyphenylglycol; HVA = homovanillic acid.

SOURCE: Reference *6*.