Integrating Cell Phone Numbers into Random Digit-Dialed (RDD) Landline Surveys

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1. Introduction

The introduction of cellular technology has had a significant change in telephone coverage of the US adult population. In 2007 it was estimated that 98% of all 18+ adults have access to a telephone, but approximately 14% of these adults are exclusive cell phone telephone users (Mediamark Research Spring 2007 Survey). Thus, only about 84% of US adults reside in households served by landlines. As a result, current RDD surveys which exclude most cellular exchanges are based on sampling frames that can not claim to cover the full (or nearly full) adult population of the US.

Cell phone telephone numbers have been typically excluded from RDD samples for several reasons. First, the Telephone Consumer Protection Act and the FCC's implementation (71 Federal Reg 21634, April 26, 2006) prohibits machine-based dialing of cell phone numbers, a technique used by may survey research organizations to reduce costs and increase interview volume. In addition, the fact that most US cellular calling plans require the cell phone subscriber to pay for incoming calls raises a number of ethical and legal issues associated with the solicitation of cell phone subscribers and users in surveys without appropriate financial compensation. Further, the lack of published cell phone numbers means that cell-only and mixed-use blocks of 1,000 numbers are typically excluded from 1-plus list assisted RDD sampling plans.

As shown in Table 1 the rate of landline phone coverage appears to be on a continuing downward trend since the coverage rate for any telephones has stabilized at about 98% while the rate of the cell phone only population continues to rise (Blumburg and Luke 2007). As a result, there have been a number of recent efforts to determine how cell phone only persons can be added to standard RDD surveys (Brick et al 2007; Fleeman 2006). Here we address some of the issues associated with the inclusion of cell phones in telephone surveys, including a discussion of sampling frames, potential sample selection models, and a conceptual discussion of sample weighting and projection. We end with the presentation of data and results from a pilot project.

2. Population and Cell Phone Frame Models

In traditional landline only RDD samples, each person in the landline-covered population is assumed to be associated with a single landline household that contains one or more landline telephone numbers. The basic assumption is that all population members of the household are eligible for sampling. With cell phones the association of individual with cell phone numbers is more complex, with more possible sample model options. There are at least three basic models that have been suggested for linking individuals with cell phone numbers for the purposes of sampling. These are the complete household or family model, the shared usage model, and the individual model.

Complete Household Model: The complete household model assumes that all cell phones, with the possible exception of cell phones used exclusively for business and those used exclusively by persons outside of the defined population (e.g., children), are linked to all members of the household that are considered eligible for the survey. This is essentially the same model used for landline phones and typically involves linking all adults 18+ to each cell phone line "owned" by any adult 18+ in the household. This method probably provides the most complete population coverage (particularly in the case of cell phone only households) but is probably the most difficult to implement and the most subject to nonresponse, because a cell phone user in a household may be unwilling to let another household member use their cell phone to respond to a survey. Since cell phone usage may involve persons under 18 years of age, specific rules must be used to either include or exclude phones that are used exclusively by persons not in the defined population eligible for interviewing.

Shared Usage Model: The shared usage models attempts to create a sampling frame structure that is most consistent with actual cell phone usage. Although definitive information is lacking there is some evidence that a substantial proportion of cell phones are "shared" with one or more persons (Tucker et al. 2007). A cell phone number (or device) is linked to all persons who "share" the phone. As is described later, this linkage may either be static or time-based.

Individual Model: The basic assumption for the individual model is that each cell phone is linked to a single individual. This model is the most restrictive in terms of population coverage. The person in possession or using the cell phone at the time of sample selection is considered to be linked to the cell phone number. In the case that cell phones are shared, the individual model creates a "time based" coverage of the population. However, from the standpoint of implementation, it poses the fewest operational problems, and may result in the highest response rate.

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 (that is, a sample is drawn and respondent is selected 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 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 sampling frame through the cell number. There is some emerging evidence that phone usage may not be entirely consistent with the presence of landline telephones in a household or the ownership and possession of a cell phone. More specifically, there may be individuals who live in a household with a landline, who do not answer the landline. They may use it for outgoing calls only. There is also anecdotal evidence that certain individuals may own or share a cell phone but only use it for outgoing calls. These individual do not keep the phone on to receive calls and they do not use voice mail. 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 behavior information to modify calculations of probabilities of selection, weighting as well as measures of response rate.

3. Sample Selection of Cell Phones as Part of an Overall Telephone Sampling System.

Sampling of individuals from cell phone frames is typically accomplished in two stages. First, a sample of cell phone numbers is selected. For each selected number a determination is made as to the linkage of the cell phone number to one or more population members. The next step typically involves the selection of one of the linked population members.

The particular linkage will depend upon the frame model (complete household, shared usage model or individual model) used and the details that link the particular model to persons. This determination typically requires speaking with an individual, but in some instances it may be possible to determine lack of linkage on the basis of a voice-mail phone message. It is generally the case that cell phones that are used exclusively for business and those that are used (possibly exclusively) by persons under 18 are not eligible for linkages to population members.

Most current cell phone surveys use interviewing protocols that first determine whether or not the person first answering the phone is an adult (18 or over), who is not engaged in an activity which might be adversely impacted by having a telephone conversation (e.g. driving an automobile). Next, depending upon the frame model, information is collected that establishes the linkage of person to cell number. In the case of the complete household model the person answering the phone is asked, at a minimum, to provide information about the number of persons linked to the cell phone (typically the number of adults in the answerer's household). Depending upon the particular second stage sampling process, further information such as the number of males, the number of females, ages and possibly some more explicit identification information are sought. Finally, one of the standard selection algorithms used in RDD landline surveys is used to select a survey respondent for interviewing.

When the shared usage model is employed, two types of sampling algorithms may be used. For either sampling algorithm, if the individual who provides the linkage or sharing information is the only person who uses the phone, then they are the selected respondent and the second stage of selection is carried out with certainty (i.e., probability of 1.0). In those cases where one or more additional persons "share" the phone, one algorithm selects from among the k sharing persons with equal probability. This may be done by including the selected person with probability 1/k and, if this person is not selected, making use of either an implicit or explicit listing of individuals. Implicit listing may be accomplished by age order, while explicit listing may be carried out using first names, or initials or some other identification system. An alternative to the selection of the answering respondent with probability 1/k involves the certainty selection of the answering respondent and the use of one or more questions that attempt to determine the percentage of time that the answering respondent has possession of the phone.

This percentage of time may be used as a second stage probability of selection.

For the individual model, second stage selection is deemed unnecessary as the person answering the telephone is automatically selected as the respondent. The drawback of this approach is that in the event the cell phone is the only telephone in the household and is actually a shared device, then those adults who did not answer the telephone have a zero probability of inclusion in the survey.

4. Basic Overall Telephone (Landline and Cell Phone) Weighting Strategies

The basic model used in most designs that sample both landlines and cell phones recognizes three basic mutually exclusive strata: Stratum I: landline only, Stratum II: both landline and cell phone and Stratum III: cell phone only. These are shown in Figure 1

Standard landline RDD frames generally cover both Stratum I and Stratum II. In the US, for list enhanced (directed) sampling, most sample providers include banks of area code-exchange combinations that are either landline only (POTS), and mixed use (landline and cellular, landline and paging, etc.). When 1-plus bank elimination is used, banks of 100 numbers in both landline only and mixed landline and cellular banks are excluded from the sampling frame if they contain zero residential directory-listed telephone landline numbers. By doing this it is assumed that with the exception of landline to cell phone ported numbers, virtually all of the telephone numbers in landline only 100 banks are actually landline numbers. This assumption is supported by empirical evidence from a study of more than 2 million telephone numbers sampled as part of a large, nationwide RDD survey, which found that after eliminating zero blocks (those with no residential listed numbers) less than 0.1% of the remaining numbers were linked to cell phones (Link, Town, and Mokdad, forthcoming).

Stratum III is not covered by landline RDD samples and can only be covered through the sampling of dedicated cellular 1,000 banks as well as banks of 100 numbers in mixed-use exchanges that do not contain any directly listed numbers (Survey Sampling International 2006).

Weighting Telephone Surveys which include both Landline and Cellular Telephones: Most surveys, which include both landline and cellular telephones, require some degree of data weighting. Data weighting is typically accomplished by appending numerical values or weights to each sample individual or case record. These weights are used as multipliers for both simple counting tabulations or for more complex statistical estimates. Weights may be scaled using a constant factor so that the sum of weights equals a predetermined sum. Most often, this will be either the simple sum of the number of data cases, the size of the population to which the sample is to be projected, or a value equal to the "effective" sample size.

In the case of probability samples, weighting is typically used 1) to account for differential probabilities of selection, 2) to compensate for differential rates of non-response, non-cooperation and/or non-coverage, and 3) to adjust the sample to external characteristics, which are assumed to be "known" about the population to which inference is to be made.

Our proposed model for weighting of samples that include both cellular and landline phones, assumes the division of the total telephone population into the three basic strata previously discussed: Stratum I (landline only persons), Stratum II (landline and cell phone persons) and Stratum III (cell phone only persons).

Because of operational considerations data will be collected as two samples: a sample obtained from landline phone numbers and a sample obtained from cell phone numbers. The landline sample will include persons in Strata I and II (landline only and landline and cell phone). The cell phone sample will include persons in Stratum III (cell phone only), and may also include persons in Stratum II (landline and cell phone).

When a single sample is used, sample weighting is typically carried out in three steps. Step 1 involves applying a weigh that compensates for either the overall probability of selection associated with each case, or the differential probabilities of selection across the cases. In Step 2 adjustment factors (either absolute or relative) are applied to account for unit (case level) non-response or non-cooperation. Finally in Step 3, weights are applied so that certain sample characteristics (e.g. age, gender, education, geographic region, etc) conform to "known" population values.

When two or more samples are used together (as is the case with landline and cell phone samples) there are two general approaches that are often applied in carrying out the weighting process, which must also combine the various samples. One of these approaches first combines the different samples, prior to Step 1, while the second combines the samples after either Steps 1, 2 or 3. In certain instances, the mathematical description of the process may be the same for both approaches, but in other instances there are mathematical and numerical differences. As a result, the final weights associated with each case may be different depending upon which approach is used. It should be noted that if the

second approach is applied and the samples are combined after step 3, then an additional weighing adjustment may be applied after this basic combining step to adjust the proportion of landline only, cell and landline, and cell only households.

In the case of combining landline and cell phone samples we advocate this latter approach because we feel it offers maximum flexibility coupled with the ability to carry out diagnostic and check steps as part of the process.

5. Proposed Weighting Process

We briefly sketch the proposed process and suggest some options below. We assume that two samples are to be combined. Sample A consists of interviews obtained from a landline telephone sample and sample B consists of interviews obtained from a cell phone telephone sample. This later sample may include all cell phone persons or may be restricted to persons who are cell phone only. We assume that completed cases from sample A have been classified into two groups, respondents with landline only A1 and respondents with both landlines and cell phones A2. Respondents from sample B are classified as B3, cell phone only and, in the case were landline and cell phone individuals are not screened out, B2, landline and cell phone.

Step 1: Probability or Design Weights: Weights are computed for each of the sample individuals on the basis of their probability of selection. This process is carried out separately for both samples A and B. As a result it is not necessary to compute joint probabilities of selection for individuals in group A2 and (if present) B2. The weights for landline sample respondents will typically involve a factor, which reflects the basic probability of selection for each telephone number, and a factor associated with the multiplicity (if present) of telephone numbers associated with the household. In most cases the factor is 1/k, where k is the number of different voice use landline numbers in the individual's household. The first step weight will also typically include a factor which reflects the within household probability associated with the selected sample person. If a single random adult is selected within the household, the factor will be equal to m, the number of eligible adults within the household. If more complex within household selection schemes are used, then the inverse of the selection probability for the selected respondent will be applied. It should be noted that the weight factors may be based on absolute or relative probabilities.

Step 2: Nonresponse Adjustment Factors: In step 2, non-response adjustment factors are often calculated. These factors are typically used when there are relatively large differentials in interview success rates (cooperation or response) across the sample in a way that may be computed from the full selected sample or for the fully screened sample. For example, different response rates may be observed for eligible households from telephone exchanges that are classified on the basis of demographic information (e.g. geography, race-ethnicity, income, urbanicity, etc). Further adjustments may be applied to compensate for differences in cooperation rates once a sample respondent is selected (e.g. selected respondent is person on the phone for sample selection vs. other). As is the case with probability weights, under certain circumstances these adjustments may be absolute or relative.

Step 3: Individual sample post-stratification: If external estimates of demographic characteristics are available either of the two samples may be adjusted (individually) to conform to these characteristics. It is more likely that certain demographic characteristics may be available for persons in landline telephone households (Stratum I and II). However, it may also be possible to obtain demographic characteristics of for cell only (if only B3 (cell phone only) sample is used or any cell (B2 and B3). At the national level, information for these groups is available at the total US level and for the four Census Regions from the National Health Interview Survey (Blumberg and Luke 2007). Other sources may be available for sub-national groups.

Step 4: Combining the two samples: In the case that the two samples consist of A1 and A2 as well as B3 (i.e. persons with both landline and cell phone access are covered in the landline sample) but not in the cell phone sample, the process of combining the two samples requires that estimates proportions (PI, PII and PIII) of the three stratum sizes are available. These estimates of stratum sizes may be derived from either external or within sample sources. Initial report from various cell phone pilot studies indicate that external sources are preferable because results obtained directly from the samples may be distorted due to differential rates of usage or non-response (Brick et al, 2007). Assuming that preliminary weights (steps 1 and possibly 2 and 3) have been applied to samples A and B, then the following estimated proportions PI, PII and PIII may be obtained by ratio adjusting the relative size of Stratum II within one of the two samples to match the other and then computing the relative contribution of each of the groups to the overall total. The ratio adjustment may be applied from sample A to sample B or visa versa with the same final results. Adjusting

the size of the landline cell group in sample B to sample A, we have:

LL = the estimated proportion of the landline sample (Sample A) that is landline only and LLCP= 1-LL, the estimated proportion of the landline sample that is both landline and cell.

CP = the estimate proportion of the total cell phone population (Sample B) that is cell phone only and CPLL = 1-CP, the estimated proportion of the cell phone covered population that is also landline.

The relative sizes of strata I, II and III are estimated by first obtaining the estimate PII:

$$PII = \frac{1}{\left[\frac{1}{LLCP} + \frac{1}{CPLL} - 1\right]} \text{ and then}$$

$$PI = PII\left[\frac{1}{LLCP} - 1\right]$$

$$PIII = PII\left[\frac{1}{CPLL} - 1\right]$$

For example if from sample A we have (LL=0.2 and LLCP=0.8) and from sample B we have (CP=0.3 and CPLL=0.7) we find PI = 0.14894, PII=0.59574 and PIII=0.25532.

If landline and cell phone (Stratum II) respondents are screened out from sample B, the combining of samples A, B and C is accomplished by re-proportioning the sum of weights from each of 3 strata to either the estimates PI, PII and PIII or some multiple of these values. If landline and cell phone respondents are included in sample B, then there are several options for combining these two samples from the same stratum (Hartley 1962). Most often this combining is accomplished by dividing the total proportion PII into two portions (Sample A2 and Sample B2) on the basis of the unweighted sample sizes from each sample or the "effective sample sizes" from each sample. The most common way to compute effective sample size is to divide the unweighted sample size by 1 plus the squared coefficient of variation of the weights for the sample (i.e. effective n = actual n / (1 + rel-variance of weights). Other options are possible and are discussed in the "dual-frame" sampling literature.

Step 5: Final Post Stratification:

Once samples A and B have been combined a final post-stratification based on external estimates of sample characteristics is recommended. The wording of the telephone question in the American Community Survey (ACS) that this survey may provide appropriate estimates of the demographic characteristics of the telephone covered population. It should be noted that estimates from the ACS are available at the both the national level as well as sub-national (state and local) level.

6. Application to Data from BRFSS Pilot Study

The Behavioral Risk Factor Surveillance System (BRFSS) is one of the largest on-going RDD health surveys in the world (further details on survey design, methodology, and questionnaire are available at http://www.cdc.gov/brfss). Because of the potential for coverage bias in BRFSS estimates due to the increase in cell-only households increases, a study was conducted in 2007 in Georgia, New Mexico, and Pennsylvania to develop a methodology for incorporating these numbers into the BRFSS sample.

Sampling: The universe for the pilot study consisted of all non-institutionalized adults aged 18 and older living in the United States. Cellular telephone numbers were sampled and screened for the presence of adults living in private residences and within the three pilot states (Georgia, New Mexico, and Pennsylvania). Interviews were not conducted with those who live in institutions.

Sample was obtained from two vendors to compare the efficiency of the two frames. Each is based on the Telecordia database of telephone numbers, but structured and sampled from in slightly different ways. The first vendor, Survey Sampling Incorporated (SSI), partitions 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 code, telephone carrier, and sequential 100-block identification. The intent is to provide a stratification that will yield a 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 k-th selection of 100-blocks was performed and a 2-digit random number between 00 and 99 is appended to each selected 100-block stem.

The second vendor, Marketing Systems Group (MSG) used dedicated cellular 1,000 banks, sorted on the basis of area code and exchange. An interval, K, is formed by dividing the population count of telephone numbers in the frame, N, by the desired sample size, n. The frame of telephone numbers is divided into n intervals of size K

telephone numbers. From each interval, one 10-digit telephone number is drawn at random.

Overall a sample of 23,397 telephone numbers in cell phone exchanges across the three states (Georgia, New Mexico, and Pennsylvania) was drawn. For more details on the methodology used to conduct the pilot study see Link et al. (2007).

BRFSS Landline Telephone Survey: The cell phone pilot survey was conducted in parallel with the ongoing, monthly RDD data collection, thereby facilitating the comparison of results across the two approaches. Telephone survey data from the three participating states for the months of January through March, 2007, were used in this analysis. Additional questions were added to the landline telephone survey to determine the type of telephone access in the household (landline and cellular telephone or landline only) and to provide information for combining the data with the cell phone data and developing proper weights.

We used the design weighted (Step 1) data from the landline sample in each state to estimate LL and LLCP, and the design weighted data from the cell phone sample to estimate CP and CPLL. Based on the landline sample the LLCP estimate is lowest in New Mexico (66.1%) and highest in Georgia (74.2%). From the cell phone sample the CPLL estimates for Georgia and Mew Mexico are very close (60.8% and 60.3%, respectively) while the estimate for Pennsylvania is considerably higher (74.0%). The estimated sizes of three strata (PII, PI and PIII) are also shown in Table 2. Focusing on PIII, the cell-only stratum, the percentage of adults that only have a cell phone is at 32.4% in Georgia and 30.3% in New Mexico. In Pennsylvania PIII equals 20.3%. All three estimates are considerably higher than the latest national estimate from the National Health Interview Survey (Blumberg and Luke 2007). To test the sensitivity of health conditions and risk factors measured in the BRFSS to the size of PIII, we divided CP by two and recalculated PII, PI, and PIII as shown in Table 3.

In Table 4 we show estimates for the three states combined for four key health conditions and risk factors. In terms of the steps described above, we applied Steps 1 and Step 3, to produce the weights used for these results (a non-response adjustment, Step 2, was not applied. Table 4 shows estimates for the landline sample alone (after design weighting) as well as combined landline and cell estimates based on both sets of PI, PII and PIII values. Under either scenario regarding the values of PII, PI and PIII, the current smoker and binger drinking estimates are higher when the cell phone-only adults are included. The estimate of the percentage of adults with health insurance goes down, while the asthma health condition estimate declines by a very small amount.

Typically, the weights of landline only samples are adjusted, via raking age by gender control totals or more extensive age by gender, race-ethnicity and possibly education marginals. In order to examine the persistence of the difference among the landline and cell phone only groups we applied two versions of post-stratification weighting to the landline only weighted sample and the combined landline and cell phone samples (using both sets of proportions, PI, PII and PIII) One of these post-stratifications used age by gender control totals only. The other post-stratification based on raking used four control marginals: age by gender, race-ethnicity, education, and marital status. The results of this post-stratification weighting are shown for the 3 combined states in Tables 5 and 6. As these tables show, relative to landline only samples the impact of including cell phone only individuals persists even when extensive post-stratification for age, gender, race-ethnicity, education, and marital status is applied. While the magnitude is not large, it is consistent with results that do not involve extensive post-stratification.

7. Conclusions

Based on the results of this pilot test we conclude that it is feasible to augment a traditional landline based RDD survey with a cell phone only component based on somewhat different, but more realistic sampling models and procedures. At this point it appears that the cost of the supplemental sample is higher on a per case basis.

Second, there appears to be somewhat differential non-response/non-participation levels between cell phone only and landline-cell phone portions of the population covered by cell phones. As a result, it is critical that external estimates of the three telephone covered populations (Landline Only, Cell Phone Only and Landline and Cell Phone) be available at both the national and sub-national levels.

Finally, the pilot data provides evidence that various estimates of health status and risk behaviors are different when cell phone individuals are added to traditional landline RDD surveys. These differences persist when demographic and socio-economic weighting is applied. While the elimination of certain frame bias is not proven, these results show that is partially reduced by the inclusion of cell phone only individuals .

8. References

Brick, J. Michael, Sarah Dipko, Stanley Presser, Clyde Tucker, and Yangyang Yuan. 2006. "Nonresponse Bias in a Dual Frame Sample of Cell

and Landline Numbers." Public Opinion Quarterly 70: 780-793.

Brick, J. Michael, Pat D. Brick, Sarah Dipko, Stanley Presser, Clyde Tucker, and Yangyang Yuan. 2007. "Cell Phone Survey Feasibility in the U.S.: Sampling and Calling Cell Numbers Versus Landline Numbers." Public Opinion Quarterly 71: 23-39.

Blumberg, Stephen, and Julian Luke. 2007. "Wireless Substitution: Early Release of Estimates Based on Data from the National Health Interview Survey, July – December 2006." Available at: http://www.cdc.gov/nchs/data/nhis/earlyrelease/wireless200705.pdf.

Fleeman, Anna. 2006. "Merging Cellular and Landline RDD Sample Frames: A Series of Three Cell Phone Studies." Paper presented at the Second International Conference on Telephone Survey Methodology, Miami, FL.

Link, M., M. Battaglia, M. Frankel, L. Osborne, and A. Mokdad. "Reaching the Cell Phone Generation: Comparison of U.S. Cell Phone Survey Results with an Ongoing Landline Telephone Survey" *Public Opinion Quarterly* (forthcoming).

Link, M., M. Town, A. Mokdad. "Telephone Number Portability and the Prevalence of Cell Phone Numbers in Random Digit-dialed Survey Samples." *International Journal of Public Opinion Research* (forthcoming).

Tucker, Clyde, J. Michael Brick, and Brian Meekins. 2007. "Household Telephone Service and Usage Patterns in the United States in 2004: Implications for Telephone Samples." Public Opinion Quarterly 71: 3-22.

Table 1: Percentage of Adults in US Residing in Households that Only Have Cellular Telephone Service

Dates of survey	Percent of adults residing in a cell phone-only household
January-June 2003	2.9%
July-December 2003	3.5%
January-June 2004	4.4%
July-December 2004	5.4%
January-June 2005	6.7%
July-December 2005	7.7%
January-June 2006	9.6%
July-December 2006	11.8%

Source Wireless Substitution: Early Release of Estimates Based on Data from NHIS, http://www.cdc.gov/nchs/data/nhis/earlyrelease/wireless200705.pdf

Table 2: Results from the three cell phone pilot survey states

State	LL	LLCP	CP	CPLL	PII	PI	PIII
GA	0.258	0.742	0.392	0.608	0.502	0.175	0.324
NM	0.339	0.661	0.397	0.603	0.461	0.236	0.303
PA	0.275	0.725	0.260	0.740	0.578	0.219	0.203

Table 3: Alternative values for PII, PI and PIII

State	Revised value of CP	PII	PI	PIII
GA	0.196	0.628	0.218	0.153
NM	0.199	0.568	0.291	0.141
PA	0.130	0.654	0.248	0.098

Table 4: Comparison of Health Condition and Risk Factor Estimates Based on Design Weights

Health condition / risk factor	Landline sample	Landline sample and cell phone-only adults based on Table 3	Landline sample and cell phone-only adults based on Table 2
Current smoker	22.0%	23.3%	24.7%
Have health insurance	85.2%	83.8%	82.2%
Have asthma	8.1%	8.2%	8.3%
Binger drinker	24.1%	24.6%	26.8%

Table 5: Comparison of Health Condition and Risk Factor Estimates Based on Age by Gender Poststratified Weights

Health condition / risk factor	Landline sample	Landline sample and cell phone-only adults based on Table 3	Landline sample and cell phone-only adults based on Table 2
Current smoker	21.7%	22.8%	23.8%
Have health insurance	86.0%	84.3%	83.2%
Have asthma	8.0%	8.1%	8.2%
Binger drinker	24.4%	24.5%	24.8%

Table 6: Comparison of Health Condition and Risk Factor Estimates Based on Weights from Age by Gender, Race-Ethnicity, Education and Marital Status Raking

Health condition / risk factor	Landline sample	Landline sample and cell phone-only adults based on Table 3	Landline sample and cell phone-only adults based on Table 2
Current smoker	24.6%	25.2%	25.6%
Have health insurance	83.2%	82.6%	82.1%
Have asthma	8.7%	8.4%	8.5%
Binger drinker	23.8%	24.1%	24.1%

Figure 1. Telephone access by sample frame