Public Opinion Quarterly, Vol. 71, No. 5 2007, pp. 814–839

REACHING THE U.S. CELL PHONE GENERATION
COMPARISON OF CELL PHONE SURVEY RESULTS WITH AN ONGOING LANDLINE TELEPHONE SURVEY

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Abstract Noncoverage rates in U.S. landline-based telephone samples due to cell phone only households (i.e., households with no landline but accessible by cell phone) and the corresponding potential for bias in estimates from surveys that sample only from landline frames are growing issues. Building on some of the few published studies that focus on this problem, a study was conducted in three states (Georgia, New Mexico, and Pennsylvania) as part of the Behavioral Risk Factor Surveillance System (BRFSS), the world's largest ongoing public health telephone survey, to evaluate the effectiveness of conducting the BRFSS interview with a sample drawn from dedicated cell phone telephone exchanges and mixed-use (landline and cell phone) exchanges. Approximately 600 interviews were conducted in each of two groups: *cell phone only adults* ($n = 572$) and *adults with both a landline and a cell phone* ($n = 592$). Making comparisons with data from the ongoing, landline-based BRFSS survey, we report on response rates, demographic characteristics of respondents, key survey estimates of health conditions and risk behaviors,

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doi:10.1093/poq/nfm051

and survey costs. The methods used in this study have wide application for other U.S. telephone surveys.

For the past several decades, random-digit-dial (RDD) landline telephone sampling has provided a cost-efficient strategy for conducting surveys of the U.S. household population. However, as the percentage of cell phone only households (households with no landline but accessible by cell phone) continues to grow, the validity of the basic RDD landline sampling model has come into question. The continually increasing percentage of households that are abandoning their landline telephones for cell phones has significantly eroded the population coverage provided by landline-based surveys to pre-1970s levels. For the second half of 2006, the percentage of cell phone only households was 12.8 percent (Blumberg and Luke 2007). Moreover, more than half (54.0 percent) of all adults living with unrelated roommates and one in four (25.2 percent) adults aged 18 to 24 years live in cell phone only households. These adults are not covered by current RDD landline sampling procedures, which exclude telephone exchanges and 1,000 banks used exclusively for cell phones, and the percentages are trending upward. Furthermore, these are some of the same groups that are increasingly underrepresented in current RDD landline telephone surveys due to differential nonresponse.

Because the use of cell phones in the United States has grown so quickly since 2000, the empirical literature in this area is sparse. Moreover, because of the rapid changes in the telephone landscape, findings from just a few years ago may already require updating. In 2003, Steeh (2004) conducted one of the first national surveys by cell phone. The study found that although conducting surveys with sampled cell phone numbers was feasible, the approach faced a number of challenges, including lower response rates than in landline surveys, higher refusal rates, and lower refusal conversion rates. Brick et al. (2007) reached similar conclusions, finding as well that although the use of incentives could boost response rates, sending text messages did not improve participation.

In terms of the potential for bias in survey estimates, Keeter (2006) provided reason for optimism by demonstrating that bias in 2004 presidential voting preferences due to exclusion of cell phone only households was essentially eliminated when age was incorporated into the weighting methodology. In their analysis of a February 2004 supplement to the Current Population Survey, however, Tucker, Brick and Meekins (2007) struck a more cautionary tone. They warned of a high potential for bias in telephone survey estimates that sample only from landline frames because of increasing undercoverage caused by cell phone only households and the different demographic profile of this group (cell phone only respondents were more likely to be younger, unmarried, and Hispanic). Brick et al. (2006) found that topic salience and household

inaccessibility resulted in substantial nonresponse bias in estimates of households by type of telephone service (landline, cell phone, or both). Topic salience was a larger factor for households selected from a landline frame, and inaccessibility was a greater concern for those sampled from a cell phone frame. Additionally, for the cell phone sample, a higher than expected percentage of respondents were from cell phone only households, resulting from differential nonresponse rates among those who used their cell phones often versus those who used their cell phones less frequently.

The research presented here builds upon these earlier works. First, we examine how respondents sampled and interviewed by cell phone differ from those from a landline frame with respect to an ongoing RDD survey in the United States, the Behavioral Risk Factor Surveillance System (BRFSS), one of the world's largest health telephone surveys. Health and risk behaviors have not, heretofore, been the focus of a survey conducted using a sample of cell phone numbers. Second, we provide a first look at state-based data from the cell phone population. In contrast, all of the previously cited studies were focused at the national level, thereby potentially masking differences that may be seen at the state level. Third, we provide comparisons of two different vendors of cell phone numbers and compare resulting residential working number rates from each. Finally, in addition to comparing response rates, respondents' demographic characteristics, and survey estimates for key health conditions and related risk factors, we also analyzed the costs of conducting surveys with cell phone samples.

Methods, Design, and Analytic Considerations

The BRFSS collects uniform, state-specific data on preventive health practices and risk behaviors that are linked to morbidity and mortality among adults. The survey is conducted by state health departments with assistance from the Centers for Disease Control and Prevention (further details on the BRFSS survey design, methodology, and questionnaire are available at http://www.cdc.gov/brfss).

Because of the concerns that significant bias may be introduced into BRFSS estimates as the percentage of cell phone only households increases, a study was conducted in 2007 to develop and test two approaches for conducting BRFSS interviews by cell phone. The first involved screening persons reached by cell phone to identify and interview those persons who were living in cell phone only households. The second involved interviewing sample members reached at cell phone numbers regardless of their household landline telephone status. The goals of the study were to determine the feasibility and costs of conducting surveys with sampled cell phone numbers and to explore the similarities and differences between those interviewed by landline and those interviewed by cell phone.

SAMPLING

Three states were selected for participation in the study: Georgia, New Mexico, and Pennsylvania. The three states were chosen because they represent various geographic regions of the United States and combined they provide a good representation of both the urban/rural and racial/ethnic mix of the U.S. population. The universe for the study consisted of all noninstitutionalized adults aged 18 and older with telephone service living in the three states. Cell phone numbers were sampled and screened for the presence of adults living in private residences within three states. Because this was a household-based survey, interviews were not conducted with those who lived in institutions or group quarters.

Two methods of sampling and interviewing were used in this study: (1) screening persons reached at cell phone numbers to identify and attempt interviews with all such adults living in cell phone only households; and (2) screening persons reached at cell phone numbers to identify and attempt interviews with a random subsample of such adults living in households with landline and cell phone service.

The sample was obtained from two vendors using a split sample design across the three states to compare the efficiency of the sampling methods used by the two vendors (that is, half of the numbers in each state were drawn from one vendor and the other half from the other vendor). Each sample was derived from the Telecordia database of telephone numbers, but structured and sampled from in slightly different ways. One vendor, Survey Sampling International (SSI), used both dedicated cell phone banks and "mixed use" banks (banks of numbers containing no residential directory-listed residential numbers, which are used for cell phone and one or more other telephone uses such as landline service, paging, etc.) and partitioned the frame into 100 blocks of numbers (that is, blocks of numbers with an identical combination of area code, exchange, and first two digits of the last four digits of the telephone number), sorted by state FIPS (Federal Information Processing Standards) code, telephone carrier, and sequential 100-block identification. The intent is to provide a stratified sample that is representative both geographically and by large and small cell phone service carriers. A systematic sampling interval was determined by dividing the universe of eligible 100 blocks by the desired sample size. Using a random start less than or equal to the sampling interval, a systematic kth selection of 100 blocks was performed and a two-digit random number between 00 and 99 was appended to each selected 100-block stem.

The other vendor, Marketing Systems Group (MSG), used dedicated cell phone 1,000 banks sorted on the basis of area code and exchange. An interval, K, was formed by dividing the population count of telephone numbers in the frame, N, by the desired sample size, n. The frame of telephone numbers was divided into n intervals of size K telephone numbers. From each interval, one 10-digit telephone number was drawn at random.

Overall, a sample of 23,397 telephone numbers was drawn from cell phone exchanges across the three states. For sample release and management purposes, the sample from each sampling vendor was divided into random subsamples (replicates) within each state.

RECRUITMENT

When a potential respondent was contacted, he or she was first asked questions to determine study eligibility (see Appendix A for the text of the screening questions). Specifically, the person answering the telephone was asked whether he or she had been reached on a cell phone, lived in a private residence, was aged 18 years or older, and resided in one of the specified states. For those who responded "No" to any of these questions, the interview was terminated. Those answering "Yes" to all of the screening questions were then asked whether they also had a landline telephone in their home (i.e., "a 'regular' telephone in your home that is connected to outside telephone lines through a cable or cord and is used for making or receiving calls"). All of those who had *only a cell phone* were interviewed, whereas persons who had both types of telephones were subsampled for administration of the full interview; the subsampling rate varied depending on state, sampling vendor and sample replicate release. The subsampling procedure was used *within each state* in order to achieve approximately 200 interviews with *each* of the two cell phone groups.

For this study we made an assumption that cell phones are individual devices and not shared household devices; i.e., that there is a one-to-one correspondence between the person answering the cell phone (assumed to be the cell phone owner) and the cell phone itself. As a result, no additional within household selection was undertaken.

Since little is known, however, about the extent of cell phone sharing within households, a series of questions were asked to determine the extent to which cell phones are shared among adults and if, in future studies, within household selection is warranted for households with multiple adults. The first question (Appendix B: #1) established whether or not the respondent had a cell phone for their personal use, including phones that were used for both personal and business purposes. Those with a negative response to the first question (or who answered "Don't Know" or "Refused") were asked a follow-up question (#2) to determine whether or not the respondent shared a cell phone for personal use with other adults, to ensure that all cell phone users were identified, regardless of phone "ownership." Those with a positive response to the first question were asked whether they usually shared the cell phone with any other adults (#3). All respondents who shared their cell phone were next asked the number of other adults who used the cell phone "at least one-third of the time" (#4). These questions were asked in all three states for the cell phone sample and in the landline survey in New Mexico and Pennsylvania (because of concerns about

interview length, the sharing questions were not added to the Georgia landline interview).

DATA COLLECTION

A shortened (approximately 12 minutes) version of the 2007 BRFSS core questionnaire was programmed using a computer-assisted telephone interviewing (CATI) system. Interviewing was conducted in English and Spanish. A translated questionnaire and bilingual interviewers were used for respondents who preferred to complete the interview in Spanish. Respondents who did not speak either English or Spanish were excluded from the study. Data were collected from January 18 through April 5, 2007.

While existing BRFSS protocols were used for the cell phone study to the extent possible, it was necessary to implement some study-specific protocols to account for differences between the cell phone and landline studies. Some of these contacting and interviewing protocols were developed on the basis of recommendations from a group of survey experts convened in 2005 to address issues related to cell phone interviews (cf. Lavrakas and Shuttles 2005). The study-specific protocols were then updated throughout the field period as new situations were encountered. In particular, a series of interviewer debriefings were held in order to learn more about the process of collecting data via cell phone and to increase data collection productivity and quality, and feedback from the debriefings was used to refine the protocols. Some of the more important study-specific protocols included the following.

Calling hours: Although considerable evidence shows that specific times of day, as well as days of the week, are particularly productive for achieving contact with landline households, little is known about the best times to make calls to cell phone holders (Brick et al. 2007). It was initially assumed that weekday evening and weekend calling hours would be most productive, since those are the hours that are least restrictive in terms of cost to potential respondents in many cellular service plans. A productivity analysis conducted after the first week of interviewing showed that evening calls were more productive than daytime calls, but weekend calling was not particularly productive. Therefore, an increased emphasis was placed on weekday evening calling for the remainder of the data collection period.

Call answering and ring tones: Some cell phone companies offer a service in which the customer can set personalized ring tones so that incoming callers hear music rather than a usual ring. Therefore, it was necessary for interviewers hearing music after dialing to remain on the line for a short period of time to see whether the respondent or their voicemail would pick up the call. In addition, many cell phone voicemail systems do not pick up until after six or more rings. To ensure that voicemail messages were left appropriately, interviewers were required to allow the phone to ring at least seven times before exiting a case.

Respondent location: Because cell phone users may take calls in a variety of situations, such as during a routine errand or while driving, it was important for interviewers to determine whether or not the respondent's location would hinder the conduct of an interview or place the respondent in a position of undue risk. The informed consent language read to all respondents asked them to confirm that they were in a place where they could continue with the interview at the time of contact. Even when respondents agreed that they would continue with the interview, interviewers were encouraged to listen for cues that the respondent might be in a distracting situation and, if so, to offer to set an appointment to complete the interview at another time. Respondents were also allowed to make arrangements to be called back on their landline telephone to complete the interview if they preferred.

Identifying business-only cell phone numbers: A substantial number of cell phone customers use their phones for personal as well as business purposes, making them eligible for the cell phone study (analogous to the approach used for home/business numbers in landline surveys). Only those using their phone exclusively for business purposes were ineligible for the study. Therefore, if an interviewer reached voicemail suggesting that a cellular number was used for business purposes, a pending disposition code was assigned and the case was recontacted until it could be definitively determined whether or not the number was solely for business use.

Identifying child/teen cell phones: Persons under the age of 18 were ineligible for the study. However, if a cell phone was used by both children or teenagers and an adult aged 18 or older, attempts were made to contact the adult user in order to conduct the interview. Thus, when interviewers reached an answering party under age 18, they probed to determine whether or not the cell phone belonged to the child or teenager exclusively or if it was shared by their parent or another adult, and the case was coded appropriately.

Refusal conversion: If respondents asked not to be called on their cell phone, interviewers attempted to avert a refusal by asking for another telephone number at which the respondent could be contacted or if there was a better time for them to take a call via cell phone (e.g., when incoming calls would not incur a cost). No further attempt was made to contact respondents who would not provide this information. However, more general, "nonhostile" refusals were recontacted once for a conversion attempt.

Coding of recorded messages: Early in the data collection period, it became clear that a wide variety of recorded messages were used by cell phone companies to indicate a similarly wide variety of circumstances, including respondent unavailability, that the number dialed was for company business purposes, that the number was temporarily or permanently out of services, etc. To facilitate the coding of these messages, additional disposition codes for messages indicating that the respondent was temporarily unavailable or not accepting calls and for operator messages that were unclassifiable were added to the study.

Voicemail messages: Given the increased use of voicemail in the United States, special procedures were developed for leaving messages on respondents' voicemail. This procedure is similar to leaving messages on answering machines in landline surveys (Link and Mokdad 2005). Interviewers were restricted to leaving one voicemail message per week for a given telephone number. When voicemail was reached before eligibility could be established, the following message was left:

> Hello. The [STATE HEALTH DEPARTMENT] is conducting a study about the health of adults in [STATE]. Your telephone number has been selected at random. Would you please call us, toll-free, at 1-800-555-5555 to determine whether or not you are eligible for the study? The toll-free number again is 1-800-555-5555. Thank you.

A slightly different wording was used when callbacks were required to continue an interview that had been suspended.

Text messages: We also tested the effectiveness of sending text messages to sampled telephone numbers with high call attempts. This was conducted with only one large carrier, which operated in all three states, for cases that had no actual contact after 10 attempts (i.e., a mixture of no answer, busy, voicemail, or other types of automated messages). The message was worded as follows:

> Please participate in a survey for the Centers for Disease Control. If eligible, you will get $10 to pay for your cell time. Please call 1-800-555-5555.

Remuneration for minutes used: To increase the response and to offset any charges incurred by respondents, a modest payment was provided to respondents. Those who completed the full screening portion of the interview but were not eligible for the interview because of cell or landline subsampling were offered $1. Eligible respondents who completed the detailed interview were offered $10.

BRFSS LANDLINE TELEPHONE SURVEY

The cell phone survey was conducted in parallel with the ongoing, monthly BRFSS RDD data collection, thereby facilitating the comparison of results between the two approaches. Telephone survey data from the three participating states for January through March 2007 were used in this analysis. As discussed above, additional questions were added to the landline telephone survey to determine the type of telephone access in the household (landline and cell phone or landline only) facilitating comparison with the cell phone study data. More details on the BRFSS design and methodology are available elsewhere (Mokdad, Stroup and Giles 2003).

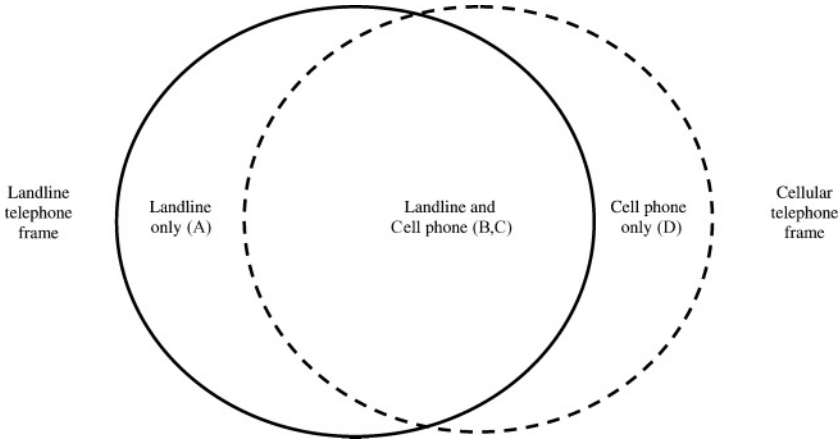

Figure 1. Telephone access by sample frame.

WEIGHTING ADJUSTMENTS

Design weights were calculated for the cell phone sample in the three states. The design consists of six strata – three states by two sample vendors. The base sampling weight of each sampled cell telephone number in a stratum equals the population count of telephone numbers divided by the sample size of telephone numbers in the released replicates. For adults living in households with landline and cell telephone service, the base sampling weight was adjusted to reflect the subsampling that took place in each stratum. Finally, within each stratum, an interview unit nonresponse adjustment was performed separately for cell phone only adults and for cell phone plus landline adults. These design weights were then divided by two so that the samples from the two sampling vendors could be combined within a state. Finally, the design weights in a state were ratio-adjusted, separately for cell phone only and cell phone plus landline adults, so that the sum of the design weights in each state equaled the same total. This "equalized" design weight was used in the comparison of demographic characteristics across four key analysis groups determined by sample frame (landline versus cell phone) and household telephone access (see figure 1 – note that groups B and C differ in terms of the frame from which they are sampled):

(A) landline sample with landline-only telephone access,
(B) landline sample with landline and cell phone access,
(C) cell phone sample with landline and cell phone access, and
(D) cell phone sample with cell phone.

The "equalized" design weight was used to produce the estimates presented in the analyses below because it gave each state an "equal" contribution to the combined state estimates (i.e., the estimates were not dominated by Pennsylvania or Georgia, the two larger states).

For the analyses conducted here, the landline data in each state were weighted to account for the probability of selection of the telephone number, the number of voice-use landline telephone numbers in the household, and for the random selection of one adult from the household. Next, mirroring the process followed with the cell phone data, the design weight was ratio-adjusted, separately for landline-only adults and landline plus cell phone adults, so that the sum of the design weights in each state equaled the same total.

RESPONSE RATE CALCULATIONS

To maximize comparability between the landline and cell phone surveys, we used response rate calculations recommended by the American Association for Public Opinion Research (AAPOR 2006). For the BRFSS landline telephone survey, the original BRFSS disposition codes were mapped to the AAPOR specified codes, and response rates were calculated using AAPOR response rate formula RR4. However, interviewing by cell phone requires the addition of case disposition codes beyond those identified currently by AAPOR to deal with some of the unique situations encountered, such as when a respondent is in an area with limited or no cell phone service, the call fails for some unknown reason, or the interviewer receives any one of a variety of operator messages. Using the disposition code categories recommended by Callegaro et al. (2007) as a starting point, we developed a set of interim and final dispositions that could be mapped back to the four broader AAPOR disposition categories (eligible, ineligible, unknown eligibility, and out-of-scope).

Because we subsampled cases in the cell phone survey, to improve comparability we calculated two interim participation rates: a screening completion rate and a full interview completion rate. The former rate indicated whether the respondent successfully completed the initial screening portion of the questionnaire and it was calculated with AAPOR formula RR4 (AAPOR 2006). The latter rate reflected the proportion of those who were successfully screened as being eligible for the study, were subsampled for the full interview, and actually completed the full interview. Multiplying these rates provided an overall response rate.

PREVALENCE ESTIMATES

Differences in demographic characteristics of respondents by the four analytic groups were examined, including sex, age, race/ethnicity, education, employment status, marital status, presence of children in the household, and veteran

status. We also used self-reports of survey participants to assess the prevalence of 10 important health practice and risk behavior measures: access to health care coverage, cost as a barrier to health care, physical activity, asthma, diabetes, high blood pressure, obesity, current smoking, binge drinking, and human immunodeficiency virus (HIV) testing.

COST CALCULATIONS

Cost is an important component in the evaluation of any survey design. The data collection costs per interview were calculated for both the landline and cell phone surveys, using the following: (1) actual unit costs for materials and supplies derived from the study experience, (2) production statistics from the effort, and (3) estimates of industry averages for direct hourly rates and indirect cost rates (i.e., fringe benefits, general and administrative expenses, indirect technical costs, and materials support expenses). Other costs assumed to be nearly equivalent regardless of the survey design were not included, such as overall project management, survey design development, and postdata collection weighting and analysis. Cell phone costs were calculated separately for two scenarios: (1) inclusion of all completed interviews regardless of type of household telephone access, and (2) screening for cell phone only households.

ADDITIONAL ANALYTIC CONSIDERATIONS

Analyses were initially conducted at the state level. Respondent demographic characteristics and responses to health questions varied little, however, at the state level. Additionally, it was determined that presentation of results by state by the four analytic groups would be cumbersome and lengthy, resulting in more added confusion than more added clarity. As a result, we chose for some analyses (comparison of demographic characteristics and health and risk factor estimates) to take a more parsimonious analytic approach, combining the data from the three states with weighting adjustments to ensure that the results were not distorted by the respective state sample sizes. The few significant differences identified in the state-level analyses have been noted in the text.

Results

RESPONSE RATES

Overall, 1,164 interviews were completed with those reached on a cell phone: 572 interviews with cell phone only households and 592 interviews with households that had both a cell phone and a landline (see table 1). For the landline survey, 5,788 interviews were completed: 1,972 interviews with persons in

Table 1. Cell Phone and Landline Survey Response Rates, by State

	GA	NM	PA
Cell phone sample			
Cell phone sample size (*n*)	9,000	4,400	9,997
Completed interviews – cell phone only (*n*)	206	215	151
Complete interviews – cell phone & landline (*n*)	199	198	195
Cell phone only (%)[a]	35.5	38.5	23.6
Working cell phone number rate (%)	64.7	63.2	72.5
Cell phone screener completion rate (%)	40.2	47.5	34.3
Cell phone interview completion rate (%)	60.8	65.8	67.6
Cell phone only response rate (%)[b]	23.2	31.7	24.1
Cell phone & landline response rate (%)[b,c]	26.6	30.4	22.2
Cell phone overall response rate (%)[b,c]	24.4	31.3	23.2
Landline sample			
BRFSS landline overall response rate (%)[b]	23.6	51.9	45.3

BRFSS = Behavioral Risk Factor Surveillance System.

[a]Reflects the percentage of the total screened sample indicating they had only a cell phone and no landline in the household.

[b]Response rate based on formula RR4 recommended by the American Association for Public Opinion Research (APOR 2006).

[c]Adjusted to account for subsampling among households with both a landline and a cell phone.

landline-only households and 3,816 interviews with those in households with both a landline and a cell phone. As noted earlier for the cell phone survey, all of those having only a cellular telephone were interviewed, while persons having both types of telephones were subsampled for administration of the full interview. The proportion of screened respondents having only cell phones was 35.5 percent in Georgia, 38.5 percent in New Mexico, and 23.6 percent in Pennsylvania. A total of 1,049 potential respondents having both cell phones and landlines were categorized as not selected for interview based on the subsampling.

For the cell phone sample, residential working number rates varied significantly by state, from a low of 63.2 percent in New Mexico to a high of 72.5 percent in Pennsylvania; the rate was 64.7 percent in Georgia. Residential working number rates also varied significantly between sample vendors. Samples from SSI provided slightly higher working residential rates than did samples from MSG: Georgia, 66.1 percent versus 63.0 percent; New Mexico, 65.3 percent versus 61.2 percent; and Pennsylvania, 74.5 percent versus 70.5 percent. If "mixed use" 100 banks with no residential directory-listed landline telephone numbers are more densely populated with working residential cell phone numbers, then this could account for some of the observed difference. Looking at the components of the overall response rate, we found that the screening completion rate to determine study eligibility was significantly

higher in New Mexico (47.5 percent) than in Georgia (40.2 percent) or Pennsylvania (34.3 percent). The interview completion rates, however, were closer in New Mexico (65.8 percent) and Pennsylvania (67.6 percent), but lower in Georgia (60.8 percent). Interview completion rates also varied considerably by whether the household also had a landline telephone. The interview completion rate in cell phone only households versus cell phone and landline households was higher in New Mexico (66.7 percent versus 64.1 percent) and Pennsylvania (70.2 percent versus 64.8 percent), but lower in Georgia (57.7 percent versus 66.1 percent).

Overall, the cell phone response rate was considerably higher in New Mexico (31.3 percent) than in either Georgia (24.4 percent) or Pennsylvania (23.2 percent). These rates are similar to those reported by Brick et al. (2007).

The cell phone response rates were significantly lower than the landline response rates in New Mexico (51.9 percent versus 31.3 percent) and Pennsylvania (45.3 percent versus 23.2 percent). In Georgia, however, the landline and cell phone response rates were nearly identical (23.6 percent versus 24.4 percent).

Because we did not implement an experimental design, it is difficult to determine what role the incentive played in raising or lowering the participation rates. We do know that only 23 percent of those eligible for the $1 screener completion remuneration accepted the payment, and 87 percent of those eligible for the $10 payment for the full interview provided mailing information so they could receive the payment.

Additionally, the text message did not appear to be very effective in encouraging participation among the hard-to-reach group. Of the 217 cell phone numbers to which the text message was sent, only two respondents ultimately completed the interview. Other researchers have reported similar findings with regard to the apparent ineffectiveness of text messages in prompting participation in cell phone surveys (Brick et al. 2007; Steeh, Buskirk and Callegaro 2007).

CELL PHONE SHARING

Questions were added to both the cell phone and landline surveys to assess the percentage of respondents in households with at least one working cell phone who share a cell phone with one or more adults one-third of the time or more. Among the cell phone survey respondents, sharing was highest in Georgia (15.2 percent), followed by New Mexico (15.2 percent), and Pennsylvania (11.1 percent); none of these differences was statistically significant (see table 2). The rates of sharing were somewhat higher in cell phone only households than in households with both a landline and a cell phone in Georgia and New Mexico; again these differences were not statistically significant.

Table 2. Cell Phone Sharing, by Sample Frame, by State

	GA	NM	PA
Cell phone sample			
Share cell phone – cell phone only (%)	19.6	18.9	10.5
Share cell phone – cell phone & landline (%)	15.0	12.9	11.3
Share cell phone – total (%)	16.6	15.2	11.1
Landline sample (cell phone & landline households only)			
Have personal cell phone (%)	71.7	64.5	64.3
Share cell phone – have personal cell phone (%)	–[a]	13.1	13.7
Share cell phone – do not have personal cell phone (%)	–[a]	7.8	5.0
Share cell phone – total (%)	–[a]	11.2	10.6

NOTE.—"Cell phone sharing" is defined as sharing a cell phone "one-third" of the time or more with another adult in the household, with the time allotment of "one-third" being self-defined by the respondent.

[a]Data not collected for landline survey in Georgia.

For the landline sample, among those in households with at least one working cell phone, two-thirds of those interviewed in both New Mexico (64.5 percent) and Pennsylvania (64.3 percent) said that they had a cell phone for personal use; in Georgia the rate was significantly higher (71.7 percent; $p < .05$). The prevalence of cell phone sharing overall was roughly equivalent in New Mexico (11.2 percent) and Pennsylvania (10.6 percent) (these data were not collected as part of the landline survey in Georgia). Sharing was more prevalent in both states among those who indicated they had a personal cell phone compared to those who said they did not ($p < .05$).

DEMOGRAPHIC COMPARISONS

Next we compared demographic characteristics across the four critical analysis groups, categorized by the frame from which their telephone number was sampled (landline or cell phone frame) and type of telephone access in the household (landline, cell phone, or both). The data, as presented in table 3, were weighted using the "equalized" design weights.

Focusing first on the two groups sampled from the cell phone sampling frame (groups C and D in figure 1), we found that those from cell phone only households, compared with those from households with both landline and cell phone access, were *more likely* to be aged 18 to 34 years ($p < .001$), single or never married ($p < .001$), Hispanic ($p < .01$), a student ($p < .001$), and out of work ($p < .01$). Those in cell phone only households were *less likely* to be married ($p < .001$), between the ages of 35 and 64 years

Table 3. Comparison of Demographic Characteristics by Sample Frame and Type of Household Telephone Access

	Landline survey		Cell phone survey	
Demographic characteristic	Landline only (A)	Cell phone and landline (B)	Cell phone and landline (C)	Cell phone Only (D)
N	1,972	3,816	592	572
Sex				
Male	37.9 (34.8, 41.0)	38.2 (36.1, 40.3)	46.0 (41.9, 50.0)	51.1 (46.9, 55.3)
Female	62.1 (59.0, 65.2)	61.8 (59.7, 63.9)	54.0 (50.0, 58.1)	48.9 (44.7, 53.1)
age (years)				
18–34	14.5 (12.2, 17.1)	19.6 (17.9, 21.6)	24.0 (20.7, 27.7)	51.4 (47.2, 55.5)
35–49	20.9 (18.3, 23.8)	32.0 (30.1, 34.1)	35.2 (31.5, 39.2)	26.5 (22.9, 30.3)
50–64	29.9 (27.0, 32.9)	30.6 (28.7, 32.6)	30.4 (26.7, 34.2)	18.9 (15.8, 22.4)
65+	34.7 (31.9, 37.6)	17.7 (16.2, 19.3)	10.4 (8.1, 13.1)	3.3 (2.1, 5.1)
Race/ethnicity				
Hispanic	16.8 (14.5, 19.4)	12.2 (10.8,13.7)	15.2 (12.6, 18.3)	21.4 (18.5, 24.8)
Non-Hispanic white	69.8 (66.7, 72.8)	77.3 (75.3,79.1)	64.6 (60.6, 68.3)	53.6 (49.5,57.6)
Non-Hispanic black	9.3 (7.4, 11.6)	7.5 (6.5, 8.8)	15.0 (12.4, 18.1)	15.8 (13.0, 19.0)
Non-Hispanic other	4.1 (3.0, 5.6)	3.0 (2.3, 3.9)	5.2 (3.7, 7.3)	9.2 (7.1, 11.8)
Education				
Less than high school	20.4 (18.0, 23.1)	7.1 (6.0, 8.4)	10.1 (8.0, 12.9)	12.7 (10.2, 15.6)
High school diploma	39.9 (36.8, 43.0)	26.5 (24.7, 28.4)	29.7 (26.1, 33.5)	35.8 (31.9, 39.9)
Some college	20.9 (18.4, 23.8)	26.7 (24.8, 28.6)	26.2 (22.8, 29.9)	30.8 (27.1, 34.8)
College degree	18.8 (16.4, 21.4)	39.7 (37.7, 41.9)	34.0 (30.2, 38.0)	20.7 (17.5, 24.3)
Employment status				
Employed	37.2 (34.1, 40.3)	63.0 (60.9, 65.1)	71.9 (68.1, 75.4)	66.9 (62.8, 70.7)
Homemaker	12.4 (10.5, 14.7)	8.8 (7.6, 10.1)	5.5 (3.9, 7.6)	5.4 (3.8, 7.6)

Table 3. (*Continued.*)

	Landline survey		Cell phone survey	
Demographic characteristic	Landline only (A)	Cell phone and landline (B)	Cell phone and landline (C)	Cell phone Only (D)
Student	2.1 (1.3, 3.4)	3.9 (3.0, 5.0)	4.8 (3.3, 6.9)	11.1 (8.7, 14.0)
Retired	28.4 (25.7, 31.1)	18.5 (17.0, 20.2)	10.2 (8.0, 13.0)	3.6 (2.4, 5.5)
Out of work/unable	19.9 (17.3, 22.8)	5.8 (4.9, 6.9)	7.6 (5.7, 10.1)	13.1 (10.5, 16.2)
Marital status				
Married	49.5 (46.3, 52.7)	69.8 (67.9, 71.7)	62.0 (57.9, 65.8)	32.0 (28.2, 36.0)
Separated/divorced/widowed	34.1 (31.2, 37.0)	16.5 (15.1, 17.9)	17.7 (14.8, 21.0)	24.2 (20.8, 27.9)
Single/never married	16.4 (14.1, 19.0)	13.7 (12.2, 15.4)	20.4 (17.3, 23.8)	43.9 (39.8, 48.0)
Children in household				
None	70.5 (67.3, 73.4)	61.1 (59.0, 63.2)	54.4 (50.4, 58.4)	60.5 (56.4, 64.5)
One or more	29.5 (26.6, 32.7)	38.9 (36.8, 41.0)	45.6 (41.6, 49.6)	39.5 (35.5, 43.6)
U.S. veteran status				
Veteran	87.1 (85.7, 88.5)	87.1 (84.8, 89.0)	87.3 (84.3, 89.7)	90.6 (87.9, 92.8)
Not a veteran	12.9 (11.5, 14.3)	12.9 (11.0, 15.2)	12.7 (10.3, 15.7)	9.4 (7.2, 12.1)

NOTE.—Percentages are shown along with 95% confidence limits in parentheses. Data were weighted using the state "equalized" design weight. Standard errors were calculated using SPSS version 13 with the Complex Samples Module.

($p < .001$), a college degree recipient ($p < .001$), non-Hispanic white ($p < .001$), or retired ($p < .001$).[1]

Comparing the two extremes in telephone access (groups A and D in figure 1), the cell phone only group was significantly different from the landline-only group for all but two subgroups examined (having a high school diploma and having a college degree). Among those with access to a landline only, just over one-third of the respondents were younger than 50 years compared to more than three-quarters of those in cell phone only households. Additionally, among the largest differences noted, those in landline-only households were *less likely* to be men ($p < .001$), currently employed ($p < .001$), single ($p < .001$), or to be a racial/ethnic minority ($p < .001$).

Looking next at differences between the two groups with access to both a cell phone and a landline (groups B and C in figure 1), we found that these groups differed significantly across a number of characteristics. Compared with the landline survey, the cell phone survey resulted in a *higher* percentage of men ($p < .001$), non-Hispanic blacks ($p < .001$), employed persons ($p < .001$), those who were single or never married ($p < .001$), and those with one or more children in the household ($p < .001$). In contrast, the cell phone survey resulted in a *lower* percentage of non-Hispanic whites ($p < .001$), those aged 65 years or older ($p < .001$), retired persons ($p < .001$), and those who were married ($p < .001$). No significant differences were found between these groups with respect to education level or veteran status.

COMPARISON OF SURVEY ESTIMATES

Prevalence estimates for 10 key health practices and risk behaviors were also examined across the four analysis groups. As shown in table 4, these data were weighted using the "equalized" design weight.

The two groups sampled from the cell phone frame (groups C and D in figure 1) differed significantly on three of the 10 measures, with a higher percentage of those in cell phone only households reporting they had engaged in binge drinking in the past 30 days ($p < .001$) and they had not received health care at some point during the past year due to health care costs ($p < .001$). Those in cell phone only households were less likely to have any kind of health care coverage ($p < .001$).[2]

1. With the exception of race, there were no significant differences in the demographic makeup of these two groups at the state level. Not surprising given the racial/ethnic makeup of the population in each state, New Mexico had a higher percentage of Hispanics, Georgia had a higher percentage of non-Hispanic blacks, and Pennsylvania had a higher percentage of non-Hispanic whites for both the landline and cell phone group and the cell phone only group (data not shown). No other significant state-based differences in demographic characteristics were noted across these two groups from the cell phone frame.

2. Differences at the state level were found for only two variables. Among those in cell phone only households, the percentage saying they had a health plan was significantly higher ($p < .001$)

Table 4. Comparison of Estimates of Key Health Practices and Risk Behaviors by Sample Frame and Type of Household Telephone Access

	Landline survey		Cell phone survey	
Health condition or risk factor	Landline only (A)	Cell phone and landline (B)	Cell phone and landline (C)	Cell phone only (D)
N	1,972	3,816	592	572
Any kind of health care coverage	78.7 (75.9, 81.4)	89.0 (87.6, 90.4)	86.0 (82.9, 88.6)	70.1 (66.3, 73.6)
Had not received care because of cost	20.4 (17.8, 23.3)	10.2 (8.9, 11.6)	16.3 (13.5, 19.5)	24.9 (21.5, 28.6)
Physical activities or exercise	60.7 (57.5, 63.7)	75.1 (73.2, 77.0)	75.1 (71.4, 78.5)	70.8 (66.9, 74.5)
Ever had asthma	12.8 (10.7, 15.1)	13.3 (11.9, 14.9)	13.3 (10.7, 16.3)	15.8 (13.0, 19.1)
Ever had diabetes	15.6 (13.4, 18.1)	8.7 (7.6, 10.0)	9.2 (7.0, 11.8)	7.7 (5.7, 10.2)
Ever had high blood pressure	38.8 (35.8, 41.9)	29.2 (27.3, 31.1)	25.9 (22.5, 29.6)	20.8 (17.6, 24.4)
Obesity (BMI $\geq$ 30 kg/m^2)	27.6 (24.8, 30.6)	25.5 (23.6, 27.4)	30.9 (24.6, 37.9)	24.4 (20.9, 28.2)
Currently smoke cigarettes	24.8 (22.1, 27.7)	17.3 (15.7, 19.0)	23.4 (18.0, 30.0)	31.1 (27.3, 35.1)
Binge drinking in past 30 days	11.0 (9.0, 13.5)	21.1 (18.9, 23.5)	15.5 (10.9, 21.4)	28.7 (22.0, 36.5)
Ever tested for HIV[a]	37.5 (33.5, 41.6)	36.6 (34.3, 39.0)	43.6 (39.4, 48.0)	53.4 (45.0, 61.7)

BMI = body mass index; HIV = human immunodeficiency virus.

NOTE.—Percentages are shown along with 95% confidence limits in parentheses. Data were weighted using the state "equalized" design weight. Standard errors were calculated using SPSS version 13 with the Complex Samples Module.

[a]Asked only of adults 18 to 64 years old.

Comparing the two groups with access to both a cell phone and a landline (groups B and C in figure 1), a higher percentage of those from the cell phone frame indicated they had not received health care due to cost considerations ($p < .01$) and that they had been tested for HIV at some point in their lives ($p < .001$). There were no significant differences across the other eight variables examined.

The differences in health estimates were starker when we compared the landline-only groups with the cell phone only group (groups A and D in figure 1). Those in landline households were much *more likely* to say that they had high blood pressure ($p < .001$), some form of health coverage ($p < .001$), and diabetes ($p < .001$). Conversely, a *lower* percentage of those with only a landline said that they engaged in binge drinking ($p < .001$), have ever been tested for HIV ($p < .001$), partake in some form of regular exercise ($p < .001$), and currently smoke cigarettes ($p < .001$). Many of these differences are not surprising given the demographic composition, particularly in terms of age, of these two groups.

COST COMPARISONS

The costs of conducting surveys with a cell phone sample are considerably higher than those of conducting a landline telephone survey. We calculated a generic cost model for obtaining 1,000 completed interviews with a sample drawn from a landline frame, a cell phone frame (with no screening), and a cell phone frame with screening for cell phone only households (see table 5). The projected data represent call-center costs only and do not include other project costs (such as project management, statistical support, CATI and other programming support), which are assumed to be relatively equivalent across the two types of surveys. On a per-interview completed basis, these costs averaged approximately $64 for a landline survey, $74 for a cell phone survey (no screening), and $196 for a cell phone -only household survey. It is important to place these numbers in context, however. Because of restrictions we placed on the calling protocols for cell phones (a single refusal conversion call was made and fewer call attempts were made than for the landline sample), the overall level of effort per case was lower (averaging 3.2 call attempts for the cell phone sample and 7.4 call attempts for the landline sample). Additionally, the cell phone survey included an incentive, whereas the landline survey did not.

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in Pennsylvania (85.5 percent) than in New Mexico (64.0 percent) or Georgia (60.7 percent). Conversely, a lower percentage of those in Pennsylvania (16.3 percent) reported that they had forgone health care in the past year due to costs than was the case with those in New Mexico (27.0 percent) or Georgia (31.4 percent). There were no statistically significant differences in survey estimates across the three states for those sampled from the cell phone frame who had both a cell phone and a landline.

Table 5. Projected Costs per 1,000 Completed Interviews Comparing Landline Versus Cell Phone Surveys

	Landline telephone survey	Cell phone survey	Cell phone only (via screening)
Assumptions			
Number of sampled telephone numbers/addresses (per 1,000 completed interviews)[a]	5,920	12,800	38,400
Average call attempts per sampled case[a]	7.4	3.2	3.2
Total call attempts required (per 1,000 completed interviews)	43,808	40,960	122,880
Cost calculations for materials/supplies			
Telephone sample ($0.08 per case)[b]	$474	$1,024	$3,072
Telephone connect charges ($0.0625 per call)[b]	$2,738	$2,560	$7,680
$10 incentive plus mailing charges – materials and postage ($10.70 per complete)[b]	NA	$10,700	$10,700
Subtotal for direct cost of materials/supplies	*$3,211*	*$14,284*	*$21,452*
Subtotal for indirect costs of materials/supplies (@ 25%)[c]	*$803*		
Total cost for materials/supplies (direct and indirect)	**$4,014**	**$17,855**	**$26,815**
Cost calculations for labor			
Hours of interviewer time required (@ 20 calls/hour)[a]	2,190	2,048	6,144
Hours of supervisor/monitor/quality control time required (@ 25% of interviewer time)[c]	548	512	1,536
Interviewer time ($8.00 per hour)[c]	$17,523	$16,384	$49,152
Supervisor or monitor time ($12.00 per hour)[c]	$6,571	$6,144	$18,432
Subtotal for direct labor costs	*$24,094*	*$22,528*	*$67,584*
Subtotal for indirect labor costs (fringe and other indirect costs (@ 150%)[c]	*$36,142*	*$33,792*	*$101,376*
Total cost for labor (direct and indirect costs)	**$60,236**	**$56,320**	**$168,960**
Total cost of materials/supplies and labor (absent fee/profit) per 1,000 completed interviews	**$64,251**	**$74,175**	**$195,775**
Cost per sampled telephone number	**$10.85**	**$5.79**	**$5.10**
Cost per completed interview	**$64.25**	**$74.18**	**$195.78**

NA = not applicable.

NOTE.—Comparison includes only costs of actual data collection and does not include other costs such as survey design, statistical support, analysis, or project management (other than direct supervision costs noted in the table).

[a] Based on production statistics from cell phone study.

[b] Based on cost data from cell phone study.

[c] Based on estimates of average rates across survey research industry.

Discussion

Similar to some previous studies (Brick et al. 2006; Fleeman 2006; Steeh 2004), the state-based cell phone study conducted here shows that conducting surveys by sampling cell phone numbers is feasible, but it is costly and produces relatively low rates of participation. Response rates varied by state, but were in line with those reported by other cell phone studies (Brick et al. 2007). Given some of the unique situations encountered when calling people on cell phones (e.g., respondents are driving, shopping, working, or otherwise engaged in a manner not typically encountered in landline telephone surveys), it has been recommended that special contacting protocols be put into place for cell phone surveys (cf. Lavrakas and Shuttles 2005). Following these recommendations in this study, we used a protocol with fewer calls per case than what would typically be used for the landline RDD survey. Further, only a single attempt was made to complete an interview once a respondent refused. Participation rates may have been improved in this study, therefore, had more robust methods been used, such as increasing the total call attempts and making an additional attempt (as warranted) to convert those who initially refused to complete the survey.

The survey industry is, however, at a crossroads with regard to such actions. Although such attempts may indeed improve response rates modestly (a best guess on the basis of landline surveys would be 5–10 percentage points maximum gain depending on the protocol used), they are just as likely to increase respondents' frustration, which could cause already low cell phone survey response rates to drop further. The consistent decline in response rates to landline telephone surveys (Battaglia et al. 2007) shows that a substantial percentage of the population does not want to participate in telephone surveys, regardless of the study's goals. There is no reason to think that respondents reached on cell phones should be any different. Researchers who decide to conduct interviews by cell phone should tread cautiously in this area, balancing the desire to obtain valid and reliable data with the need to minimize the burden on respondents.

The study also verifies at the state level what others have found in national surveys with regard to the significant differences between cell phone only households and those with other types of telephone access. Differences in demographic characteristics of the respondents and in some of the health and risk behavior measures are similar to those reported elsewhere (Blumberg, Luke and Cynamon 2006; Brick et al. 2006). The fact that this group differs significantly even after controlling for other potential confounders (e.g., age, sex, race, education, marital status, children in the household, and state of residence), however, means that current weighting practices in most landline surveys are *insufficient* to account for these differences. Although most landline surveys poststratify by factors such as sex, age, race, and education, it appears that many of those in cell phone only households are different to a nonnegligible extent in at least some of their health problems and behaviors despite these

characteristics, such that weighting to these factors does not account fully for the differences.

Problems associated with weighting extend as well to that portion of the population that has both a cell phone and a landline. As shown here, this group appears to have *different demographic characteristics when sampled by landline versus when sampled by cell phone*. Brick et al. (2006) come to a similar conclusion, noting differential nonresponse rates in this group depending on the type of telephone on which they make and receive most of their telephone calls. Those sampled from a landline telephone frame were more likely to report relying more on their landline than their cell phone, whereas this finding was reversed for those sampled according to their cell phone number. As a result, it appears that to fully account for the population, many telephone researchers will have to *consider the telephone frame as a single frame with landlines and cell phones being separate strata and sample from each, without screening for cell phone only households*.

Another explanation for some of the differences in health conditions and risk factors may be mode effects: that is, adults may answer questions differently on a landline phone in the household versus on a cell phone in a location outside the household. This is an area of scant research with regard to cell phones. At issue is the degree to which persons interviewed by cell phone are "cognitively engaged" in the interview. Cell phones are one of many modern tools that facilitate the "multitasking" so prominent in society today. Not only do researchers need to be concerned about questions of safety (e.g., potentially interviewing someone who is driving), but they also need to be concerned about how respondents answer questions while engaged in other activities, such as shopping, being in a restroom or outdoors, or dining in a restaurant. Ideally, researchers would like respondents to be "fully engaged" mentally in the interview process and not distracted by other activities or stimuli. We know very little, however, about the conditions in which respondents find themselves when they are taking part in an interview by cell phone.

The finding that sharing of cell phones among adults appears to be taking place in 10–15 percent of households (a proportion many might consider "nonignorable") has both statistical and operational implications. In most probability sample designs the linkage between elements of the sampling frame and the population under study is viewed as static, although some may be time-based since linkages are defined as of a particular date or dates. In the case of sampling frames associated with telephones, the linkage between a telephone number and an individual is generally based on membership rather than behavior. Thus, if an individual is a member of a household, which is served by a landline telephone, that individual is assumed to be linked to the landline frame. Similarly, in the case of cellular telephone numbers, if an individual owns a cell phone (i.e., is the cell phone user or holder), that individual is assumed to be linked to the cell phone sampling frame through the cell number. What do we do, however, when two or more adults in a household share a cell phone?

Because the linkage of individuals to phone numbers is a critical part of the sampling model, the weighting model, as well as models used for the computation of response rates, it may be necessary to obtain "usage" information from sample respondents and, in turn, use this behavioral data to modify calculations of probabilities of selection, weighting as well as measures of response rate. It may also be necessary to develop (or adopt from existing approaches) methods for conducting within household selection, so that all adults who share the telephone have a nonzero probability of selection. But as shown by Brick et al. (2007), this can be operationally difficult and lead to increased nonresponse. More work in this area is required before a definitive set of recommendations is developed, particularly in terms of the establishment of thresholds where sharing is determined to be nonignorable (i.e., what percentage of the time does the cell phone need to be shared) and the most effective wording of usage questions to be asked.

Finally, interviewing respondents by cell phone also appears much more costly than conducting landline telephone surveys, the costs of which are already high because of the need for increased effort to achieve acceptable response rates. As a result, researchers may want to conduct as few cell phone interviews as possible (but taking into account the inflation of sampling variances due to unequal weights) and simply weight these responses accordingly. A key difficulty with the weighting procedures at this point, however, is the lack of a good population standard denoting telephone access at the subnational level. Currently, the National Health Interview Survey (NHIS) provides the only external standard against which to adjust data by type of household telephone access; however, this survey provides data only down to the Census Region level, not at the state, local, or other subnational level (Blumberg, Luke and Cynamon 2006). Researchers must, therefore, either not account for this factor in their weighting schemes using the internal survey data (a potentially problematic approach) or assume that the national estimates fit equally at the subnational level and make adjustments accordingly (a dubious assumption, but a less problematic approach). Neither is likely to be a very good solution. Including questions on telephone access in other larger population-based surveys, such as the Current Population Survey or American Community Survey, would help begin to remedy this problem.

Sampling and interviewing respondents by cell phone no longer appears to be a choice, but is now a necessity if surveys by telephone are to provide valid, reliable, and representative data. Such surveys, because of issues of differential nonresponse and cost per interview, should include all eligible sample members reached by telephone and not simply focus on cell phone only households. Considerable work remains with regard to weighting and postsurvey adjustments, however, before landline and cell phone surveys can be combined to produce integrated estimates, particularly at the subnational level.

Appendix A. Cell Phone Survey Screening Questions

INITIAL INTRO

HELLO, I am calling for the **(HEALTH DEPARTMENT).** My name is **(NAME).** We are gathering information about the health of **(STATE)** residents and you will be paid for any time you spend answering our questions on your cell phone. This project is conducted by the health department with assistance from the Centers for Disease Control and Prevention.

I have just a few questions to find out if you are eligible for the study.

1. Is this **(PHONE NUMBER)**?
   IF NO: Thank you very much, but I seem to have dialed the wrong number. It's possible that your number may be called at a later time. **STOP**
2. Is this a cellular telephone? **READ ONLY IF NECESSARY:** "By cellular telephone, we mean a telephone that is mobile and usable outside of your neighborhood."
   IF NO: Thank you very much, but we are only interviewing cell telephones at this time. **STOP**
3. Are you 18 years of age or older?
   IF NO: Thank you very much, but we are only interviewing persons aged 18 or older at this time. **STOP**
4. Do you live in a private residence, that is, not in a dormitory or other type of group living situation?
   IF NO: Thank you very much, but we are only interviewing private residences. **STOP**
   READ ONLY IF NECESSARY: "By private residence, we mean someplace like a house or apartment."
5. Are you a resident of **(STATE)**?
   IF NO: In what state do you live? **COLLECT STATE** Thank you very much, but we are not interviewing in your state at this time. **STOP**
6. Do you also have a landline telephone that is used to make and receive calls?

READ ONLY IF NECESSARY: "By landline telephone, we mean a "regular" telephone in your home that is connected to outside telephone lines through a cable or cord and is used for making or receiving calls."

INTERVIEWER: TELEPHONE SERVICE OVER THE INTERNET COUNTS AS LANDLINE SERVICE.

IF "YES" AND NOT SUBSAMPLED: Thank you very much. Those are all the questions that I have for you today. In appreciation for the time you have spent answering our questions, we would like to provide you with one dollar in compensation. Would you please give me your name and address so that we can send you the one-dollar payment?

COLLECT NAME AND ADDRESS—STOP

IF "NO" OR IF "YES" AND SUBSAMPLED, SKIP TO SURVEY INTRO

Appendix B. Household Cell Phone Sharing Questions

1. Do you have a cell phone for personal use? Please include cell phones used for both business and personal use.
   IF YES: GO TO Q3
   IF NO: GO TO Q2
2. Do you share a cell phone for personal use with other adults?
   IF YES: GO TO Q4
   IF NO: GO TO NEXT SECTION
3. Do you usually share this cell phone with any other adults?
   IF YES: GO TO Q4
   IF NO: GO TO NEXT SECTION
4. How many other adults use this cell phone at least one-third of the time?

RECORD NUMBER: _____

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