

Executing Household Telephone Surveys in a Wireless World

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The Issue

Over the past decade, the proportion of the US adult population with a cell phone but no landline phone has been steadily increasing. Current estimates from the [National Health Interview Survey \(NHIS\)](#), the gold standard on this topic, indicate that, as of December 2010, more than one in four US adults has become “wireless-only,” a 3 percent increase compared to July 2010. This consistent upward trend in wireless-only adults is seen across many demographic groups and shows no signs of slowing in the near future.

The largest share of these wireless-only adults is clustered among the younger demographic (18-35 years old), although the proportion of adults 30 and older without a landline has increased as well. In addition to being a younger group than the population at large, wireless-only adults are more likely to earn less, rent rather than own their homes and live in non-family households with other adults.

In 2007, the NHIS began to measure a new behavior characterized as “wireless-mostly.” These are people who have a landline phone but receive all or almost all of their phone calls on their cell phone. The NHIS estimates that, at the end of 2010, just over 17 percent of US adults were wireless-mostly. Like the wireless-only, this group clusters in the younger demographic.

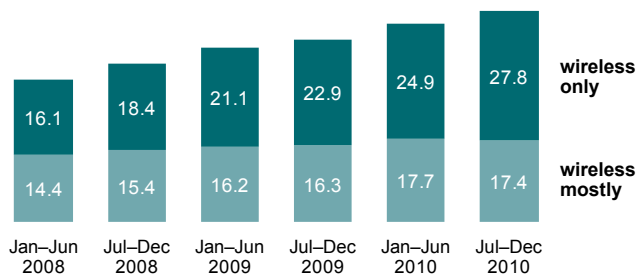
The implications for survey research are significant. Perhaps as many as 45 percent of adults may be impossible or, at least, difficult to reach via traditional, landline-based telephone data collection methods.

This raises a number of troubling questions: Can surveys that only include landlines still be valid? Are the estimates derived from traditional telephone sampling and data collection techniques accurate representations of the population?

The empirical research needed to answer these questions continues to evolve, but the overall theme is that as the wireless-only population has grown, so has the potential for bias. Keeter, Kennedy, Clark, Tompson and Mokrzycki (2007) measured the differences between landline and wireless-only samples in a 2006 survey and concluded that, with the proper demographic weights, only a minimal amount of bias is introduced in estimates for the total population when wireless-only respondents are excluded. This was due to the relatively small proportion of the total population that was wireless-only at that time and the similarities in attitudes within the demographic group with the highest proportion of wireless-only respondents, that is, young adults.

More recently, Mokrzycki, Keeter and Kennedy (2009), in an analysis of 2008 exit poll data, found substantial differences in voter preferences between wireless-only voters and the rest of the population. Further, they found that

FIGURE 1: Percent of US adults living in households who mostly or only use wireless telephone service



Source: CDC/NCHS, National Health Interview Study

those differences were not corrected by standard demographic weighting. They concluded that the wireless-only population has become so large that standard demographic weighting techniques no longer correct the bias introduced by excluding the wireless-only population from survey samples.

Similarly, Christian, Keeter, Purcell, and Smith (2010) compared weighted landline survey results with weighted dual frame (i.e., landlines and cell phones) survey results on a variety of topics including public policy issues, religious and social values and national economic ratings. They found small but significant differences in 29 of the 72 items examined and attributed those differences to bias in the landline-only sample. In addition, they noted the potential for bias is cause for more concern with certain demographic subgroups, especially those that are severely under-represented, in the landline telephone frame (e.g. 18-29 year olds).

Finally, there is the matter of public perception of survey validity. There has been substantial coverage of the wireless-only problem in the popular media and one result has been growing suspicion of polls and surveys that do not include cell phones. As such, it is increasingly necessary to include cell phones in survey samples in order for a survey's results to be viewed as credible.

All things considered, we believe that the widespread use of cell phones in the US population now requires that telephone surveys employ a dual frame design that samples landlines and cell phones to accurately measure attitudes and behaviors in the general population.

Operational Challenges

Including cell phones in a telephone study poses a number of statistical and operational challenges, many of which have been discussed at some length in the AAPOR white paper, [*New Considerations for Survey Researchers When Planning and Conducting RDD Telephone Surveys in the U.S. With Respondents Reached via Cell Phone Numbers*](#). In addition, ESOMAR recently released their [*Guideline on Research via Mobile Phones*](#). These documents explore the issues in considerable detail. Here, we focus on four specific challenges:

1. FCC rules in support of the Telephone Consumer Protection Act of 1991 forbid the use of automated dialers when calling cell phones. Thus, known cell numbers must be dialed manually, degrading the efficiency of the calling effort and raising costs.
2. The link of area code and telephone exchange to a specific geographic area is much less reliable for cell phones than for landlines. In general, it is not possible to target cell phone sample geographically to the same degree of precision as landlines. For example, landlines can often be targeted in an efficient and affordable fashion for areas that are based upon a modest number of zip codes. In general, cell phone samples can only be efficiently targeted at much larger areas, typically states or very large metropolitan areas. When studies require that respondents live in specific geographic areas, the screen costs for the cell phone portion of the sample can be substantial.
3. Unlike landline telephones, cell phone owners generally incur charges for incoming calls, such as a survey request. As a consequence, compensation should be offered to respondents. However, the evolving structure of calling plans has substantially reduced the cost risk to respondents and, in our experience, few respondents ask for compensation.
4. Because of the portable nature of cell phones, interviewers can sometimes reach respondents in circumstances where doing an interview might be dangerous (e.g., driving a car), inconvenient (e.g., at work or exercising) and where concentration or confidentiality is compromised (e.g., in a public place with other people nearby). These possibilities also mean that additional screening is necessary and more call backs may be required.

With the right survey design and proper calling procedures all of these are manageable.

Recommendations for Inclusion of Cell Phones

We suggest two approaches to including cell phones in survey samples, depending on the study design.

List Samples of Customers

Some wireless-only and wireless-mostly individuals provide their cell numbers to companies with whom they do business, and these numbers can be used for survey purposes. Samples drawn from these customer files typically include cell phone numbers.

From experience, we know the costs associated with fielding wireless telephone sample can differ, often significantly, from fielding landline telephone sample (although the overall response rates are quite similar). In general, we expect wireless sample to be 40 percent to 50 percent more expensive than landline sample, although these cost differences can vary based on the study design. The primary factor driving the increased costs of fielding wireless sample from customer lists is the requirement that wireless phone numbers are dialed manually. Landline phone numbers are most often fielded using a predictive dialer, which is more efficient. The magnitude of increase in the overall cost of the survey depends on the proportion of cell phones in the sample.

For projects relying on list samples of customers, we recommend the following:

1. Determine the proportion of cell phones that exist within the sample frame, that is, the customer list.
2. Sample landline and cell phone numbers, choosing one of two options for determining the percentage of cell phone numbers in the sample:

Option A. Sample landlines and cell phones proportionate to the sample frame and let the distribution of cell phone and landline completes fall out naturally. Alter the budget to reflect reduced productivity expectations on the cell phone portion. Combine the landline and cell phone completed interviews.

Option B. Reduce the sample size of the cell phone component to control costs, and let the distribution of cell phone and landline completes fall out naturally. Combine the landline and cell phone completed interviews, and weight the entire dataset to reflect the cell phone distribution within the original customer list. Apply demographic and/or telephone status weights as needed.

There is a tradeoff. Weighting will reduce the cost of interviewing but also reduce the effective sample size of your study which will, in turn, increase the margin of error around your estimates.

In the example below, a survey with 500 target completes from a frame that is 40 percent wireless will increase costs by approximately 16 percent if cell phone sampling is done proportionately (row 1). Reducing wireless sampling to only 10 percent will increase costs by only 4 percent but will reduce the effective sample size to 250 and increase margin of error from 4.4 percent to 6.2 percent (row 3). A less drastic reduction in cell phone sampling results in a much smaller reduction in effective sample size and margin of error (row 2).

FIGURE 2: The potential tradeoff between costs and effective sample size

SAMPLE FRAME		TARGET COMPLETES					OUTCOMES					
Percent Wireless	Percent Landline	Total	Percent Wireless	Percent Landline	Wireless Completes	Landline Completes	Wireless Base Weight	Landline Base Weight	Effective Sample Size	Effective Sample Size (ESS) Decrease	Cost Increase w/Cell Phones	MOE @ 95% with Design Effect
40%	60%	500	40%	60%	200	300	1.00	1.00	500	0%	16%	4.4%
40%	60%	500	25%	75%	125	375	1.60	0.80	446	11%	10%	4.6%
40%	60%	500	10%	90%	50	450	4.00	0.67	250	50%	4%	6.2%

The acceptable margin of error will vary greatly from project to project as will the actual costs associated with cell phone sampling. It is important to review the best options with a sampling analyst before proceeding.

RDD Sample

The procedure for RDD samples is somewhat more difficult and almost always more costly. Our experience suggests that RDD cell phone sample is between 2 to 3 times more expensive to field than RDD landline sample. This finding is supported by a meta-analysis presented in the 2010 AAPOR Cell Phone Task Force report. Twenty-six dual-frame RDD surveys were included in the meta-analysis, with the goal of comparing costs of fielding cell phone samples and landline samples. The costs per completed interview for cell phone samples were found to be 2.5 times greater than those of landline samples. Cost factors considered included sample procurement, sample productivity, interview length and dialing method (predictive dialing for landline sample vs. manual dialing for cell phone sample).

For projects using RDD cell phone and RDD landline sample, we recommend the following:

1. Use two sample frames:
 - The standard RDD frame containing telephone exchanges assigned to landline numbers.
 - A supplemental frame containing telephone exchanges associated with cell phones.
2. Select a sample such that the proportion of cell phone numbers is no less than 15 percent of the total.
3. Dial both sets of numbers, the cell phones being dialed manually.
4. Set a minimum quota for completes from the cell phone frame that is no less than 10 percent of the total or a minimum of 50 completed interviews.
5. If necessary, screen for the specific geographic area.
6. Make sure the survey instrument includes questions to help determine the telephone status of each person/household (i.e. landline only, cell phone only, landline mostly, cellphone mostly).
7. Combine the landline and cell phone completes and weight the data based on demographic and telephone status.

The proportion of cell phone numbers in the sample and the quota set for cell phone completes in steps 2 and 4 above are recommended minimums. When there is reason to believe that the proportion of wireless-only in the target population is high, it may be appropriate to sample more cell numbers and set a somewhat higher quota. However, there are important cost implications as well as the same tradeoffs between cost and the design effects of weighting, so these parameters should be carefully considered.

Conclusion

The wireless-only population has now grown to a size where most researchers believe that the only way to produce accurate estimates from telephone surveys is by using a sample design that includes landlines and cell phones. In addition to the scientific evidence described above, the issue has drawn so much attention in the media that surveys that exclude cell phones may be viewed as invalid. There are multiple design options to be considered depending on specific study goals, sample type and available budget.

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