# COMPARISON OF THREE INFORMATION-GATHERING STRATEGIES IN A POPULATION STUDY OF SOCIOMEDICAL VARIABLES

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The Human Population Laboratory is an epidemiologic study whose primary interest is in learning the distribution of disease in a community and examining the relationships between disease and those social, psychological and environmental factors which we loosely call "way-of-life".

Since the development of disease, particularly chronic disease, is a long-term process, a longitudinal study design with its repeated interviews of the same individuals over a period of time appears to be appropriate for the Human Population Laboratory.

Obviously, it is costly to conduct personal interviews with a reasonably large sample of the population repeatedly, particularly if one follows all or a sample of the migrants wherever they go. This consideration led us to look into less costly methods of information gathering, primarily telephone interviews and mail questionnaires, or to some combination of methods which might lower costs without reducing quality.

Our first step was to comb the literature to discover what studies had been made on the comparative merits of personal interviews, telephone interviews and mail questionnaires. We went through the major American publications in survey research, applied psychology, sociology, statistics and marketing. In many of the journals we made a complete search back to 1948.

In general, much has been written about the various methods of data collection, but attempts to compare these different methods have been very few. The limited information available does not help in developing a longitudinal study in a compact geographic area, where rigorous controls can be exercised over the quality of methods chosen.

We therefore found it necessary to conduct our own study. This report represents the results of this study. Our objective was to compare three strategies of information gathering - mail, telephone and personal interviewing used in certain combinations - in terms of rate of return, the completeness of the returns and cost. In addition, we aimed to investigate comparability of the results obtained by the three strategies.

The site selected for the Human Population Laboratory is Alameda County, in the San Francisco Bay Area. The county has a population of almost a million, mainly urban and suburban, like most of California. The population is heterogeneous with respect to occupation, socioeconomic class, race and other factors possibly related to disease occurrence. The area is small enough to allow data collection with a minimum of travel expense, while its proximity to the State Department of Public Health permits a maximum of supervision

A short description of the sample design is necessary here because this design affected the analysis of the study.

An area probability sample of Alameda County, California, was drawn based on 1960 census data. A multistage design was used. The only 1960 census statistics available at the time of sampling were census enumeration districts; so we decided to use these as our primary sampling units. The county was stratified by geography and the enumeration districts were selected with probability proportionate to size. Each enumeration district in the sample was subdivided into secondary units - blocks or, in rural areas, quasi blocks. Two blocks were chosen from each sample enumeration district, again with probability proportionate to size. Within each block, a cluster of six households was drawn from a random start. Altogether, 175 enumeration districts, including 350 blocks and about 2,100 households, were thus selected. This sample, supplemented by a sample of new construction, conversions and demolitions undertaken since the 1960 Census, yielded a total of 2,148 housing units, representing about 1 out of every 150 housing units in Alameda County.

Table 1

RATE OF RETURN OF HOUSEHOLD ENUMERATION

| SAMPLE STATUS OF HOUSING UNITS | HOUSING UNITS | |
|---|---|---|
| | Number | Percent |
| Total Housing Units | 2,148 | 100 |
| Enumeration Completed | 1,973 | 92 |
| Enumeration Not Completed | 175 | 8 |
| Reason not completed | | |
| Refusal | 33 | 2 |
| Not at home | 20 | 1 |
| Other biasing reasons[1] | 10 | a |
| Vacant | 90 | 4 |
| Other nonbiasing reasons[2] | 22 | 1 |
| Total Effective Sample (Excluding "Vacant" and "Other nonbiasing") | 2,036 | |
| Number and Percent of Effective Sample Completed | 1,973 | 97 |

[1] Includes households containing persons who were too ill to be interviewed or who were senile.

[2] Includes persons ruled out of the sample by definition e.g., students living on campus and military personnel on military bases.

[a] Less than 1 percent.

The 2,148 sample households were then enumerated. Enumeration involved a listing of all household members by sex, age and relation to head, as well as certain housing and other information. As you see in Table 1, the enumeration was successfully completed in 92 percent of the selected households; or in 97 percent of the occupied housing units.

Altogether 1,973 housing units were enumerated in groups of 6 housing units per block. These housing units were next subdivided into two samples. All those units which fell on the even-numbered lines of the block listing sheets became Sample A, the subject of our present discussion. The remaining households were reserved for a replication of the study design, but using a different subject matter.

The sample for the present study was divided into three subsamples, each a representative sample of the total county. Out of the total of 350 blocks, 50 were selected systematically for personal interviews, 3 households per block. In the other 300 blocks, 3 households per block also were taken - one assigned at random to the telephone strategy, the other two assigned to the mail strategy. Obviously, cost factors determined the disproportionate numbers assigned to the three strategies.

For all three strategies we did everything possible to achieve a high rate of return. We used all the prestige of the Department and the fact that we are promoting public health. Each household received an advance notice of its selection for the study, in the form of a letter from the Chief of the Human Population Laboratory, personalized as far as possible and hand-signed. Extreme care was exercised at every stage of the study to induce a sense of participation in the respondent.

In all three strategies every member of the household seventeen years and over was eligible for the study. Identical questions were used throughout, the topics being demographic, familial, behavioral and medical.

Let me describe each of the three strategies. In the mail strategy, each eligible member of the household was sent a separate questionnaire, with an accompanying letter. A second mailing, again with an accompanying letter, was sent to those who did not return the first questionnaire; and, if necessary, a third - this by certified mail with the request that the addressee sign a return receipt. The postoffice also was asked to report a new address in case the person had moved.

Those still not responding were then called upon, either by telephone or in person. Callbacks were made to obtain as high a return rate as possible within the limits of the budget. So much for the mail strategy.

In the second strategy, the primary aim was to conduct the interview by telephone. However, some people do not have a telephone. In order to keep the three samples comparable, the telephone sample included its proper share of nontelephone subscribers; otherwise it would have represented a higher socioeconomic group. Those households drawn for the telephone strategy which did not have a telephone were handled like the mail sample.

The third strategy employed personal interviews, with callbacks where necessary.

The overall rate of return from all three strategies combined was ninety percent (Table 2). Nonreturns were made up of seven percent refusals and three percent not-at-home and unable to locate.

Table 2

RATE OF RETURN OF DATA COLLECTION

| SAMPLE STATUS OF PERSONS | PERSONS | |
|---|---|---|
| | Number | Percent |
| Total Adults[1] in Housing Units | 1,984 | 100 |
| Interviews or Questionnaires Obtained | 1,779 | 90 |
| Not Obtained | 205 | 10 |
| Reasons not obtained | | |
| Refused | 135 | 7 |
| Not at home | 15 | 1 |
| Unable to locate (moved and left no forwarding address) | 33 | 1 |
| Other reasons | 22 | 1 |

[1] Persons 17 years old and over

Looking next at the 3 strategies separately (Table 3), we find that a completed questionnaire or interview was obtained from 88 percent of the mail strategy sample; 91 percent of the telephone strategy sample was completed, as was 93 percent of the personal interview strategy.

Table 3

RATE OF RETURN BY STRATEGY AND METHOD OF COMPLETION

| METHOD OF COMPLETION | STRATEGY | | |
|---|---|---|---|
| | Mail | Telephone | Personal |
| Number of Adults in Households | 1,109 | 571 | 304 |
| Number of Interviews Obtained | 977 | 518 | 284 |
| | Percent | | |
| Percent Interviews Obtained | 88 | 91 | 93 |
| Obtained by | | | |
| Original method | 81 | 72 | 90 |
| Other methods | 7 | 19 | 3 |
| Mail | x | 14 | 3 |
| Telephone | 4 | x | - |
| Personal | 3 | 5 | x |

x Not applicable.

In each of the three strategies the great bulk of the assignment was completed by the method originally selected. For example, the 88 percent obtained in the mail strategy was made up of 81 percent returned by mail, the other 7 percent divided about evenly into telephone and personal interviews. The 91 percent return from the telephone strategy included 72 percent completed by telephone, 14 percent by mail and 5 percent in person.

Our next concern was the completeness of the questionnaires. Even though the mail strategy yielded a satisfactory rate of return, the questionnaires themselves might have a disproportionately high rate of unanswered questions. Over the telephone as well as in the personal interview, the interviewer can encourage responses; this sort of prodding is not possible in the mail questionnaire. Therefore, it was expected that the proportion of unanswered questions in the mail strategy might be higher than in the other two strategies. As it turned out, this expectation was justified, but the nonresponse to individual questions was so low - seldom going over five percent even in the mail strategy - that it did not present a problem.

Table 4

SUMMARY OF NONRESPONSE TO SIXTY-ONE QUESTIONNAIRE ITEMS BY STRATEGY

| PERCENT "NO ANSWER" | NUMBER OF ITEMS NOT ANSWERED | | |
|---|---|---|---|
| | Strategy | | |
| | Mail | Telephone | Personal |
| 0.0 | 20 | 25 | 30 |
| 0.1-0.9 | 14 | 13 | 14 |
| 1.0-1.9 | 10 | 14 | 5 |
| 2.0-2.9 | 4 | 3 | 4 |
| 3.0-3.9 | 2 | 3 | 2 |
| 4.0-4.9 | 5 | 3 | 4 |
| 5.0 or More | 6 | - | 2 |
| Average Percent "No Answer" | 1.9 | 0.9 | 1.0 |

I should comment here that the figures on rate of completeness for the mail strategy include a few edited questionnaires. If a questionnaire was returned which had, say, a whole page left blank, it was assigned to an interviewer who telephoned the respondent to obtain the answers to the unanswered questions. Thus, the rate of completion of mail questionnaires is the rate of respondents' answers plus some subsequent prodding in the few cases where there were gross omissions.

Coming now to the question of costs: A great many expenditures enter into the conduct of a survey - administration, planning, sampling, questionnaire construction, testing, etc. We are concerned here only with the cost of interviewing, on the assumption that most other expenses will not vary greatly with the strategy employed. However, there are questions of just what charges to include in interviewing, and what fractions of certain costs to assign to each strategy.

You will remember that we conducted a household enumeration before doing the actual interviewing, primarily in order to get names and addresses for the telephone and mail strategies. One could take the position that enumeration and interviewing might have been conducted simultaneously in the personal strategy and therefore none of this enumeration cost should be assigned to this strategy. However, this view is not quite realistic because all members of the household 17 years and over were to be interviewed, and even where a respondent was available on the enumeration trip, additional visits were often necessary to interview the other eligible household members. In fact, in many cases the enumerator found no one at home and simply took name and address for subsequent telephone calls to complete the enumeration. Consequently, it is not unreasonable to charge at least a fraction of the enumeration to the personal strategy.

Another expense involves selection, training and supervision of interviewers. Such costs are quite substantial in the personal interview strategy, less so in telephone strategy and minor in the mail strategy. How much of this interview supervision should be charged to each strategy?

We computed per interview costs on a number of bases, ranging from charging personal strategy with none of the enumeration to charging various fractions, and from dividing interviewer training and supervision costs equally among the three strategies to assigning them heavily to personal and telephone strategies. Depending on what assumptions we made on these issues, we came up with the following comparisons: Telephone strategy interviews cost from ten percent to twenty percent more than the mail strategy returns and personal strategy interviews cost from two to two-and-a-half times as much as mail.

I want to draw a broad band of caution around these comparisons. These figures apply only to this particular study, and even here we are not sure how good our cost accounting was. Also, with a different rate paid to interviewers, or with a different length of questionnaire, or with any difference in procedure - for example, no certified letter in the mail strategy - cost ratios would change, perhaps considerably. All we can say is that, not unexpectedly, the personal interview strategy cost substantially more than either of the other two.

So far we have shown that in terms of rate of return and in terms of completeness, the three strategies were quite comparable and that in terms of cost, the mail and telephone strategies were more efficient than the personal interview strategy.

The next item to investigate is a comparison of the findings from the three strategies. Let us look first at those data for which comparisons with outside sources are available, i.e., Census. Does any one of the three strategies appear to have a marked advantage over the other?

Not all statisticians agree on the usefulness of comparisons between sample data and population data. While some are unimpressed, others think that such comparisons are a realistic way of assessing the representativeness of a sample. Without taking sides on this issue, I will report the comparisons we made on a series of items obtained in the Human Population Laboratory which were also reported in the 1960 Census.

When the returns from the individual strategies are compared with one another and with census data, we find (Table 5):

1. In most cases results from the three strategies are in good agreement with each other and with census, and
2. None of the three strategies is consistently closest to the census on all items compared.

Table 5

COMPARISON BETWEEN U.S. CENSUS 1960 AND HUMAN POPULATION LABORATORY STUDY 1961

| DEMOGRAPHIC VARIABLE | U.S. CENSUS 1960[a] | HUMAN POPULATION LABORATORY STUDY 1961 Strategy | | |
|---|---|---|---|---|
| | | Mail | Telephone | Personal |
| Total Persons 17 Years and Over | 595,556 | 977 | 518 | 284 |
| | PERCENT | | | |
| Sex | | | | |
| Male | 47 | 48 | 46 | 45 |
| Female | 53 | 52 | 54 | 55 |
| Age | | | | |
| Less Than 25 | 13 | 10 | 13 | 13 |
| 25-34 | 20 | 19 | 24 | 22 |
| 35-44 | 22 | 23 | 22 | 22 |
| 45-54 | 18 | 19 | 15 | 19 |
| 55-64 | 13 | 13 | 13 | 13 |
| 65-74 | 9 | 9 | 8 | 5 |
| 75 and Over | 5 | 6 | 4 | 5 |
| Not Reported | - | 1 | 1 | - |
| Race | | | | |
| White | 86 | 86 | 86 | 78 |
| Negro | 11 | 10 | 11 | 16 |
| Other Races | 3 | 4 | 3 | 6 |
| Nativity | | | | |
| Native Born | 91 | 88 | 90 | 90 |
| Foreign Born | 9 | 11 | 10 | 10 |
| Not Reported | - | 1 | b | b |

| DEMOGRAPHIC VARIABLE | U.S. CENSUS 1960[a] | HUMAN POPULATION LABORATORY STUDY 1961 Strategy | | |
|---|---|---|---|---|
| | | Mail | Telephone | Personal |
| | PERCENT | | | |
| Marital Status | | | | |
| Married | 71 | 75 | 75 | 68 |
| Widowed | 9 | 7 | 8 | 9 |
| Divorced | 5 | 5 | 4 | 4 |
| Separated | 2 | 2 | 3 | 4 |
| Never Married | 13 | 11 | 10 | 14 |
| Employment Status | | | | |
| In Civilian Labor Force | 61 | 61 | 59 | 63 |
| Employed | 57 | 57 | 54 | 58 |
| Looking for work | 4 | 4 | 5 | 5 |
| Not in Labor Force | 39 | 39 | 41 | 37 |
| Occupation[1] | | | | |
| Professional and Managerial | 23 | 21 | 21 | 21 |
| Clerical and Sales | 25 | 29 | 30 | 31 |
| Craftsmen | 14 | 13 | 16 | 13 |
| Operatives and Laborers | 20 | 20 | 19 | 18 |
| Service Workers | 11 | 10 | 12 | 15 |
| Uncodable | 7 | 7 | 2 | 2 |
| Industry[1] | | | | |
| Agriculture | 1 | 2 | 3 | 2 |
| Construction | 6 | 6 | 7 | 5 |
| Manufacturing | 22 | 21 | 22 | 19 |
| Transportation, Utilities, Communication | 8 | 8 | 9 | 12 |
| Trades | 18 | 16 | 16 | 21 |
| Services | 31 | 26 | 28 | 27 |
| Public Administration | 8 | 8 | 11 | 10 |
| Industry Not Reported | 6 | 13 | 4 | 4 |

[1] Census figures refer to employed persons, Human Population Laboratory Study excludes housewives and students.

[a] Adjusted to exclude students and military personnel not in the Human Population Laboratory Study.

[b] Less than 1 percent.

Interestingly, the mail and the telephone strategies show just as close relationships to census as does the personal strategy. In fact, the largest difference - though not statistically significant - appeared in the personal strategy. The important point, however, is that all three strategies are close to census and to one another.

Next we proceed to a comparison of the substantive findings obtained by the three strategies. I won't go into the details here of computation of the standard errors except to say that I have been using a technique pretty much like the one Leslie Kish presented in his article on "Confidence Intervals for Clustered Samples", in the April 1957 issue of the American Sociological Review. This technique is not unlike the one Jerome Cornfield described in the study on "Health and Medical Care in New York City". In essence, these techniques take cognizance of the fact that we are dealing with a cluster sample instead of a simple random sample.

Generally speaking, the three strategies drew similar responses. In the great majority of findings, the differences observed are not large enough to be statistically significant. There are, however, a number of questions and a number of items on which statistically significant differences did appear. By chance alone, we would expect that in five percent of the comparisons, a statistically significant difference would occur. In fact, we observed such differences on six percent of the items.

If we look at the questions where significant differences are found, and if we arrange them systematically and classify them in order to seek a rationale for what may have happened, certain patterns emerge.

First, we find that about one-third of all the differences appear in a series of six questions out of sixty-one. This was our first attempt to develop an index of physical activity and I am afraid we were not successful.

Second, some of the interstrategy differences seem to arise from the need for special instructions or explanations. For example, interviewers can be given detailed instruction as to how occupation will be coded and should be recorded. The fact that in the mail strategy seven percent of the answers were uncodable, while only two percent each for the telephone and personal strategies were uncodable, documents this speculation. The same point holds for recording "industry" and for some other items too.

Third, there are situations where ideas about acceptable responses give the advantage to one strategy over another. Herb Hyman and our chairman, here, in their standard work on "Interviewing in Social Research", have dwelt on the importance of interviewer expectations in survey research. Respondents, too, have ideas of what is expected or is acceptable. If somebody asks me, or any one of you, "How do you feel?" we almost automatically answer, "Fine," even if we don't feel very well. Similarly, when our interviewers asked respondents how they would generally rate their health - excellent, good, fair or poor - the automatic response tended to be "excellent". However, asked to put down a check mark on a questionnaire, the response tended to be less off-the-cuff than in the more social situation.

Table 6

RESPONDENTS' HEALTH RATING BY STRATEGY

| | STRATEGY | | |
|---|---|---|---|
| | Mail | Telephone | Personal |
| Total Persons | 977 | 518 | 284 |
| | Percent | | |
| Total Percent | 100 | 100 | 100 |
| Health Ratings | | | |
| Excellent | 30 | 37 | 44 |
| Good | 51 | 51 | 45 |
| Fair | 17 | 10 | 10 |
| Poor | 2 | 2 | 1 |

Comparing findings on health rating for the three strategies, you will observe in Table 6 that the proportion saying "excellent" is much higher in the personal strategy, and the proportion saying "fair" is higher in the mail strategy. I would hypothesize that in this case, the mail strategy may come closer to reflecting the respondents' true state. What is operating here is probably not so much a desire to deceive as the impulsive face-to-face response compared with the more considered reply to a printed question.

Another example: In our culture, drinking alcoholic beverages, particularly by women, is not quite acceptable middle-class behavior. If we look at the findings on frequency of drinking wine, beer and hard liquor (Table 7) we notice that some eight percent to thirteen percent more women tell the interviewer that they never drink than make this response on the impersonal mail questionnaire or over the telephone. This appears to be a case where respondents conceivably may answer more honestly if they are not facing an individual who may be critical of their behavior.

Table 7

FREQUENCY OF DRINKING ALCOHOLIC BEVERAGES
WOMEN RESPONDENTS BY STRATEGY

| | STRATEGY | | |
|---|---|---|---|
| | Mail | Telephone | Personal |
| Total Women | 507 | 282 | 157 |
| | Percent | | |
| Total Percent | 100 | 100 | 100 |
| Women Saying They | | | |
| Never drink wine | 46 | 44 | 55 |
| Never drink beer | 51 | 49 | 59 |
| Never drink whiskey or liquor | 36 | 34 | 47 |

So much for the pattern of differences. Looking now at the magnitude of the differences, we find them not very large. Aside from the physical activity items, the mean of the statistically significant differences between any two strategies is seven percentage points and the range is from four to fourteen points.* Introducing this element of the size of the observed differences brings up the question of statistical in relation to meaningful significance. Often a difference, even though statistically significant, has little substantive importance.

To sum up: We all know that in any interview study, however conducted, some respondents are easier to find than others, and that the hard-to-get respondents are very costly. Because we have been aware that certain types of people do not respond to mail questionnaires or are not available by telephone, we tend to conduct entire studies by personal interview, even when the information may be obtainable by other techniques.

What I have reported here is a study of three strategies of information gathering. In two, we tried to obtain the easy-to-get interviews in the less costly ways, at the same time identifying the hard-to-get respondents for follow-up by the more expensive techniques. The third strategy was based on the personal interview in order to gain comparative data.

As I reported: First - rate of return was satisfactory for all three strategies

RATE OF RETURN BY STRATEGY

| | PERCENT |
|---|---|
| Mail Strategy | 88 |
| Telephone Strategy | 91 |
| Personal Interview | 93 |

Second - We did get the bulk of our interviews by the method originally assigned

RATE OF RETURN
STRATEGY BY METHOD OF COMPLETION

| METHOD OF COMPLETION | STRATEGY | | |
|---|---|---|---|
| | Mail | Telephone | Personal |
| | Percent | | |
| Total | 100 | 100 | 100 |
| Mail | 92 | 15 | 3 |
| Telephone | 4 | 80 | - |
| Personal | 4 | 5 | 97 |

Third - Rate of questionnaire completeness also was satisfactory for all three strategies

AVERAGE PERCENT "NO ANSWER"
PER QUESTIONNAIRE ITEM

| | |
|---|---|
| Mail Strategy | 1.9 |
| Telephone Strategy | 0.9 |
| Personal Interview Strategy | 1.0 |

* On the physical activity items, the corresponding figures are 11 percentage points for the mean and 5 to 19 points for the range.

Fourth - Interviewing costs were about two to two-and-a-half times as high for the personal strategy as for the mail strategy, and about twice as high for the personal strategy as for the telephone strategy

COST RATIOS OF DATA COLLECTION
FOR THE THREE STRATEGIES

(Per Questionnaire Cost of Mail Strategy Equals 100)

| STRATEGY | RATIO TO MAIL STRATEGY |
|---|---|
| Telephone Strategy | 110-120 |
| Personal Interview Strategy | 190-240 |

Finally - So far as substantive findings go, the returns from the three strategies were generally quite comparable and it appears that on most items the strategies could have been used interchangeably.

Before I begin to sound as though I am advocating the use of the mail or telephone strategy, I should say that I am aware of certain limiting factors. One I have touched on: A public health department, seeking information which presumably would benefit many people, may have an aura that induced an unusual rate of mail and telephone cooperation. Obviously, a lower return would have changed cost comparisons considerably.

Another limiting factor is that certain kinds of inquiries simply cannot be made by mail or telephone - because they are too complicated, because they involve tests of knowledge, because question sequence is important, because of the sensitivity of the subject and so forth.

What we are searching for, of course, is a way that can be used in certain situations to save costs, particularly where follow-ups in a longitudinal study are involved, and where the problem of respondent mobility looms large.

There is much analysis still to be done on these data. Additional investigations are also being made. You may remember that in discussing the sample design, I mentioned that we put aside half of the households enumerated, those listed on the odd-numbered lines of the enumeration sheets. We have just completed in these households a survey which replicates the methodological study I have discussed, with a different subject matter, but a good many identical questions. Therefore, with a sample using households on the very same blocks, we have a two-pronged effort here: a complete replication on some issues and also new information on a very sensitive subject matter.

Since these date are in the processing stage, no comparisons can be made at this time. It is hoped that by replications of studies of this type, it will be possible to build up a body of knowledge giving us information as to if, and under what conditions and with what safeguards, mail and/or telephone interviews, supplemented by personal follow-ups for the hard-to-get cases, are practicable.