

**Comparing Telephone and Face-to-Face Surveys in Terms of Sample Representativeness:
A Meta-Analysis of Demographic Characteristics**

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April, 1999

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Abstract

Primarily for reasons of practicality, telephone interviewing has replaced face-to-face interviewing as the principal method of survey data collection in the United States during this century. In order to explore the potential costs of this shift in terms of sample representativeness, we conducted a meta-analysis of all published studies comparing the results of telephone and face-to-face surveys done simultaneously by the same investigators. In general, telephone survey samples contained greater proportions of the well-educated, the wealthy, and whites. This has been partly because people with little education and with lower incomes were less likely to have working telephones in their residences. Also responsible were the facts that people with lower incomes and non-whites were more likely to refuse to participate in telephone surveys than to refuse to be interviewed face-to-face. Comparisons with population data revealed that face-to-face samples were more accurate than telephone survey samples.

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Introduction

During the past fifty years, the use of telephones for the collection of survey data has been transformed from a rare and often criticized practice into the dominant mode of data collection in government, academic, and private sector survey research. Researchers in all fields have come to recognize that the advantages of telephone interviewing are numerous, most notably the substantially lower cost. But also, telephone interviewing permits quicker data collection than can be accomplished by interviewers visiting respondents' homes, and interviewer supervision and standardization is easier to accomplish in centralized interviewing facilities. Given the simultaneous increases in the numbers of American homes with telephones and the increasing costs of conducting personal interviews, the practical advantages of telephone surveys have proved to be nearly irresistible.

However, the practical appeal of telephone interviewing may come at some costs. First, because telephone ownership is not universal, certain segments of the population may be systematically excluded from survey samples when telephone interviewing is done. Second, people's decisions about whether to agree to be interviewed may vary across these two modes, making telephone samples even more different from face-to-face samples in their composition. This could raise questions about the representativeness of telephone samples and generalizability of the estimates they yield.

Concerns about such costs have led to a plethora of studies comparing the representativeness of

telephone and face-to-face samples. To gauge the state of this research, we have conducted a comprehensive review of books, book chapters, journal articles, and industry reports on the subject; a list of the materials we reviewed can be found in Appendix A. In the pages that follow, we first review some reasons why telephone and face-to-face samples might be expected to differ. Then, we report the results of a meta-analysis of existing studies to assess: (1) whether telephone and face-to-face samples are systematically different from one another, (2) why such differences occur, and (3) whether one mode yields more representative samples than the other.

Theory

People who have working telephones in their homes can be sampled to participate in both telephone and face-to-face surveys, but people without working telephones can only participate in face-to-face surveys. The systematic exclusion of this latter group from telephone surveys may introduce bias if this group is both sufficiently sizable and also sufficiently different from telephone owners. And indeed, there are a number of attributes that are likely to distinguish people who do and do not have working phones in their homes.

For example, people with smaller incomes or who are unemployed are less likely to have a working telephone simply because they cannot afford to pay the monthly bill as readily. Because people with lower incomes tend to be less educated and to hold blue-collar jobs more often, these groups may be under-represented in telephone samples as well. Furthermore, because young adults are more transient and less settled than middle or older age adults, the former individuals may be less likely to own telephones and therefore may be under-represented in telephone samples.

It also seems possible that different sorts of people refuse to participate in telephone versus face-to-face interviews. Specifically, women and the elderly may feel more physically vulnerable than

men and younger people. So the first of these groups may be more reluctant to allow a stranger into their homes for an interview, whereas they may be willing to talk with an interviewer over the telephone. On the other hand, people who are generally skeptical about the value of survey participation may be quick to decline a telephone call but may be more readily persuaded to participate by a friendly face on their doorstep. The process of rapport development in the first moments of a face-to-face interaction may reduce or even eliminate a tendency of these reluctant individuals to refuse an interview, thus causing non-response to be primarily a function of non-contact rather than refusal.

Evidence

The Studies

To test these ideas, we reviewed demographic differences between telephone and face-to-face samples using data gathered from all the studies we could find that systematically compared sample demographics (Aneshensel et al. 1982; de Leeuw 1992; Gfroerer & Hughes 1991; Groves 1977; Groves & Kahn 1979; Henson et al. 1977; Hinkle & King 1978; Hochstim 1962; Hox & de Leeuw 1994; Jordan et al. 1980; Klecka & Tuchfarber 1978; Mulry-Liggan 1983; Thornberry 1987; Weeks et al. 1983). The studies addressed a wide variety of topics, including political attitudes, depression, drug use, medical care reports, and crime rates. Three of these studies (Groves & Kahn 1979; Mulry-Liggan 1983; Thornberry 1987) were national surveys of the United States, so these data provided a basis for comparisons of telephone and face-to-face samples with population characteristics (as gauged by the U.S. Census Bureau's November Voting Supplement to the Current Population Survey from years that most closely matched the national studies we examined).

A detailed description of the methods employed in each study appear in Appendix B.

Unfortunately, the procedures employed in these studies were rarely described in complete detail, so it

is difficult to be sure that comparable approaches were employed in each pair of telephone and face-to-face surveys. For example, almost none of the studies we examined reported the number of call-backs attempted in each mode. Similarly, few reports include a discussion of whether telephone samples were weighted to handle the possibility of multiple phone numbers in a given home (Groves & Kahn 1979 and Thornberry 1987 are the two notable exceptions). However, the information that is available suggests that the sampling, respondent selection, weighting, and call-back procedures used in each mode of a particular study were equivalent.

Analysis

Using the data reported in these studies, we examined differences in the proportion of telephone and face-to-face samples with regard to six demographic variables: gender, age, race, income, education, and marital status. We describe the differences: (1) between telephone survey samples and face-to-face samples; (2) between face-to-face survey respondents who have working telephones and those who do not; and (3) between telephone survey samples and samples of people who responded to face-to-face surveys and had working telephones (to assess differences between the modes in the types of people who refuse to participate).

For each comparison in each study, we conducted a log-linear analysis to gauge its statistical significance (the results are reported in Tables 1-19 and in the text where appropriate). Using the resulting χ^2 statistics, we then conducted meta-analyses to assess the significance of the differences between modes combining across studies. Our analysis and the data presented in Tables 1-19 are based on unweighted meta-analyses. The decision to employ unweighted analyses, where each study is given an equal weight in determining the overall significance of the effect, was based on the large variability in the sample sizes across studies. The sample sizes ranged from 284 (Hochstim 1962) to

19,800 (Thornberry 1987).

Results

Comparing Telephone and Face-to-Face Samples

Studies that compared telephone and face-to-face samples did indeed reveal systematic differences between the samples generated by the two methods. Although these differences were less pronounced for gender, race, and marital status, they were more pronounced regarding age, education, and income. We review each of these results in detail next.

Gender. Shown in Table 1 are figures comparing the proportions of men and women in telephone (column 1) and face-to-face (column 2) samples of various studies. Column 4 displays the differences between the percentages obtained in the face-to-face and telephone samples. A positive number means the group was larger in the face-to-face sample than in the telephone sample, and a negative number means the group was larger in the telephone sample than in the face-to-face sample.

Of the seven studies permitting gender comparisons, five reported differences suggesting that men made up a greater proportion of telephone samples (Aneshensel et al. 1982; Hochstim 1962; Groves & Kahn 1979; Thornberry 1987; Weeks et al. 1983), while the remaining two reported findings suggesting the opposite (Klecka & Tuchfarber 1978; Mulry-Liggan 1983). As the eighth and sixteenth rows of Table 1 show, the average difference between the telephone and face-to-face samples in terms of the proportion of men and women was a mere 1.00 percentage points. A meta-analysis combining across the eight studies that permitted gender comparisons indicated that this difference was not statistically reliable (combined $z=1.10$, $p=.14$).

Age. Seven studies permitted comparisons of the age distributions of respondents across modes (see Table 2). The top panel of the table shows that the two types of samples did not differ in

terms of the proportion of 18-24-year-olds. However, as compared to the face-to-face samples, the telephone samples consistently and significantly contained greater proportions of people between 25 and 44 years old (by a margin of 3.30 percentage points, combined $z=4.78$, $p<.001$), marginally significantly smaller proportions of people ages 45 to 64 (by a margin of .83 percentage points, $p<.10$) and significantly smaller proportions of people age 65 and older (by a margin of 2.1 percentage points, combined $z=5.22$, $p<.001$).

Race. Four studies permitted comparisons of race and revealed significant differences indicating that the telephone samples contained greater proportions of whites and smaller proportions of African-Americans than face-to-face samples (see Table 3). The average difference in the percentage of whites between the two modes was 4.80 percentage points (combined $z=3.34$, $p<.001$). This difference is mirrored in the percentages of African-American respondents, where the average difference across all four studies was 3.00 percentage points (combined $z=3.57$, $p<.001$). No significant difference appeared across modes in the percentage of people of other races (difference = 1.75 percentage points, n.s.).

Income. Five studies permitted comparison of income distributions across modes and suggested that the telephone samples contained smaller proportions of people with low incomes and greater proportions of people with high incomes (see Table 4). The average proportion of people in the lowest income group was 3.96 percentage points greater in the face-to-face samples than the telephone samples (combined $z=6.79$, $p<.001$). And the average proportion of people in the highest income group was 2.94 percentage points greater in the telephone than in the face-to-face samples (combined $z=2.07$, $p<.01$).

Education. Six studies permitted comparisons of educational attainment across modes and

suggested that the telephone samples contained more people who are most educated and fewer people who were least educated (see Table 5). All six of the studies reported having more people with 8 years of education or less in the face-to-face samples than in the telephone samples. The average mode difference across all studies was 3.52 percentage points (combined $z=10.06$, $p<.001$). Similarly, five out of the six studies reported a greater proportion of people with between 9 and 12 years of education in the face-to-face samples than in the telephone samples, with an average difference across all studies of 1.35 points (combined $z=2.40$, $p<.01$). And in all six studies, a greater proportion of people with 13 years of education or more appeared in the telephone samples than in the face-to-face ones. The average mode difference was 4.70 percentage points (combined $z=10.06$, $p<.001$).

Marital status. Four studies allowed for comparison of marital status across modes and found that the telephone samples contained more people who were married and fewer people who were divorced, separated, or widowed (see Table 6). Three of the four studies reported having more married people in the telephone samples than in the face-to-face samples. The average difference across modes was 2.18 percentage points (combined $z=2.86$, $p<.01$). The average proportion of divorced, widowed, or separated people was 0.83 percentage points higher for the face-to-face samples than for the telephone samples (combined $z=2.34$, $p<.01$). People never married were marginally significantly more common in the telephone samples than in the face-to-face samples, by 1.23 percentage points ($p<.10$).

Summary. As compared to face-to-face samples, telephone samples sizably over-represented whites, people with high incomes, and highly educated people. By contrast, the telephone samples under-represented African-Americans, people with low incomes, less educated people. Thus, telephone samples tended to under-represent members of social groups with lower social status as

compared to face-to-face samples.

Telephone Ownership

One obvious possible explanation for these differences between telephone and face-to-face samples is that the former exclude the segment of the population who do not have telephone service. If this is a sizable number of people and if they differ systematically from other individuals, telephone surveys may not be able to effectively generate samples representative of the general population. We consider this issue first by establishing the number of people without working telephones in their residences in the United States.

Telephone coverage in the United States grew dramatically in the early to mid-1900s, grew slowly and steadily through the 1980s, and has been relatively stable in the 1990s. In 1930, there were 2 telephones for every 100 Americans, and by 1965, that figure had risen to 47 for every 100. Figure 1 and 2 illustrate how increases since that time have been less dramatic. According to Thornberry and Massey (1988), the percentage of U.S. households without working telephones declined from about 20% in 1963 to about 7% in 1985 (see Figure 1). And according to data from the Federal Communications Commission (1998), the percentage of U.S. Households without working telephones declined from about 8% in 1984 to about 6% in 1998 (see Figure 2).

This means that telephone surveying was more severely limited in this regard decades ago than it is currently. Nonetheless, some of the discrepancies between telephone and face-to-face samples we have seen thus far may be attributable to the portion of the electorate without working telephones being represented only in the latter.

Demographic Characteristics of People With and Without Telephones

In order to test this claim, we must gauge whether people without telephones in their homes are

systematically different from people with telephones. This can be done via data from four face-to-face surveys in which respondents were asked whether or not they had a working telephone in their homes. Using answers to this question, respondents can be separated into those with and without phones, and it turns out that these groups have been systematically different.

Gender. The proportion of men in non-telephone households was, on average, 3.51 percentage points higher than the proportion of men in households with a telephone (see Table 7). This difference is highly statistically significant (combined $z=3.20$, $p<.001$).

Age. People without a telephone were much more likely to be between ages 18 and 24 than people with a phone (average difference = -14.8 percentage points, $p<.001$), and people without a phone were somewhat more likely to be between ages 25 and 44 than were people with telephones (average difference = -3.87 percentage points, $p<.01$; see Table 8). In contrast, people with telephones were much more likely to be between the ages of 45 and 64 (average difference = 10.57; percentage points, $p<.001$) and over age 65 (average difference = 8.07 percentage points, $p<.001$).

Race. Whites have been substantially more likely to own a telephone than were racial minorities (see Table 9). On average, the proportion of whites was 18.36 percentage points higher among people with telephones than without (combined $z=19.33$, $p<.001$). In contrast, the proportion of African-Americans was 13.15 percentage points lower among people with telephones than among those without telephones (combined $z=15.94$, $p<.001$). Other racial minorities were similarly less likely to own a phone, with a difference of 5.26 percentage points (combined $z=6.76$, $p<.001$).

Income. Income was also powerfully correlated with telephone ownership (see Table 10). The proportion of individuals falling into the lowest income group was substantially smaller among people with telephones than among people without telephones (difference = 33.82 percentage points;

combined $z = 22.50$, $p < .001$). And the proportion of people in the highest income bracket was much higher among people with phones than among those without (difference = 30.08 percentage points; combined $z = 12.00$, $p < .001$). People with moderate incomes were also more common among telephone owners than non-owners (difference = 3.77 percentage points; combined $z = 1.46$, $p < .01$).

Education. A similar, though less powerful, trend is evident with regard to education (see Table 11). The proportion of people with only an elementary school education (0-8 years) was substantially greater among people without a telephone than among people with a telephone (difference = 14.60 percentage points; combined $z = 13.85$, $p < .001$). A smaller difference in the same direction appeared for people with 9 to 12 years of formal education (difference = -5.23 percentage points; combined $z = 3.45$, $p < .001$). People who had between 13 and 17 years of education were substantially under-represented among people without telephones as compared to those with telephones (difference = 15.70, combined $z = 10.35$, $p < .001$). And again, a smaller difference in the same direction appeared with regard to people with advanced degrees (difference = 4.10 percentage points, combined $z = 6.37$, $p < .001$).

Marital status. As compared to people with telephones, people without telephones are much more likely to be previously married or never married. On average, the proportion of married people was much greater among people with telephones than among those without (difference = 17.15 percentage points; combined $z = 11.97$, $p < .001$). Conversely, the proportion of divorced, separated, or widowed respondents was greater among people without telephones than among those with (difference = 8.85 percentage points, $p < .001$), as was the proportion of never married respondents (difference = 8.10 percentage points, $p < .001$).

Conclusion. These results suggest a partial explanation for the fact that telephone samples over-

represent well-educated people and people with high incomes. Individuals in these groups are in fact quite a bit more likely to have a working telephone than people with less education and lower incomes. However, the magnitude of the population of people without telephones and the magnitudes of the differences just observed are not big enough to explain the entire gap between telephone and face-to-face samples in terms of demographic composition. We therefore turn to considering another type of explanation: differential non-response.

Response Rates in Telephone and Face-to-Face Surveys

There is abundant evidence in the research literature of widespread variation in response rates both within a given mode and between modes. However, as the data in Table 13 suggest, response rates for face-to-face surveys have generally been higher than those for telephone surveys (Aneshensel et al. 1982; de Leeuw 1992; Groves 1977; Groves & Kahn 1979; Henson et al. 1977; Hinkle & King 1978; Hochstim 1962; Hox & de Leeuw 1994; Jordan et al. 1980; Mulry-Liggan 1983; Thornberry 1987; Weeks et al. 1983). The studies presented in Table 13 include both national and local samples and deal with a wide range of topics. Each study's goal, however, was the comparison of telephone and face-to-face strategies for the collection of data, in order to assess the comparability of the two modes. On average, response rates for face-to-face surveys were 7.3 percentage points higher than response rates for telephone interviews.

Telephone and face-to-face samples may therefore differ because of these differential response rates for the two modes if non-respondents in telephone surveys are systematically different from non-respondents in face-to-face surveys. We explore this possibility next.

Demographic Characteristics of Non-Respondents

To assess whether people who refuse to participate in telephone surveys are identical to the

people who refuse to participate in face-to-face surveys, we examined data from a series of studies that compared the demographic characteristics of telephone survey respondents to the demographic characteristics of respondents to comparable face-to-face surveys who had working telephones. Therefore, we have eliminated differences between modes due to telephone ownership and can focus on non-response differences.

Gender. The data in Table 14 suggest that men are more willing to participate in a telephone survey than in a face-to-face survey. On average, the difference between the proportion of male respondents in telephone and face-to-face surveys was 2.25 percentage points (combined $z=4.88$, $p<.001$).

Age. The data in Table 15 suggest that telephone non-respondents are older than face-to-face non-respondents. The proportion of telephone survey respondents between the ages of 18 and 24 was 1.70 percentage points higher than the proportion of face-to-face survey respondents (combined $z=9.00$, $p<.001$). For people between ages 25 and 44, the difference between modes is in the same direction and of greater magnitude (3.92 points, combined $z=7.60$, $p<.001$). In contrast, the face-to-face surveys included larger proportions of people aged 45 to 64 (difference = .46 percentage points; combined $z=4.48$, $p<.001$) and ages 65 or older (difference = 3.66 percentage points; combined $z=9.13$, $p<.001$).

Race. Telephone non-respondents were significantly more likely to be racial minorities than were face-to-face non-respondents, as suggested by the data in Table 16. On average, the proportion of telephone respondents who were white was 8.06 percentage points higher than the proportion of face-to-face respondents who were white (combined $z=11.19$, $p<.001$). The proportions of telephone respondents who were African-American or another racial minority were smaller than the proportions of

face-to-face respondents who were African-American or another racial minority (difference = 2.41 and 5.69 percentage points, respectively; $p < .001$ in both cases).

Income. Telephone non-respondents are more likely to have been from lower income groups than face-to-face non-respondents (see Table 17). On average, the proportion of face-to-face respondents in the lowest income bracket was 4.50 percentage points higher than the proportion of telephone interview respondents in that group (combined $z=6.31$, $p < .001$). In contrast, the proportion of face-to-face respondents in the highest income bracket was, on average, 6.55 points lower than the proportion of telephone interview respondents in that same group (combined $z=12.80$, $p < .001$).

Education. The data in Table 18 suggests that telephone non-respondents were less educated than face-to-face non-respondents. The proportion of face-to-face respondents with only an elementary school education was 2.98 percentage points higher, on average, than the proportion of telephone survey respondents with an equivalent education (combined $z=8.01$, $p < .001$). The same trend is evident for people with only a high school education, although the magnitude of difference is substantially less (difference = 1.33 percentage points, $p < .05$). In contrast, the proportion of face-to-face respondents with at least some college education was, on average, 2.95 percentage points lower than the proportion of telephone survey respondents (combined $z=9.21$, $p < .001$). And the proportion of face-to-face respondents with an advanced degree was slightly lower than the proportion of telephone survey respondents with a similar education (difference = 1.15 percentage points, combined $z=2.92$, $p < .01$).

Marital status. Table 19 indicates that there was very little difference between face-to-face and telephone non-respondents in terms of marital status. On average, the differences between the two mode groups did not reach one percentage point in magnitude, and only the average difference among

respondents who are either divorced, separated or widowed was statistically significant at conventional levels (difference = 0.80 percentage points; combined $z=1.82$, $p=.0344$).

Conclusion. Differences between the characteristics of non-respondents in telephone and face-to-face surveys were, for most variables, small and inconsequential. Only in terms of race and income did these differences become more substantial. Thus, it appears that moving from the face-to-face methodology to the telephone methodology reduces the proportion of non-whites and low-income individuals, because these individuals are especially likely to be telephone non-respondents.

Telephone and Face-to-Face Sample Accuracy

Simply documenting reliable differences between telephone and face-to-face samples in these regards does not mean that one mode's results are necessarily more accurate than the other's. Therefore, to see whether a conclusion can be reached about general accuracy, we focused on the three studies of nationally representative samples in order to compare their results to CPS data on the entire national population. The relevant comparisons are displayed in columns 5 and 6 of Table 1 through 6. Positive differences mean the samples under-represented the group of respondents relative to the population, and negative differences mean the samples over-represented the groups of respondents relative to the population.

Gender. For gender, the average error between the face-to-face samples and the population values was 0.80 percentage points (combined $z=0.64$, n.s.) and 0.33 percentage points between the telephone samples and the population values (combined $z=1.13$, n.s.; see Table 1). Therefore, males were not significantly under-represented or over-represented in either mode's samples.

Age. As Table 2 shows, both the face-to-face and telephone samples over-represented 18-24-year-olds (by 1.67 and 1.30 percentage points, respectively, $p<.001$). The face-to-face samples

under-represented 25-44-year-olds (by 1.83 percentage points, $p < .001$), whereas the telephone samples over-represented this age group (by 2.43 percentage points, $p < .001$). The only sizable difference between the modes involved people ages 65 and older, who were much more over-represented in the telephone samples than in the face-to-face samples (by 3.40 vs. 0.43 percentage points, respectively, $p < .01$ and $p < .001$). Thus, the face-to-face mode appears to have been more accurate in representing the population age distribution.

Race. As Table 3 shows, both face-to-face and telephone surveys tended to under-represent whites and over-represent minorities relative to the population. The under-representation of whites is slightly greater in the face-to-face surveys than in the telephone surveys.

Income. According to Table 4, both modes tended to underestimate the proportion of people in low and middle income groups while over-estimating the proportion of people in the high income category. The discrepancy between the telephone samples and the population is greater than the discrepancy between the face-to-face samples and the population for both the lowest and highest income groups (low income: 10.95 vs. 5.60, respectively; high income: 15.75 vs. 13.75, respectively). The under-representation of people with moderate incomes was a bit greater in the face-to-face samples than in the telephone samples.

Education. Another case in which the telephone samples were less accurate than the face-to-face samples involved education (see Table 5). The telephone samples under-represented individuals who did not graduate from high school and over-represented people who did attend college. In contrast, the face-to-face surveys only very slightly over-represented people of low to moderate educational attainment and under-represent people with at least some college education.

Marital status. The two modes were nearly equivalent in terms of their representation of people

of different marital statuses (see Table 6). Both modes under-represented currently or previously married people and over-represented people who were never married.

Discussion

Taken together, our findings both document mode differences and explain them at least partially. Specifically, relative to face-to-face samples, telephone samples under-represent people with low incomes, people with relatively little education, and minorities. This is due in part to the fact that these people are especially unlikely to own telephones. In addition, minorities and people with low incomes are more likely to refuse to participate in telephone surveys than to do so in face-to-face surveys. Thus, the combination of telephone ownership and non-response differences yields the sample composition differences we initially examined.

One reaction to these findings might be simple: weight! In order to eliminate the differences we documented between modes, one can simply weight minorities and people with lower incomes and educational levels more heavily, thereby eliminating the differences we observed. But such an approach hinges on the assumption that the minority, low income, and less educated people not interviewed in telephone surveys are equivalent to the members of those demographic groups who are interviewed for such surveys. This may be a reasonable assumption to make.

However, little empirical evidence exists to support this assumption, and people who refuse to participate in surveys may be systematically different from people who do not refuse. In fact, our evidence suggests just this: the higher non-response rates for telephone surveys appear to be due to refusals from particular types of people who differ systematically from those who agree to be interviewed. Although we have shown these differences in terms of demographics, there could also be differences in attitudes, beliefs, behavior, and more.

Furthermore, weighting has undesirable effects when one does the sort of correlational analyses that are the lifeblood of surveys like the NES. Specifically, weighting introduces non-independence between originally independent observations, yet the weighted data are treated as being composed of independent observations in conventional multivariate statistical analyses. This can alter standard errors and significance tests even if not biasing coefficients in particular directions. Consequently, the results of statistical analyses can appear to be quite different than they otherwise might have (Brehm 1993). Therefore, the decision to weight may not be the simple and effective strategy that it may at first appear to be.

A second potential cost of the demographic under-representation characteristics of telephone surveys involves subgroup analyses. Many survey analysts are interested in studying variation in correlations and causal processes across various subgroups of respondents. Often of special interest to investigators using NES data are individuals minimally knowledgeable about and involved in politics. These individuals tend to be lower in education and income than others. Therefore, lower response rates to telephone surveys in these groups reduce the numbers of cases with which analysts can investigate these issues unless special over-sampling steps are taken or overall sample sizes are increased.

Conclusion

Our conclusions are based upon the findings of a range of investigators conducting studies over a wide span of years in various different populations, and the patterns we observed are relatively consistently apparent across these studies. Although some of the mode differences we have identified are quite small, others are more sizable. Investigators should therefore make the choice of survey mode knowing that the consequences may be significant in at least some regards.

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Appendix A

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Appendix B

Methods Employed by the Studies Reviewed in This Paper

Aneshensel, Frerichs, Clark & Yokopenic (1982)

This study compared data collected from the Los Angeles Metropolitan Area Sample. This sampling frame was developed by the UCLA Survey Research Center based on the 1970 Census (updated in 1976). The frame is considered representative of the adult population aged 18 or older residing in Los Angeles County. The sample is a three-stage cluster sample with probabilities proportional to size.

Participation in this study was solicited by letter and a subsequent personal contact by the interviewer. During the initial contact a household roster was completed using the Kish selection method. At the same time respondents were randomly assigned to either a telephone or face-to-face condition. The study employed a quota of 45% face-to-face and 55% telephone interviews in order to ensure a sufficient sample size in both conditions.

The field work was conducted by professional interviewers from the UCLA Institute for Social Science Research. The telephone questionnaire was considerably shorter than the face-to-face instrument.

The face-to-face condition yielded 238 interviews (response rate of 80.4%), while the telephone condition yielded 308 interviews (81.7% response rate).

Freeman, Kiecolt, Nicholls & Shanks (1982)

This study compared data from the 1976 Survey of Income and Education (SIE), conducted by the U.S. Census, and data collected in the California Disability Survey (CDS) from October, 1977 through May, 1978.

The CDS was conducted by the Survey Research Institute in Berkeley and the Institute for Social Science Research at UCLA. Interviews for the CDS were conducted from a centralized telephone facility using a computer-assisted interviewing system. The CDS survey employed a stratified, clustered random digit dialing sample of all California households. Usable interviews were obtained from 30,971 households containing 86,113 persons, of whom 57,223 were working aged adults. The response rate for the CDS was 84.6%. Data were obtained on all household members from one responsible household adult.

The 1976 SIE sample consisted of 4,202 households. Data for the SIE were collected through face-to-face interviews, and the respondent reporting procedures are the same as those employed in the CDS.

Gfroerer & Hughes (1991)

This study compares data gathered by the National Household Survey on Drug Abuse (NHSDA) conducted during the Fall of 1988 with data collected by the Quick Response Survey (QRS) conducted in November and December of 1988.

The NHSDA yielded 5719 interviews with adults aged 18 and older. The NHSDA employed a stratified multi-stage area sample of 100 primary sampling units (defined as counties or metropolitan areas) within the continental United States. Quotas were employed in the NHSDA sample to oversample respondents under the age of 35, Hispanics and African-Americans. The NHSDA had a screening response rate of 91% and an interview response rate of 71% for those aged 18 and older.

The QRS yielded interviews from 1,965 adults aged 18 and older. The QRS employed a random digit dialing sample. In order to obtain a sufficient number of African-Americans in the sample, a subsample of persons were selected from those zip codes containing more than 50% African-Americans. Within each household of the QRS sample the person with the most recent birthday was selected to be interviewed. The QRS interviews were conducted without any prior notification to the household. The estimated interview response rate for the QRS survey was 66%. The QRS survey was administered using a CATI (Computer-Assisted Interviewing) system.

Groves & Kahn (1979)

This study compared data gathered from three national surveys conducted by the Survey Research Center at the University of Michigan during the Spring of 1976. Two of the surveys were administered via the telephone, and one was conducted via face-to-face interviews. Of the two national telephone surveys, one employed a stratified (non-clustered) random sample spread over the entire United States, while the other employed a clustered random sample of the 74 primary sampling areas of the SRC's nation sample of dwellings.

In the face-to-face survey, the selection of respondents within each household was done by the interviewer, who first recorded information about the household composition and then used a selection table to choose the individual respondent. A variant of this procedure, which required only two questions be asked before selecting the respondent, was used in both of the telephone surveys.

The response rate for the face-to-face study was 74%, while the response rate for the (clustered) telephone interview study was 70%. The face-to-face study yielded interviews with 1,548 persons aged 18 or older. The telephone interview study yielded interviews with 1,734 persons aged 18 or older.

Both the telephone and personal interview questionnaires included identical items on consumer finances, political affairs, race relations, life satisfaction, and demographics.

Hochstim (1962)

This study compares data gathered in the Human Population Laboratory Experiment conducted in Alameda County, California. The study employed an area probability sample of Alameda County based on 1960 U.S. Census data.

The study employed a multi-stage design using census enumeration districts as the primary sampling units. The county was first stratified by geography and then enumeration districts were selected with a probability proportionate to their size. Two blocks were drawn from each enumeration district, again proportionate to size. With each block a cluster of 6 households were drawn from a random start. The sample was supplemented by a sample of new construction, conversions, and demolitions undertaken since the 1960 Census.

The sample was then randomly assigned to one of three conditions -- personal interview, telephone interview, or mail interview. The telephone condition yielded interviews with 518 adults aged 17 or older, while the personal interview condition yielded interviews with 284 adults aged 17 or older. The response rates for the two conditions were 72% and 93% , respectively. Although the response rate was higher for the personal interview condition, due to cost factors, fewer blocks were initially assigned to this condition, which accounts for the discrepancy in the number of interviewed adults. IN order to ensure the highest possible cooperation rates each household, in each condition was sent a letter from the State Department of Public Health notifying them of their selection for the study.

In each condition every member of the household aged 17 or older was eligible to be interviewed. Identical questions were used in each condition of the study.

Klecka & Tuchfarber (1978)

This study compared data collected by the U.S. Bureau of the Census in a survey of crime victimization in Cincinnati, Ohio and a survey replicating that study conducted by the Behavioral Sciences Laboratory at the University of Cincinnati. The Census Bureau study was in the filed from January through March of 1974, and the University of Cincinnati study was in the filed during April of 1974. The questions used for the replication study were drawn directly from the LEAA instrument.

The sampling frame for the Census Bureau study included all housing units represented in the 1970 Census of Cincinnati, with efforts made to include new housing units, including group quarters. All household information and 78% of personal information was collected via a face-to-face interview. A total of 9,708 households and 19,903 persons were interviewed in the Census Bureau study.

The University of Cincinnati study involved two random digit dialing samples, but the results presented in this paper come only from the city-wide RDD survey. The sampling frame for the city-wide RDD survey was all working telephone exchanges. Non-working numbers, non-residential numbers, and numbers outside the geographic area were excluded during the interviewing process. Households with more than one telephone number were down-weighted accordingly. The city-wide survey interviewed 800 households and 1,639 persons.

Response rates for the two studies were nearly equivalent. The Census Bureau study obtained interviews in 96% of the households contacted, while the city-wide RDD study had a cooperation rate of 93%.

Mulry-Liggan (1983)

This study compared data gathered from the 1982 Current Population Survey (conducted during the Summer of 1982) and the Random Digit Dialing Employment and Health Survey, both conducted by the U.S. Census Bureau.

Although the CPS interviews respondents both in person and occasionally by phone, the results of this study are restricted to initial interviews, which are always conducted in person. This yielded approximately 7,200 interviews. The CPS sampling frame is based on census address lists. The sampling frame for the RDD survey was all residential telephone numbers and yielded 4,040 interviews.

The overall response rate for the CPS study was 95%, while the overall response rate for the RDD survey was 84%.

Thornberry (1987):

This study compared data from the National Health Interview Study conducted by the U.S. Census Bureau and a national probability sample random digit dialing survey conducted by the Survey Research Center at the University of Michigan. Data from both surveys were collected in the Fall of 1979 and yielded interviews with 8,200 and 19,800 adults aged 17 or older, respectively. The overall response rate for the SRC Telephone Survey was 80%, while the NHIS response rate was approximately 96%.

The sampling frame for the NHIS is the civilian, non-institutionalized population of the United States. It employs a multi-stage probability sample that permits continuous sampling of the population. Interviews are conducted with persons 19 or older who are present at the time of the interview. Information on children and adults not present at the time of the interview are obtained from a related household member. The NHIS is conducted in a group format.

The sample employed by the SRC Telephone Survey was a two-stage stratified random digit dialing design. The sampling frame for the study was the list of working area and central office codes combinations in the coterminous United States. The design yields a self-weighting sample of telephone numbers within each strata.

Within the SRC study telephone numbers were randomly assigned to a set of treatments which resulted in three experimental conditions -- interviewing procedure, respondent rules, and computer - assisted interviewing. The interviewing experiment consisted of a control condition where the behavior of the interviewer was similar to that of the U.S. Census Bureau, and an experimental condition which

used explicit instructions and feedback to the respondent written into the questionnaire. The respondent rule experiment consisted of two selection rules. Half the sample was assigned to a knowledgeable respondent rule in which an adult judged as capable of answering the health questions responded for all adults in the family. The second half of the sample was assigned to a random respondent rule in which one person, 17 years or older was randomly selected to respond for all adults in the family. Finally half of the telephone sample was assigned to a computer-assisted condition and half were assigned a paper and pencil version of the questionnaire.

Because the NHIS instrument was designed to be administered in a group format, the SRC instrument had to be modified for administration over the phone.

Weeks, Kulka, Lessler & Whitmore (1983)

This study compares data gathered in the Community Health Information Policy Study conducted between February and August of 1981 in the Florida Gulf Health Systems Agency service area (the service area encompasses four counties in the Tampa area -- Hillsborough, Manatee, Pasco, and Pinellas). The CHIPS study consisted of three separate sampling frames -- an area frame, a telephone frame, and a list of persons eligible for Medicaid. The results presented in our paper focus on a comparison of the area frame and the telephone frame.

The area sample included 439 housing units which were allocated equally to the four counties and two socio-economic strata within each county. The telephone frame included all possible telephone numbers in the 168 area code-prefix combinations serving the FGHSA service area. The telephone sample consisted of an equal probability sample of 1,318 four digit suffixes without replacement within strata. The telephone sample was allocated in such a way as to yield expected contact with the same number of eligible households in each county. Re-interview attempts were made for all persons who refused to be interviewed, regardless of frame. Call-backs were conducted by different interviewers, via the same mode as the initial contact.

The same seventy-six item questionnaire was used for both the area and telephone interviews. An adult member of the household served as the respondent and provided information for all family members. When a household contained unrelated persons, separate interviews were conducted with each family unit represented.

Response rates for the area frame interviews had both a lower and upper bound estimate of 88%. The RDD frame had a lower bound estimate of 62% and an upper bound estimate of 70%.

Wofle (1979)

This study analyzes data from the National Opinion Research Center's General Social Surveys from 1973 through 1977. Each of the five surveys yielded interviews with approximately 1500 non-institutionalized adults, aged 18 or older, living in the United States. The total sample, collected over five years, included 7057 respondents. The NORC surveys employed a national, stratified, multi-stage

sample design.

Table 1:

Gender Distributions in Telephone and Face-to-Face Samples

	Phone	Face-to-Face	Population	Difference (Face-to-Face – Phone)	Difference (Population – Face-to-Face)	Difference (Population – Phone)
Male						
Hochstim (1962) ¹	46.00	45.00		-1.00		
Klecka & Tuchfarber (1978) ²	43.00	44.60		1.60		
Groves & Kahn (1979)	46.80	43.70	46.60 ^a	-3.10+	2.90*	-0.20
Aneshensel et al. (1982) ³	44.20	43.30		-0.90		
Mulry-Liggan (1983)	47.70	47.90	46.90 ^b	0.20	-1.00+	-0.80
Weeks et al. (1983) ⁴	48.60	45.30		-3.30		
Thornberry (1987)	46.80	46.30	46.80 ^c	-0.50	0.50	0.00
Average				-1.00	0.80	-0.33
Female						
Hochstim (1962) ¹	54.00	55.00		1.00		
Klecka & Tuchfarber (1978) ²	57.00	55.40		-1.60		
Groves & Kahn (1979)	53.20	56.30	53.40 ^a	3.10+	-2.90*	0.20
Aneshensel et al. (1982) ³	55.80	56.70		0.90		
Mulry-Liggan (1983)	52.30	52.10	53.10 ^b	-0.20	1.00+	0.80
Weeks et al. (1983) ⁴	51.40	54.70		3.30		
Thornberry (1987)	53.20	53.70	53.20 ^c	0.50	-0.50	0.00
Average				1.00	-0.80	0.33

^a1976 CPS Population Estimate

^b1980 CPS Population Estimate

^c1984 CPS Population Estimate

^d1996 CPS Population Estimate

***p≤.001

**p≤.01

*p≤.05

+p≤.10

¹ The population of interest in this study was residents of Alameda county in California. Therefore, no comparisons with U.S. Population estimates are presented in Table 1.

² The population of interest for this study was residents of the City of Cincinnati, OH aged 12 and older. Therefore, no comparisons with U.S. population estimates are presented in Table 1.

³ The population of interest for this study was residents of the Los Angeles, CA metropolitan area aged 18 or older. Therefore, no comparisons with U.S. population estimates are presented in Table 1.

⁴ The population of interest for this study was residents in four Florida counties – Hillsborough, Manatee, Pasco and Pinellas. Therefore, no comparisons with U.S. population estimates are presented in Table 1.

Table 2:

Age Distributions in Telephone and Face-to-Face Samples

	Phon e	Face-to- Face	Population	Difference (Face-to-Face – Phone)	Difference (Population – Face-to-Face) †	Difference (Population – Phone) †
18-24						
Hochstim (1962) ¹	13.00	13.00		0.00		
Klecka & Tuchfarber (1978) ²	31.80	33.20		1.40		
Groves & Kahn (1979)	16.20	16.00	17.90 ^a	-0.20	1.90***	1.70
Aneshensel et al. (1982) ³	12.30	17.20		4.90		
Mulry-Liggan (1983)	20.50	20.90	17.50 ^b	0.40	-3.40***	-3.00***
Weeks et al. (1983) ⁴	20.40	15.60		-4.80*		
Thornberry (1987)	18.50	19.40	15.90 ^c	0.90+	-3.50***	-2.60***
Average				0.37	-1.67***	-1.30***
25-44						
Hochstim (1962) ¹	46.00	44.00		-2.00		
Klecka & Tuchfarber (1978) ²	35.30	32.30		-3.00**		
Groves & Kahn (1979)	44.00	37.40	37.10 ^a	-6.60***	-0.30	-6.90***
Aneshensel et al. (1982) ³	43.80	42.00		-1.80		
Mulry-Liggan (1983)	41.20	37.40	39.40 ^b	-3.80***	2.00**	-1.80*
Weeks et al. (1983) ⁴	32.30	28.80		-3.50		
Thornberry (1987)	40.20	37.80	41.60 ^c	-2.40***	3.80***	1.40*
Average				-3.30***	1.83***	-2.43***
45-64						
Hochstim (1962) ¹	28.00	32.00		4.00		
Klecka & Tuchfarber (1978) ²	17.80	18.70		0.90		
Groves & Kahn (1979)	29.00	31.20	29.80 ^a	2.20	-1.40	0.80
Aneshensel et al. (1982) ³	29.50	23.10		-6.40+		
Mulry-Liggan (1983)	25.10	26.50	27.60 ^b	1.40	1.10+	2.50**
Weeks et al. (1983) ⁴	23.90	28.50		4.60*		
Thornberry (1987)	28.70	27.80	26.50 ^c	-0.90	-1.30***	-2.20***
Average				0.83+	-0.53*	0.37
65 and over						
Hochstim (1962) ¹	12.00	10.00		-2.00		
Klecka & Tuchfarber (1978) ²	15.10	15.80		0.70		
Groves & Kahn (1979)	10.70	15.30	15.20 ^a	4.60***	-0.10	4.50***
Aneshensel et al. (1982) ³	14.30	17.60		3.30		
Mulry-Liggan (1983)	13.20	15.20	15.50 ^b	2.00**	0.30	2.30***
Weeks et al. (1983) ⁴	23.40	27.20		3.80+		
Thornberry (1987)	12.60	14.90	16.00 ^c	2.30***	1.10***	3.40***

¹ The population of interest in this study was residents of Alameda county in California. Therefore, no comparisons with U.S. Population estimates are presented in Table 2.

² The population of interest for this study was residents of the City of Cincinnati, OH aged 12 and older. Therefore, no comparisons with U.S. population estimates are presented in Table 2.

³ The population of interest for this study was residents of the Los Angeles, CA metropolitan area aged 18 or older. Therefore, no comparisons with U.S. population estimates are presented in Table 2.

⁴ The population of interest for this study was residents in four Florida counties – Hillsborough, Manatee, Pasco and Pinellas. Therefore, no comparisons with U.S. population estimates are presented in Table 2.

Average

2.10***

0.43**

3.40***

^a1976 CPS Population Estimate

*** $p \leq .001$

^b1980 CPS Population Estimate

** $p \leq .01$

^c1984 CPS Population Estimate

* $p \leq .05$

+ $p \leq .10$

† Column percentages do not sum to 100% due to rounding.

Table 3:

Race Distributions in Telephone and Face-to-Face Samples

	Phone	Face-to-Face	Population	Difference (Face-to-Face – Phone)†	Difference (Population – Face-to-Face) †	Difference (Population – Phone)
<u>White</u>						
Hochstim (1962) ¹	86.00	78.00		-8.00***		
Groves & Kahn (1979)	87.10	85.60	88.70 ^a	-1.50	3.10***	1.60+
Aneshensel et al. (1982) ²	64.90	55.50		-9.40*		
Mulry-Liggan (1983)	85.90	85.60	87.80 ^b	-0.30	2.20***	1.90***
Average				-4.80***	2.65***	1.75***
<u>African-American</u>						
Hochstim (1962) ¹	11.00	16.00		5.00*		
Groves & Kahn (1979)	9.30	10.60	9.80 ^a	1.30	-0.80	0.50+
Aneshensel et al. (1982) ²	9.10	13.40		4.30		
Mulry-Liggan (1983)	9.90	11.30	9.10 ^b	1.40*	-2.20***	-0.80
Average				3.00***	-1.50***	-0.15*
<u>Other</u>						
Hochstim (1962) ¹	3.00	6.00		3.00*		
Groves & Kahn (1979)	3.60	3.80	1.50 ^a	0.20	-2.30***	-2.10***
Aneshensel et al. (1982) ²	26.00	31.00		5.00		
Mulry-Liggan (1983)	4.20	3.00	3.10 ^b	-1.20***	0.10	-1.10***
Average				1.75	-1.10***	-1.60***

^a1976 CPS Population Estimate

^b1980 CPS Population Estimate

^c1996 CPS Population Estimate

***p≤.001

**p≤.01

*p≤.05

+p≤.10

† Column percentages do not sum to 100% due to rounding.

¹ The population of interest in this study was residents of Alameda county in California. Therefore, no comparisons with U.S. Population estimates are presented in Table 3.

² The population of interest for this study was residents of the Los Angeles, CA metropolitan area aged 18 or older. Therefore, no comparisons with U.S. population estimates are presented in Table 3.

Table 4:

Income Distributions in Telephone and Face-to-Face Samples

	Phone	Face-to-Face	Population	Difference (Face-to-Face – Phone)†	Difference (Population – Face-to-Face)	Difference (Population – Phone)
Low Income						
Klecka & Tuchfarber (1978) ¹	47.30	49.70		2.40		
Groves & Kahn (1979)	19.60	26.50	29.90 ^a	6.90***	3.40*	10.30***
Aneshensel et al. (1982) ²	22.40	20.60		-1.80		
Weeks et al. (1983) ³	13.30	21.80		8.50***		
Thornberry (1987)	24.80	28.60	36.40 ^b	3.80***	7.80***	11.60***
Average				3.96***	5.60***	10.95***
Middle Income						
Klecka & Tuchfarber (1978) ¹	48.90	46.30		-2.60		
Groves & Kahn (1979)	30.30	30.60	49.40 ^a	0.30	18.80***	19.10***
Aneshensel et al. (1982) ²	50.70	49.10		-1.60		
Weeks et al. (1983) ³	57.90	63.60		5.70***		
Thornberry (1987)	49.90	42.90	40.40 ^b	-7.00***	-2.50***	-9.50***
Average				-1.04***	8.15***	4.80***
High Income						
Klecka & Tuchfarber (1978) ¹	3.90	4.00		0.10		
Groves & Kahn (1979)	50.10	42.90	20.70 ^a	-7.20***	-22.20***	-29.40***
Aneshensel et al. (1982) ²	26.70	30.20		3.50		
Weeks et al. (1983) ³	28.90	14.60		-14.30***		
Thornberry (1987)	25.30	28.50	23.20 ^b	3.20	-5.30***	-2.10***
Average				-2.94**	-13.75***	-15.75***

^a1976 CPS Population Estimate

^b1984 CPS Population Estimate

^c1996 CPS Population Estimate

***p≤.001

**p≤.01

*p≤.05

+p≤.10

† Column percentages do not sum to 100% due to rounding.

¹ The population of interest for this study was residents of the City of Cincinnati, OH aged 12 and older. Therefore, no comparisons with U.S. population estimates are presented in Table 4.

² The population of interest for this study was residents of the Los Angeles, CA metropolitan area aged 18 or older. Therefore, no comparisons with U.S. population estimates are presented in Table 4.

³ The population of interest for this study was residents in four Florida counties – Hillsborough, Manatee, Pasco and Pinellas. Therefore, no comparisons with U.S. population estimates are presented in Table 4.

Table 5:

Education Distributions in Telephone and Face-to-Face Samples

	Phone	Face-to-Face	Population	Difference (Face-to-Face – Phone)†	Difference (Population – Face-to-Face) †	Difference (Population – Phone) †
<u>Elementary (0-8 years)</u>						
Klecka & Tuchfarber (1978) ¹	22.00	26.30		4.30***		
Groves & Kahn (1979)	9.50	15.60	17.30 ^a	6.10***	1.70+	7.80***
Aneshensel et al. (1982) ²	24.70	26.10		1.40		
Mulry-Liggan (1983)	10.00	15.00	14.20 ^b	5.00***	-0.80+	4.20***
Weeks et al. (1983) ³	27.10	28.00		0.90		
Thornberry (1987)	11.20	14.60	12.10 ^c	3.40***	-2.50***	0.90*
Average				3.52***	-0.53***	4.30***
<u>High School (9-12 years)</u>						
Klecka & Tuchfarber (1978) ¹	48.70	49.40		0.70		
Groves & Kahn (1979)	49.90	50.00	53.10 ^a	0.10	3.10*	3.20*
Aneshensel et al. (1982) ²	39.60	40.30		0.70		
Mulry-Liggan (1983)	54.60	54.50	53.00 ^b	-0.10	-1.50*	-1.60*
Weeks et al. (1983) ³	42.60	47.10		4.50+		
Thornberry (1987)	52.80	55.00	52.70 ^c	2.20***	-2.30***	-0.10
Average				1.35 **	-0.23***	0.50
<u>College (13+ years)</u>						
Klecka & Tuchfarber (1978) ¹	29.30	24.30		-5.00***		
Groves & Kahn (1979)	40.70	34.40	29.60 ^a	-6.30***	-4.80***	-11.10***
Aneshensel et al. (1982) ²	35.70	33.60		-2.10		
Mulry-Liggan (1983)	34.50	30.60	32.80 ^b	-3.90***	2.20***	-1.70*
Weeks et al. (1983) ³	30.30	24.90		-5.40**		
Thornberry (1987)	35.90	30.40	35.20 ^c	-5.50***	4.80***	-0.70
Average				-4.70***	0.73**	-4.50***

^a1976 CPS Population Estimate

^b1980 CPS Population Estimate

^c1984 CPS Population Estimate

^d1996 CPS Population Estimate

***p≤.001

**p≤.01

*p≤.05

¹ The population of interest for this study was residents of the City of Cincinnati, OH aged 12 and older. Therefore, no comparisons with U.S. population estimates are presented in Table 5.

² The population of interest for this study was residents of the Los Angeles, CA metropolitan area aged 18 or older. Therefore, no comparisons with U.S. population estimates are presented in Table 5.

³ The population of interest for this study was residents in four Florida counties – Hillsborough, Manatee, Pasco and Pinellas. Therefore, no comparisons with U.S. population estimates are presented in Table 5.

+p≤.10

† Column percentages do not sum to 100% due to rounding.

Table 6:

Marital Status Distributions in Telephone and Face-to-Face Samples

	Phon e	Face-to- Face	Populatio n	Difference (Face-to-Face – Phone)†	Difference (Population – Face-to-Face) †	Difference (Population – Phone) †
Married						
Hochstim (1962) ¹	75.00	68.00		-7.00		
Aneshensel et al. (1982) ²	51.00	52.90		1.90		
Mulry-Liggan (1983)	59.70	57.10	63.60 ^a	-2.60**	6.50***	3.90***
Thornberry (1987)	65.40	64.40	61.80 ^b	-1.00	-2.60***	-3.60***
Average				-2.18**	1.95**	0.15
Divorced/Separated/ Widowed						
Hochstim (1962) ¹	15.00	17.00		2.00		
Aneshensel et al. (1982) ²	26.90	25.60		-1.30		
Mulry-Liggan (1983)	14.30	16.10	16.90 ^a	1.80**	0.80+	2.60***
Thornberry (1987)	14.60	15.40	17.70 ^b	0.80 +	2.30***	3.10***
Average				0.83 **	1.55***	2.85***
Never Married						
Hochstim (1962) ¹	10.00	14.00		4.00+		
Aneshensel et al. (1982) ²	21.10	21.00		-0.10		
Mulry-Liggan (1983)	26.10	26.90	19.50 ^a	0.80	-7.40***	-6.60***
Thornberry (1987)	20.10	20.30	20.50 ^b	0.20	0.20	0.40
Average				1.23+	-3.60***	-3.10***

^a1980 CPS Population Estimate

^b1984 CPS Population Estimate

^c1996 CPS Population Estimate

***p≤.001

**p≤.01

*p≤.05

+p≤.10

† Column percentages do not sum to 100% due to rounding.

¹ The population of interest in this study was residents of Alameda county in California. Therefore, no comparisons with U.S. Population estimates are presented in Table 6.

² The population of interest for this study was residents of the Los Angeles, CA metropolitan area aged 18 or older. Therefore, no comparisons with U.S. population estimates are presented in Table 6.

Table 7:

Gender Distributions in Telephone and Non-Telephone Households

	Household w/ phone	Household w/o phone	Difference: (Phone – No phone)
Male			
Groves & Kahn (1979)	43.50	45.00	-1.50
Wofle (1979)	45.10	51.40	-6.30***
Mulry-Liggan (1983)	47.50	52.10	-4.60*
Gfroerer & Hughes (1991)	41.57	43.21	-1.64
Average			-3.51***
Female			
Groves & Kahn (1979)	56.50	55.00	1.50
Wofle (1979)	54.90	48.60	6.30***
Mulry-Liggan (1983)	52.50	47.90	4.60*
Gfroerer & Hughes (1991)	58.43	56.79	1.64
Average			3.51***

***p≤.001

**p≤.01

*p≤.05

+p≤.10

Table 8:

Age Distributions in Telephone and Non-Telephone Households

	Household w/ phone	Household w/o phone	Difference: (Phone – No phone)†
<u>18-24</u>			
Groves & Kahn (1979)	15.10	31.50	-16.40***
Wofle (1979)	12.30	25.90	-13.60***
Mulry-Liggan (1983)	20.00	34.40	-14.40***
Average			-14.80***
<u>25-44</u>			
Groves & Kahn (1979)	37.20	41.00	-3.80
Wofle (1979)	38.60	41.90	-3.30+
Mulry-Liggan (1983)	37.30	41.80	-4.50+
Average			-3.87**
<u>45-64</u>			
Groves & Kahn (1979)	31.80	23.50	8.30+
Wofle (1979)	31.70	19.80	11.90***
Mulry-Liggan (1983)	27.20	15.70	11.50***
Average			10.57***
<u>65+</u>			
Groves & Kahn (1979)	16.00	4.00	12.00***
Wofle (1979)	17.20	12.40	4.80***
Mulry-Liggan (1983)	15.60	8.20	7.40***
Average			8.07***

***p≤.001

**p≤.01

*p≤.05

+p≤.10

† Column percentages do not sum to 100% due to rounding.

Table 9:

Race Distributions in Telephone and Non-Telephone Households

	Household w/ phone	Household w/o phone	Difference: (Phone – No phone)†
<u>White</u>			
Groves & Kahn (1979)	86.70	68.50	18.20 ***
Wofle (1979)	90.00	76.60	13.40 ***
Mulry-Liggan (1983)	86.90	69.90	17.00 ***
Gfroerer & Hughes (1991)	57.06	32.23	24.83 ***
Average			18.36 ***
<u>African-American</u>			
Groves & Kahn (1979)	9.70	24.50	-14.80 ***
Wofle (1979)	9.30	22.40	-13.10 ***
Mulry-Liggan (1983)	10.20	25.80	-15.60 ***
Gfroerer & Hughes (1991)	19.28	28.37	-9.09 ***
Average			-13.15 ***
<u>Other</u>			
Groves & Kahn (1979)	3.70	7.10	-3.40 +
Wofle (1979)	.60	1.00	-0.40
Mulry-Liggan (1983)	2.90	4.40	-1.50 +
Gfroerer & Hughes (1991)	23.62	39.34	-15.72 ***
Average			-5.26 ***

***p≤.001

**p≤.01

*p≤.05

+p≤.10

† Column percentages do not sum to 100% due to rounding.

Table 10:

Income Distributions in Telephone and Non-Telephone Households

	Household w/ phone	Household w/o phone	Difference: (Phone – No phone)†
<u>Low Income</u>			
Groves & Kahn (1979)	23.50	69.50	-46.00***
Wofle (1979)	25.30	62.20	-36.90***
Gfroerer & Hughes (1991)	36.65	55.21	-18.56***
Average			-33.82***
<u>Middle Income</u>			
Groves & Kahn (1979)	31.30	21.60	9.70*
Wofle (1979)	38.30	30.30	8.00***
Gfroerer & Hughes (1991)	23.74	30.13	-6.39***
Average			3.77+
<u>High Income</u>			
Groves & Kahn (1979)	45.20	9.00	36.20***
Wofle (1979)	36.50	7.40	29.10+
Gfroerer & Hughes (1991)	39.62	14.67	24.95***
Average			30.08***

***p≤.001

**p≤.01

*p≤.05

+p≤.10

† Column percentages do not sum to 100% due to rounding.

Table 11:

Education Distributions in Telephone and Non-Telephone Households

	Household w/ phone	Household w/o phone	Difference: (Phone – No phone)†
<u>Elementary (0-8 years)</u>			
Groves & Kahn (1979)	14.40	35.20	-20.80***
Wofle (1979)	5.00	14.00	-9.00***
Mulry-Liggan (1983)	14.10	28.10	-14.00***
Average			-14.60***
<u>High School (9-12 years)</u>			
Groves & Kahn (1979)	49.60	55.30	-5.70
Wofle (1979)	62.70	67.70	-5.00**
Mulry-Liggan (1983)	54.10	59.10	-5.00*
Average			-5.23***
<u>College (13-17 years)</u>			
Groves & Kahn (1979)	32.10	8.90	23.20***
Wofle (1979)	26.30	16.60	9.70***
Mulry-Liggan (1983)	25.70	11.50	14.20***
Average			15.70***
<u>Advanced Degree (18+ years)</u>			
Groves & Kahn (1979)	3.90	0.60	3.30+
Wofle (1979)	5.90	1.60	4.30***
Mulry-Liggan (1983)	6.10	1.40	4.70***
Average			4.10***

***p≤.001

**p≤.01

*p≤.05

+p≤.10

† Column percentages do not sum to 100% due to rounding.

Table 12:

Marital Status Distributions in Telephone and Non-Phone Households

	Household w/ phone	Household w/o phone	Difference: (Phone – No phone)†
<u>Married</u>			
Wofle (1979)	69.90	52.90	17.00 ***
Mulry-Liggan (1983)	58.20	40.90	17.30 ***
Average			17.15 ***
<u>Divorced/Separated/Widowed</u>			
Wofle (1979)	17.70	27.00	-9.30 ***
Mulry-Liggan (1983)	15.50	23.90	-8.40 ***
Average			-8.85 ***
<u>Never Married</u>			
Wofle (1979)	12.80	20.20	-7.40 ***
Mulry-Liggan (1983)	26.30	35.10	-8.80 ***
Average			-8.10 ***

***p≤.001

**p≤.01

*p≤.05

+p≤.10

† Column percentages do not sum to 100% due to rounding.

Table 13:

Response Rates for Telephone and Face-to-Face Surveys Over Time

Author	Response Rates		Difference (Face to face – Phone)
	Phone	Face-to-Face	
Hochstim (1967)	72%	90%	18%
Groves (1977)	70% ^a	74%	4%
Henson et al. (1977)	67%	77%	10%
Hinkle & King (1978)	57%	70%	13%
Groves & Kahn (1979)	70%	74%	4%
Jordan et al. (1980)	49%	64%	15%
Aneshensel et al. (1982)	82%	80%	-2%
Mulry-Liggan (1983)	84%	95%	11%
Weeks et al. (1983)	75% ^b	90%	15%
Thornberry (1987)	80%	96%	16%
De Leeuw (1992)	71% ^c	51%	-20%
Hox & de Leeuw (1994)	70%	74%	4%
Average Across All Studies	70.6%	77.9%	7.3%

^a In this study, Groves reported a response rate for the telephone survey which ranged between 59% and 70%. The lower response rate counts indeterminate telephone numbers as non-interviews and the higher rate treats them as ineligible, excluding them from the calculation. Consistent with prior research suggesting that most indeterminate numbers are non-working, the higher response rate is reported here.

^b In order to calculate a comparable response rate for the face-to-face and telephone interview samples Weeks and his colleagues exclude indeterminate cases from each sample, and exclude follow-up interviews in the telephone sample that were conducted face-to-face.

^c This study included both a paper & pencil telephone survey as well as a computer-assisted telephone interview (CATI). The response rate for the paper & pencil telephone survey was 66% and 71% for the CATI.

Table 14:

Gender Distributions in Telephone and Face-to-Face Surveys of Telephone-Equipped Households

	Phone	Face-to-Face (with phones)	Difference: (Face-to-Face - phone)
Male			
Groves & Kahn (1979)	46.80	43.50	-3.30+
Massey et al. (1981)	45.00	46.00	1.00+
Mulry-Liggan (1983)	47.70	47.50	-0.20
Weeks et al. (1983)	48.60	45.70	-2.90
Thornberry (1987)	46.80	45.80	-1.00
Gfroerer & Hughes (1991)	48.65	41.57	-7.08***
Average			-2.25***
Female			
Groves & Kahn (1979)	53.20	56.50	3.30+
Massey et al. (1981)	55.00	54.00	-1.00+
Mulry-Liggan (1983)	52.30	52.50	0.20
Weeks et al. (1983)	51.40	54.30	2.90
Thornberry (1987)	53.20	54.20	1.00
Gfroerer & Hughes (1991)	51.35	58.43	7.08***
Average			2.25***

***p≤.001

**p≤.01

*p≤.05

+p≤.10

Table 15:

Age Distributions in Telephone and Face-to-Face Surveys of Telephone-Equipped Households

	Phone	Face-to-Face (with phones)	Difference: (Face-to-Face - phone)†
<u>18-24</u>			
Groves & Kahn (1979)	16.20	15.10	-1.10***
Massey et al. (1981)	20.00	19.00	-1.00***
Mulry-Liggan (1983)	20.50	20.00	-0.50
Weeks et al. (1983)	20.40	14.30	-6.10***
Thornberry (1987)	18.30	18.50	0.20
Average			-1.70***
<u>25-44</u>			
Groves & Kahn (1979)	44.00	37.20	-6.80
Massey et al. (1981)	40.00	38.00	-2.00***
Mulry-Liggan (1983)	41.20	37.30	-3.90***
Weeks et al. (1983)	32.30	27.50	-4.80+
Thornberry (1987)	39.70	37.60	-2.10***
Average			-3.92***
<u>45-64</u>			
Groves & Kahn (1979)	29.00	31.80	2.80***
Massey et al. (1981)	27.00	29.00	2.00***
Mulry-Liggan (1983)	25.10	27.20	2.10*
Weeks et al. (1983)	23.90	29.00	5.10*
Thornberry (1987)	28.30	28.60	0.30
Average			2.46***
<u>65+</u>			
Groves & Kahn (1979)	10.70	16.00	5.30***
Massey et al. (1981)	13.00	15.00	2.00***
Mulry-Liggan (1983)	13.20	15.60	2.40***
Weeks et al. (1983)	23.40	29.20	5.80*
Thornberry (1987)	12.40	15.20	2.80***
Average			3.66***

***p≤.001

**p≤.01

*p≤.05

+p≤.10

† Column percentages do not sum to 100% due to rounding.

Table 16:

Race Distributions in Telephone and Face-to-Face Surveys of Telephone-Equipped Households

	Phone	Face-to-Face (with phones)	Difference: (Face-to-Face - phone)†
<u>White</u>			
Groves & Kahn (1979)	87.10	86.70	-0.40
Mulry-Liggan (1983)	85.90	86.90	1.00
Gfroerer & Hughes (1991)	81.85	57.06	-24.79 ***
Average			-8.06 ***
<u>African-American</u>			
Groves & Kahn (1979)	9.30	9.70	0.40
Mulry-Liggan (1983)	9.90	10.20	0.30
Gfroerer & Hughes (1991)	12.76	19.28	6.52 ***
Average			2.41 ***
<u>Other</u>			
Groves & Kahn (1979)	3.60	3.70	0.10
Mulry-Liggan (1983)	4.20	2.90	-1.30
Gfroerer & Hughes (1991)	5.39	23.65	18.26 ***
Average			5.69 ***

***p≤.001

**p≤.01

*p≤.05

+p≤.10

† Column percentages do not sum to 100% due to rounding.

Table 17:

Income Distributions in Telephone and Face-to-Face Surveys of Telephone-Equipped Households

	Phone	Face-to-Face (with phones)	Difference: (Face-to-Face - phone)†
<u>Low Income</u>			
Groves & Kahn (1979)	19.60	23.50	3.90*
Weeks et al. (1983)	13.30	18.50	5.20***
Thornberry (1987)	24.80	25.90	1.10+
Gfroerer & Hughes (1991)	28.87	36.65	7.78***
Average			4.50***
<u>Middle Income</u>			
Groves & Kahn (1979)	30.30	31.30	1.00
Weeks et al. (1983)	57.90	64.70	6.80**
Thornberry (1987)	49.90	43.80	-6.10***
Gfroerer & Hughes (1991)	17.40	23.74	6.34***
Average			2.01
<u>High Income</u>			
Groves & Kahn (1979)	50.10	45.20	-4.90*
Weeks et al. (1983)	28.90	16.80	-12.10***
Thornberry (1987)	25.30	30.20	4.90***
Gfroerer & Hughes (1991)	53.71	39.62	-14.09***
Average			-6.55***

***p≤.001

**p≤.01

*p≤.05

+p≤.10

† Column percentages do not sum to 100% due to rounding.

Table 18:

Education Distributions in Telephone and Face-to-Face Surveys of Telephone-Equipped Households

	Phone	Face-to-Face (with phones)	Difference: (Face-to-Face - phone)†
<u>Elementary (0-8 years)</u>			
Groves & Kahn (1979)	9.50	14.40	4.90***
Mulry-Liggan (1983)	10.00	14.10	4.10***
Weeks et al. (1983)	27.10	27.40	0.30
Thornberry (1987)	11.20	13.80	2.60***
Average			2.98***
<u>High School (9-12 years)</u>			
Groves & Kahn (1979)	49.90	49.60	-0.30
Mulry-Liggan (1983)	54.60	54.10	-0.50
Weeks et al. (1983)	42.60	46.90	4.30+
Thornberry (1987)	52.80	54.60	1.80**
Average			1.33*
<u>College (13-17 years)</u>			
Groves & Kahn (1979)	35.80	32.10	-3.70*
Mulry-Liggan (1983)	28.00	25.70	-2.30***
Weeks et al. (1983)	16.50	14.40	-2.10
Thornberry (1987)	28.80	25.10	-3.70***
Average			-2.95***
<u>Advanced Degree (18+ years)</u>			
Groves & Kahn (1979)	4.90	3.90	-1.00
Mulry-Liggan (1983)	6.50	6.10	-0.40
Weeks et al. (1983)	13.80	11.30	-2.50
Thornberry (1987)	7.20	6.50	-0.70*
Average			-1.15**

***p≤.001

**p≤.01

*p≤.05

+p≤.10

† Column percentages do not sum to 100% due to rounding.

Table 19:

Marital Status Distributions in Telephone and Face-to-Face Surveys of Telephone-Equipped Households

	Phone	Face-to-Face (with phones)	Difference: (Face-to-Face - phone)†
<u>Married</u>			
Mulry-Liggan (1983)	59.70	58.20	-1.50
Thornberry (1987)	65.40	65.20	-0.20
Average			-0.85
<u>Divorced/Separated/Widowed</u>			
Mulry-Liggan (1983)	14.30	15.50	1.20+
Thornberry (1987)	14.60	15.00	0.40
Average			0.80*
<u>Never Married</u>			
Mulry-Liggan (1983)	26.10	26.30	0.20
Thornberry (1987)	20.10	19.80	-0.30
Average			-0.05

***p≤.001

**p≤.01

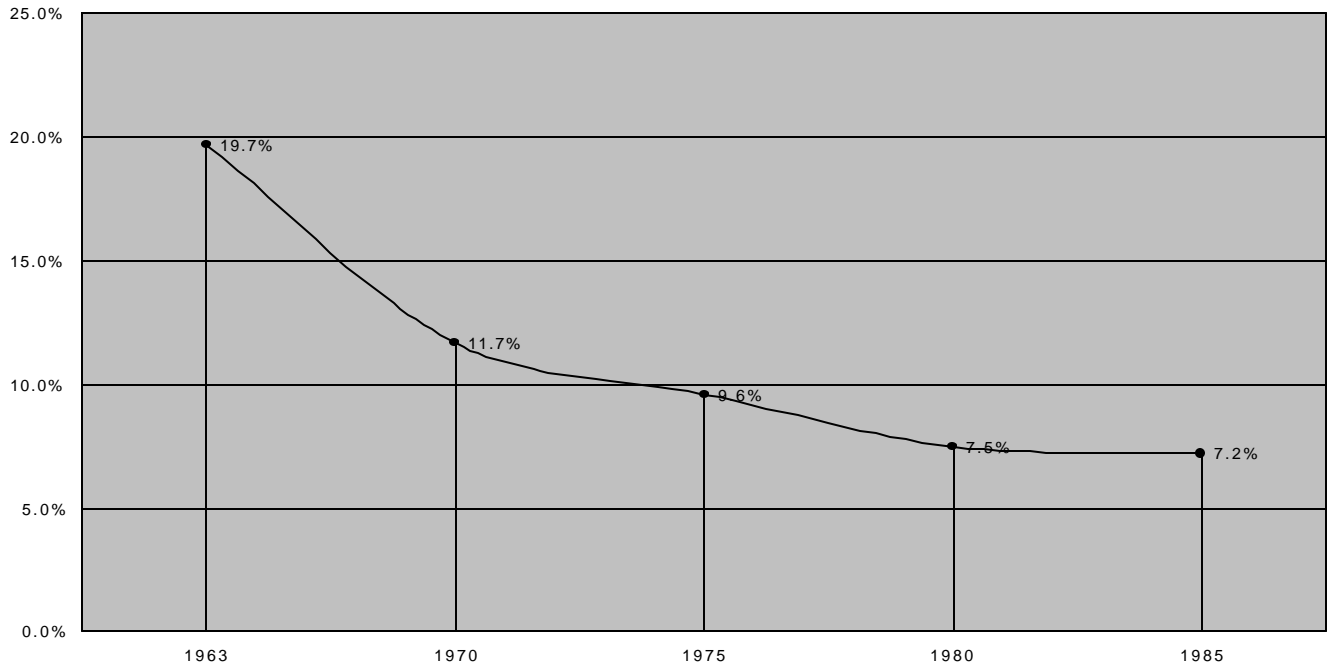
*p≤.05

+p≤.10

† Column percentages do not sum to 100% due to rounding.

Figure 1:

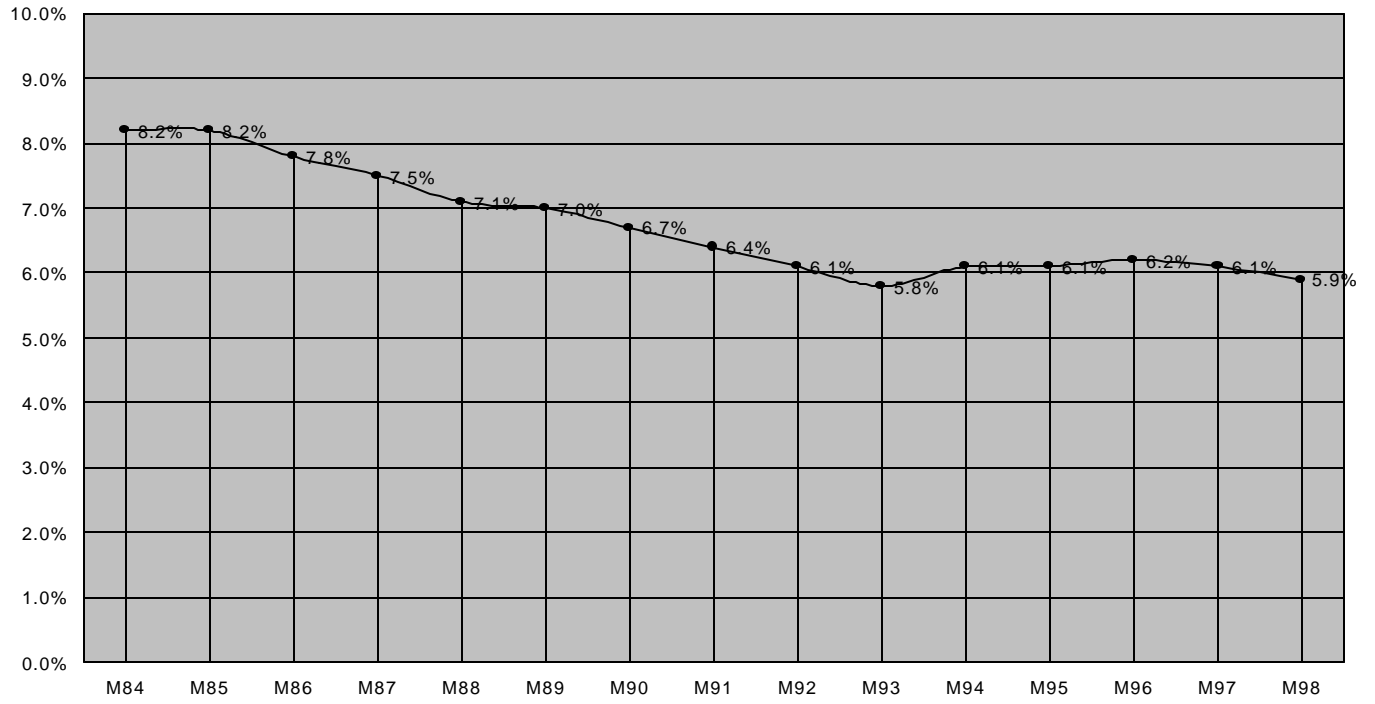
Percentage of U.S. Households Without Phones; 1963, 1970, 1975, 1980, 1985



Source: National Health Interview Surveys 1963-1985 (in Thornberry & Massey 1988)

Figure 2:

Percentage of U.S. Households Without Phones; March 1984-March 1998



Source: Federal Communications Commission, Telephone Subscribership in the United States (July, 1998)