

Holly Shulman, Melissa Adams, and the PRAMS Working Group, Centers for Disease Control  
Holly Shulman, Centers for Disease Control, C06, 1600 Clifton Road, Atlanta, GA 30333

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## Introduction

With the continuing development of computer technology in the areas of survey research and field technology, more components of the survey process can be automated. Many private and government organizations are increasingly using computer assisted telephone interviewing (CATI) and computer assisted personal interviewing (CAPI). Is the mail survey doomed to become a relic of the past?

Health researchers and other social scientists often need to conduct followback studies on specific populations. For studies like these that involve a small subset of the population at large, the household-based sampling and random digit dialing procedures that are used successfully for general population studies are inappropriate. Furthermore, cost limitations often prevent researchers from undertaking the extensive field operations that the sponsors of major surveys are able to do.

The availability or reliability of existing information may dictate the choice of survey methods. Followback studies typically have a list, roster, or set of records -- such as medical records or employee rosters -- that identify the eligible subjects and often provide addresses, telephone numbers, or both. Most researchers also have other resources through which they can fairly easily obtain telephone information if the address is known, or vice versa. Thus researchers are usually limited to considering mail surveys, telephone surveys, or a combination of the two for followback studies of specific populations.

A followback study must obtain responses from as many of the subjects selected as possible. The survey methods considered should be evaluated regarding both components of nonresponse -- noncontact and refusals. If the targeted population is likely to have poor phone coverage, a mail survey or a mixed mode (mail and phone contacts) survey may outperform a telephone survey. We believe that with attention to a few techniques for enhancing mail response rates, the mail survey can yield response rates comparable to the phone survey once a subject is contacted.

The next section will outline the mail methodology developed for a followback study of women who had recently delivered a live-born infant. Results of this study will be used to examine the effectiveness of this methodology by various maternal and infant characteristics. Information from this study was also available to examine telephone coverage in this population.

## Methods

### The Pregnancy Risk Assessment Monitoring

System (PRAMS) is a network of six state-based programs that collect information on maternal behaviors, attitudes, and knowledge during pregnancy and early infancy. PRAMS is a collaborative effort between the Centers for Disease Control and six state Health Departments -- Indiana, Maine, Michigan, Oklahoma, West Virginia, and the District of Columbia. Information gathered will be used to establish baseline rates of established risk factors for adverse pregnancy outcomes in each state, to help determine allocations of state resources, to evaluate existing state programs, to make comparisons among states, and to better understand potential risk factors for adverse pregnancy outcomes. New mothers are regularly selected once a month by means of a stratified systematic sample of birth certificates, which contain the name and address of the mother at the time of the delivery but not her telephone number. Sampling plans vary among states but share the common feature of oversampling mothers of low-birthweight infants. Three states also oversample minority mothers, and one state oversamples women who have had inadequate prenatal care. Annual sample sizes range from 1200-2000 per state.

Although contact procedures vary slightly from state to state, they are modelled after the procedures proposed by Dillman (1978) and sometimes referred to as the Total Design Method. Dillman's approach to mail surveys has two major emphases. The first relates to the initial impact the survey instrument has when potential respondents receive it in the mail. The survey materials should be personalized to distinguish it from the myriad of junk mail that people regularly receive. PRAMS personalization includes using first-class rather than metered postage, typing addresses directly onto the envelope rather than using mailing labels, giving personal salutations rather than a generic "Dear Mother", and using a blue ballpoint to sign all correspondences rather than using a signature stamp. The survey instrument should hold a general appeal to the entire survey population. This goal can often be accomplished with an attractive graphic cover relating to the survey topic. The survey instrument should not give the appearance of being too long or difficult to complete. We developed the PRAMS instrument as an 8" x 7" booklet and limited it to ten pages. Research has shown that once respondents answer the first question, they will generally complete the entire questionnaire. We therefore chose to begin with a set of "easy" questions. The reading level of the questionnaire was determined to be 7th-8th grade. The survey takes approximately 30 minutes to complete.

The other major emphasis is on repeated contact attempts of varying forms. To

accomplish this goal, we developed a procedure whereby a preletter introducing the subject to the study is followed by a cover letter and the survey instrument three to seven days later and by a reminder/thank you postcard one week later. Two weeks after the reminder postcard a second questionnaire is sent to nonresponders. Two weeks after the second questionnaire is mailed, telephone followup is attempted for the nonresponders. Telephone followup continues for at least two weeks and varies the days and times of calls.

To further encourage response, states enclose a response incentive with the first questionnaire. The incentives vary among states and include a complimentary birth certificate or a coupon for a free birth certificate, \$1.00 cash, a ballpoint, a subway fare card, or postage stamps.

Preletters are mailed within three to six months after the infant is born. An attempt is made to locate alternative addresses for mailings returned by the post office. States also generally resend returned mailings to the same address, on the chance there was a postal error. States generally use phonebooks and directory assistance to locate telephone numbers. Some states have additional resources available, such as newborn screening databases or public clinic patient records, that contain locating information. Because not all states were able to follow these techniques precisely, some minor variation exists from state to state.

Numerous studies have successfully applied Dillman's techniques. The target populations, however, were well-educated professionals, college students, or residents of areas with small minority populations. We have not seen evidence of attempts to use this methodology on a subpopulation such as that of PRAMS, which has many subjects from low socioeconomic groups.

PRAMS data collection for five of the states began in the fall of 1988. The data we examined was collected over a six-month period representing births occurring in the latter half of 1988. State sample sizes in this period ranged from about 700 to 975. All results presented in this paper were carried out on the unweighted data.

## Discussion

Response rates for the five states ranged from 44% in the District of Columbia to 86% in Maine (Figure 1). Maine and West Virginia achieved the highest response rates, at 86% and 85%, respectively. Oklahoma (71%) and Michigan (68%) followed, and Washington, D.C., trailed with a 44% response rate. We broke down response rates by the mode of participation. Clearly, the majority of respondents replied by mail. Telephone interviews accounted for between 4.7% and 15% of all responses. However, considering that telephone follow-up is only begun after repeated attempts to contact the subject by mail, it is not meaningful to directly compare mail and telephone response rates. Instead, our

evaluation addressed the survey methodology as a whole and did not separate response rates into mail and telephone components.

Although the mail survey methodology appears much more effective in some states than in others, much of the difference may be attributed to the composition of the study population in each state. The most noticeable difference is that of race. Michigan and Washington, D.C., designed their sample so that half of all subjects were black. About 11% of the Oklahoma sample was black; this sample also had a sizable (9%) Native American contingent whose response rates tended to mirror those of Oklahoma's white population. Maine and West Virginia had a negligible number of blacks in their sample. Most of the other characteristics we examined were distributed fairly similarly in each state's sample and all states' sampling schemes forced consistent distributions of infant birthweight.

Since maternal race was the characteristic that varied most widely among states, we controlled for race when examining the response rates for each state (Figure 2). Overall, black mothers had a consistently lower response rate than white mothers. Rates ranged from 36% to 75% among blacks and from 75% to 86% among whites. As stated above, West Virginia and Maine have very small black populations (<3%) so the response rates for blacks in those states should be viewed with caution. In Washington, D.C., the response rate for blacks was less than half the rate for whites. Response rates for whites in the five states clustered between 75% and 86%; the response rates for blacks were more widely dispersed (from 36% to 75%). The ordering of states by response rates, controlling for race, was similar to the ordering for overall response rates described above. Because race is closely associated with many of the other characteristics we examined, we will also controlled for this factor when determining response rates for these characteristics.

In all states -- particularly in Washington, D.C., -- response rates tended to improve as the mother got older (Figure 3). The improvement with age seems especially pronounced in Washington, D.C. This improvement was more apparent for whites than for blacks.

Response rates steadily increased with maternal education level, but this increase was more pronounced for whites (Figure 4). Except for Washington, D.C., the response rates for college graduates clustered between 88% to 94%. Especially surprising was the wide gap between response rates for blacks and for whites in the highest education category, (those who had had at least some college education). This difference suggests that our survey methodology is not very effective at getting blacks to respond.

Married women were more likely to respond than women who were not currently married (Figure 5). This pattern persisted regardless of race.

In all states, mothers with inadequate care had lower response rates than mothers with

Figure 1.

PRAMS Crude Mail and Telephone Response Rates

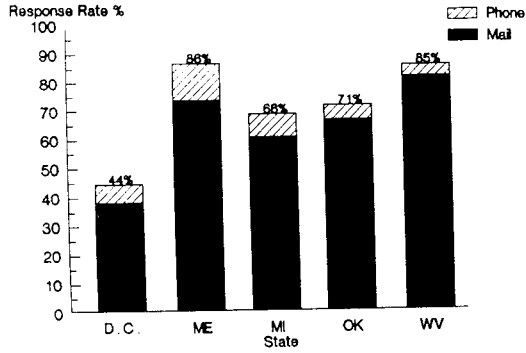


Figure 2.

PRAMS Crude Response Rates by Race

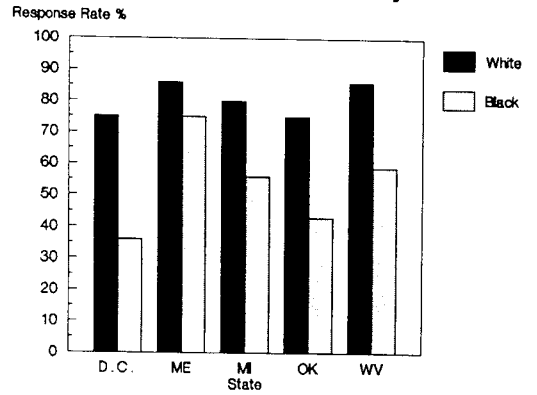


Figure 3.

PRAMS Crude Response Rates for Maternal Age Controlling for Race

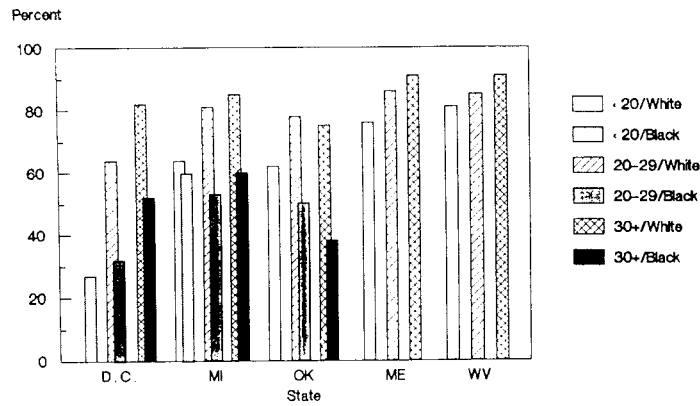
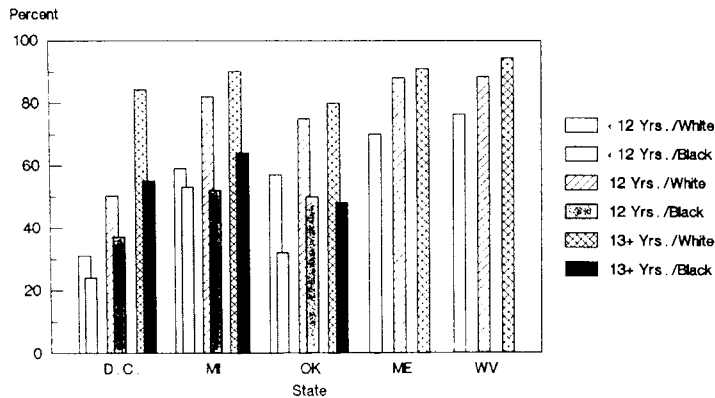


Figure 4.

PRAMS Crude Response Rates for Maternal Education Controlling for Race



adequate care (Figure 6). The adequacy of care was determined by an algorithm developed by obstetricians that takes into account the length of gestation, the number of prenatal care visits, and how early into the pregnancy prenatal care was begun. In our study, the drop in response rates from adequate to inadequate care varied from 12% to 26%. This finding was more pronounced for whites than for blacks.

Women who delivered high-risk infants (those with birthweights less than 2500 g) were less likely to respond than women who delivered low-risk, healthier babies. This result is not surprising, since low birthweight is generally associated with younger women, unmarried women, low-income women, and minority women.

Some states exhibited a slight drop in response rates as the number of the mother's previous live births increased up to three (Figure 8). However, all states showed a decline in response rates for mothers with more than three previous live births; these women may have been too busy with their children to answer our survey.

On the whole, the clustering of states for overall response rates seemed to persist when these rates were broken down by the various maternal and infant attributes. One aspect of the states' populations that we were unable to evaluate with PRAMS was the urban/rural composition. Our general impression was that the clusterings seemed to coincide with the urban/rural mix of each state. Maine and West Virginia are both sparsely populated states that have no sizeable urban hubs. Oklahoma and Michigan both have fairly large populations with major urban areas. Washington, D.C., is in a class by itself; its compact, densely populated land area is entirely urbanized.

#### Telephone Coverage

As stated above, the methodological design of PRAMS does not permit comparisons of mail and telephone response rates. Because the sampling design assured a higher proportion of subjects from lower socioeconomic status groups, there was some concern about the effectiveness of a mail survey approach for this particular study population. However, similar concerns were raised about telephone coverage in this population. To obtain a better understanding of the telephone coverage issue, we included on the mail questionnaire a pair of questions asking whether the respondent had a phone in their house that had been operating for the preceding month. Those who answered "yes" were then asked whether the number was unlisted, listed under their last name, or listed under someone else's last name.

The percentage of mail respondents who had no telephone ranged from 8% to 27% (Figure 9). Maine, Washington, D.C., and Michigan had similar rates of 8%, 10%, and 11%, respectively. Oklahoma and West Virginia had more than twice those percentages of mail responders without phones (22% and 27%, respectively). The percentage of mail respondents who had unlisted numbers ranged from 13% to 34%. Oklahoma, West Virginia, and

Maine had similar rates of 13%, 14%, and 16%, respectively. Washington, D.C., and Michigan had almost twice those rates (28% and 34%, respectively). Although not presented in the figure, the percentage of mail respondents who reported having phones listed under a different last name ranged from 11% to 22%. The figures reveal that a surprising number of respondents had no telephones in their homes. Because these rates were for mail respondents, they may not apply to the entire study population. However, since respondents without phones seemed to have the same predominant attributes as nonrespondents, the figures may actually be underreported.

To obtain an estimate of phone coverage for the entire sample population, we combined the mail respondents who indicated that their home did not have a working phone and the mail nonrespondents whom we were unable to contact by telephone (Figure 10); we assumed the latter group were unreachable by phone. If we also included mail respondents with unlisted numbers, the percentages ranged from 27% in Maine to 59% in Washington, D.C.

#### Discussion

Had only a telephone survey been carried out, the response rate in West Virginia would have dropped from 85% to at most 58%, in Oklahoma from 71% to at most 49%, in Michigan from 68% to at most 57%, in Maine from 86% to at most 78%, and in Washington, D.C., from 44% to at most 34%. These estimates do not even consider the difficulties in locating numbers for mothers who reported an unlisted phone number. Although some states have additional health department resources, such as newborn screening databases or public health clinic records, that may contain some unlisted numbers, it is doubtful that, overall, many mothers with unlisted numbers could be tracked down by phone.

The problem with phone numbers listed under another name may not be as great an obstacle in the context of PRAMS. The birth certificate typically includes the mother's maiden name and the father's full name if paternity is claimed. Searches are also made under those names if they are different from the mother's current last name. Reverse directories often enable one to locate a phone number, as long as the address given is accurate.

In the general context of followback studies where additional sources of information are not likely to be available, response rates to a telephone survey would be significantly affected by the prevalence of unlisted numbers or of numbers listed under another last name. Combining all three categories for each state, one finds that only between 34% and 54% of all mail respondents have easily identifiable telephone numbers. Although the telephone coverage rates presented here may not be indicative of other specialized populations, they may provide a fairly good guideline for similar populations. We further broke down mail respondents who indicated they had no phone, by the same maternal and infant

Figure 5.

PRAMS Crude Response Rates for Marital Status  
Controlling for Race

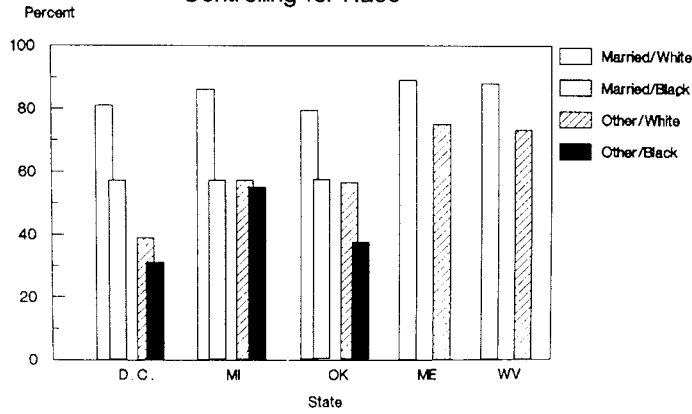


Figure 6.

PRAMS Crude Response Rates for Adequacy of  
Prenatal Care Controlling for Race

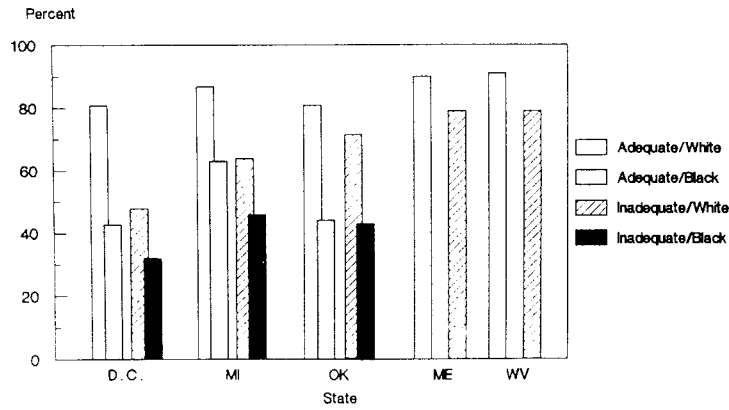


Figure 7.

Prms Crude Response Rates by Birthweight

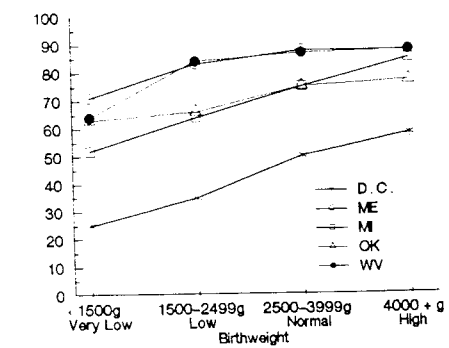
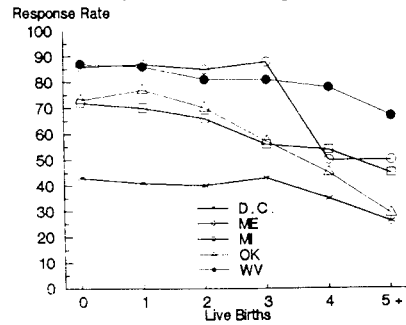


Figure 8.

PRAMS Crude Response Rates by Previous Live Births



characteristics by which response rates were examined. The trends seemed to parallel those in Figures 2 to 8. Those characteristics associated with lower response rates were also associated with lower telephone coverage. The most striking disparities were by race, marital status, maternal education, and adequacy of prenatal care.

**Summary**

In general, researchers conducting followback studies should carefully consider the composition of their target population when selecting a survey methodology. When one examines our study's response rates broken down by various attributes, the PRAMS mail survey approach is clearly very effective in some cases, fairly effective in most cases, and somewhat ineffective in a few cases. It appears to be effective with white mothers. It also appears to be quite effective with mothers who are better educated and mothers who are married, although these effects are more pronounced for white women than for black women. On the other hand, the approach is not very effective with black, unmarried, or poorly

educated mothers. In practically all other categories examined the approach seems fairly effective.

The telephone survey, however, is not a viable alternative to this methodology. Phone coverage among black, unmarried, or poorly educated mothers was inadequate to achieve acceptable response rates. Had only a telephone survey been conducted, estimated response rates would have been considerably less than was achieved by the PRAMS methodology.

We will direct further efforts towards making this methodology more appealing to, and hence more effective with, black women.

**References**

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Figure 9.

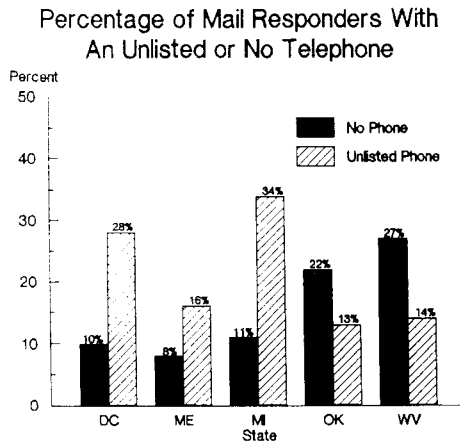


Figure 10.

