B. Collections of Information Employing Statistical Methods - revised

The proposed study will employ statistical sampling methods to collect information from the target population and draw inferences from the sample to the target population. The following sections describe the procedures for respondent sampling and data tabulation.

B.1. Describe the potential respondent universe and any sampling or other respondent selection method to be used.

The 2011 National Survey of Speeding Attitudes and Behavior (NSSAB) will be conducted with a national sample of 6,000 drivers ages 16 years and older, residing in the 50 States and the District of Columbia. A driver is defined as a person who has driven within the past year. An over-sample of drivers aged 16-34 years old will be incorporated in the national sample. We will be conducting the survey using list-assisted RDD sample for the landline frame, as well as cell phone banks and mixed-use banks for the cell phone frame.

Sample Construction

The statistical formulas for specifying the sampling precision (estimates of sampling variance), given particular sample sizes, are premised on simple random sampling. Unfortunately, random sampling requires an enumeration of all of the elements in the population. Since no enumeration of the total population of the United States (or its subdivisions) is available, all surveys of the general public are based upon complex sample designs that may employ stratification and two or more stages of sampling.

The initial stage in the construction of this sample requires the development of a national probability sample of the non-institutionalized adult population of the United States.

The estimated distribution of the population by stratum is calculated on the basis of the U.S. Census Bureau, *Population Estimates by State by Single Year of Age, Sex, Race, and Hispanic Origin: 2008*. The population estimates are taken for the population age 16 and older. Based on these Census estimates of the geographic distribution of the target population, the total sample is proportionately allocated by NHTSA region.

Landline Sampling Method

The general procedure in developing a population-based sample for telephone surveys - whether at the national, state or community level - involves four steps. The first step involves a population-based sample allocation in proportion to geographic regions. For the NSSAB we will allocate the sample based on the 10 NHTSA regions as determined by the most recent Census Bureau estimates. NHTSA regions are divided as follows (see Table 4):

Table 4. NHTSA Regions

Region	States
Region 1-New England Region	Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont
Region 2- Eastern Region	New York, New Jersey, Pennsylvania
Region 3- Mid Atlantic Region	Delaware, District of Columbia, Maryland, Virginia, West Virginia, North Carolina, Kentucky
Region 4- Southeast Region	Alabama, Florida, Georgia, South Carolina, Tennessee
Region 5- Great Lakes Region	Illinois, Indiana, Michigan, Minnesota, Ohio, Wisconsin
Region 6- South Central Region	Louisiana, New Mexico, Oklahoma, Texas, Mississippi
Region 7- Central Region	Iowa, Kansas, Missouri, Nebraska. Arkansas
Region 8- Rocky Mountain Region	Colorado, North Dakota, South Dakota, Utah, Wyoming, Nevada
Region 9- Western Region	Arizona, California, Hawaii
Region 10- Northwest Region	Alaska, Idaho, Oregon, Washington, Montana

The second step of the sampling process involves assigning telephone hundred banks with one or more residential directory-listed telephone numbers to the NHTSA regions. The third step in the sampling procedure is to a draw random sample of telephone hundred banks and append a two-digit random number to each of the sampled hundred banks. This step produces a list-assisted random digit dialing (RDD) sample of telephone numbers. The fourth step requires the screening of these numbers to identify households with eligible drivers and selection of one eligible driver within each eligible household so that the household sample will yield a probability sample of the eligible driver population in the U.S. allowing valid generalizations to be made to the entire eligible population, within specified limits of expected sampling variability.

Based on the Census Bureau estimates of the non-institutionalized civilian population, we estimate that about 33 percent of the population will be between 16 and 34 years old. However, estimates from strictly RDD landline surveys for this age group are well below 33 percent. In the most recent findings from the Motor Vehicle Occupant Safety Survey (MVOSS) study, 16-34 year olds made up only 18.7 percent of the entire cross-sectional sample. The reasons for this discrepancy include a lower response rate among younger adults, a higher proportion of 16-34 year olds living in group quarters (e.g. dormitories), and a higher proportion of this age group living in cell phone only households. Hence, a simple proportionate sample of the adult

population based on RDD landline methodology will not meet the needs of this study design. Consequently, persons in the 16-34 age group will be over-sampled using the following probability sampling procedure. The entire landline RDD sample will be divided into random subsamples called replicates. For one set of replicates, one eligible individual (aged 16 and older) will be randomly selected from the sample household. For a second set of replicates, we will screen the sample household for the presence of eligible individuals aged 16-34 years, and randomly select one per sample household. The achievement of the target number of interviews is managed through the careful release of sample replicates within each of the two sets. This approach yields a probability sample because no quotas are used.

Table 5 presents the national population figures and projected sample distribution by age for the MVOSS 2007 cross-sectional sample of 4,316 respondents (i.e., without an oversample or a cell phone component). We outline our plan to correct for this discrepancy in the following sections.

TABLE 5. EXPECTED POPULATION AND SAMPLE DISTRIBUTION BY AGE BASED ON JUNE 1, 2008 CENSUS BUREAU ESTIMATES

	Population		**Sample**		
	Target Population (in thousands)	Percentage of Target Population	Population-Based Distribution of Sample	Expected Distribution of Sample** (n)	Expected Distribution of Sample (in percent)
Total (16+)	233,627		4,316	4,316	
16-24	37,476	16.04%	692	271	6.3%
25-34	39,960	17.10%	738	534	12.4%
35-44	41,735	17.86%	771	794	18.4%
45-64	77,397	33.13%	1,430	1,764	40.9%
65+	37,060	15.86%	685	953	22.1%

U.S. Bureau of the Census, Population Estimates, Age Category Estimates, 6/01/08
Source: http://www.census.gov/popest/national/asrh/files/NC-EST2007-ALLDATA-N-File19.csv
** Sample distribution from MVOSS 2007 vA, without oversample

Cell Phone Only Households

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 increasing percentage of households that are abandoning their landline telephones for cell phones has significantly reduced the population coverage provided by landline-based surveys. For the second half of 2008, the percentage of cell phone only households was 20.2

percent according to the National Health Interview Survey (NHIS) (Blumberg and Luke 2009[1]). Moreover, three out of five (60.6 percent) adults living with unrelated roommates and two out of five (41.5 percent) adults aged 25 to 29 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. Based on NHIS estimates from January-June 2004 to July-December 2008, the percentage of cell phone only households are increasing. Furthermore, these are some of the same groups that are increasingly under-represented in current RDD landline telephone surveys due to differential non-response.

Given that this is the first time the National Survey on Speeding Attitudes and Behaviors (NSSAB) will include a sample of cellular telephone numbers, we will draw a NHTSA-region stratified sample of cellular telephone numbers. Regional stratification based on cellular area codes is feasible to implement because the regions are defined in terms of States. However, due to number portability, some cell phone respondents may be living outside of the designated area code. We will ask all cell phone respondents what their State and zip code is in order to account for this.

For the cell phone only sample, we will interview drivers that only have cellular telephone service and do not have a landline phone in their household. Our experience with other surveys is that about 40 percent of the contacted adults in a cell phone sample only have cellular telephone service, while 60 percent have a cell phone and a landline in their household. We will offer those who complete the interview via their cell phone a $10 incentive. The incentive will be mailed to the respondents by Abt SRBI no later than ten business days after the interview is completed. Our recommended number of cell phone only interviews for the cell phone sample is 780. This was derived using Cochran's formula for the optimal allocation to strata when unit costs differ between the strata:

$$\frac{p}{p+\left((1-p)\sqrt{\frac{C_{Cellonly}}{C_{Landline}}}\right)},$$

where p equals the estimated proportion of drivers in 2011 that are cellular-only, $C_{cell\text{-}only}$ is the cost of conducting a cell phone-only interview and $C_{landline}$ is the cost of conducting a landline RDD interview. The optimum allocation assumes that the two samples have similar design effects. Based on our BRFSS Pilot Study[2] and other cost estimates that have been reported, the cost ratio is around 5. For 2011 we estimate the p will be around 25%. Thus the optimum allocation calls for around 13% of the total sample being allocated to the cell phone-only adult population. Therefore with 6,000 interviews planned, we need a sample of 780 cell phone-only adult interviews to achieve a 13% allocation.

[1] Blumberg SJ, Luke JV. Wireless substitution: Early release of estimates from the National Health Interview Survey, July-December 2008. National Center for Health Statistics. May 2009. Available from: http://www.cdc.gov/nchs/nhis.htm.

[2] Link MW, Battaglia MP, Frankel MR, Osborn L, Mokdad AH. (2007). Reaching the U.S. Cell Phone Generation: Comparison of Cell Phone Survey Results with an OPngoing Landline Telephone Survey. Public Opinion Quarterly: 71 (5), 814-839.

Cell Phone Mostly Households

Dual frame sampling indicates that one can use a landline RDD sample to sample landline-only households and households that have landline and cellular telephone service (dual service). If one screens for cell phone-only adults in the cell phone sample, then the design is referred to as a non-overlapping dual frame design (i.e., a two-stratum design: landline households and cell-only individuals). Estimation procedures are much simpler for non-overlapping dual frame designs compared to overlapping dual frame designs (e.g., if we also included adults in the cell phone sample with dual telephone service). Therefore, most cell phone samples have only included cell phone-only adults.

Cell phone mostly households are those households which have both a landline and a cell phone, but the landline is not often used for receiving calls, and therefore the probability of reaching such a household through the landline sample is greatly diminished. Past studies have shown that cell-phone mostly households are similar, in many ways, to cell-phone only households (e.g. Blumberg and Luke, 2009). We will conduct 780 cell phone interviews with respondents in cell phone mostly households. As stated in the previous section, we will offer $10 to each respondent who completes the interview on their cell phone.

Blumberg and Luke (2009) demonstrate that at least 50 percent of those living in households which are cell only are between the ages 16-34. There is a slightly smaller proportion of 16-34 year olds living in households which are cell phone mostly. As such, we anticipate completing about 702 interviews in this age group from the 1,560 interviews in the cell phone sample. This will be in addition to the 721 16-34 year olds we expect to contact in the landline sample and the 500 16-34 year olds we will oversample via landline, bringing the total number of 16-34 year-olds in the final sample to 1,923 (32 percent of total sample).

In Table 6 we show the expected sample distribution based on the methodology and assumptions specified in this and previous sections stratified by age.

TABLE 6
SAMPLE SIZE BY TYPE AND AGE

Age	Landline	Landline Oversample	Cell Phone Only	Cell Phone Mostly	TOTAL
16-34	721	500	390	312	1,923
35+	3,219	0	390	468	4,077
TOTAL	**3,940**	**500**	**780**	**780**	**6,000**

B.2. Describe the procedures for the collection of information.

The most important elements of the study design of the National Survey of Speeding Attitudes and Behavior are:

- Survey population is defined as total non-institutionalized population of the United States, age 16 and older, who drove at least once in the past year, and reside in households having telephones.

- Survey will be conducted by telephone, using computer-assisted telephone interviewing.

- There will be one interview administered to every respondent. This interview will average 20 minutes to complete.

- One eligible adult (16 years or older) will be selected in each household sampled from the landline frame, using the "most recent/next birthday" for random selection of respondent from households which have multiple eligible adults. There will not be a respondent selection procedure for those drivers reached on their cell phone, since cell phones are being treated as a personal device which is currently the standard industry practice.

- A total sample size of 6,000 persons ages 16 and older will be interviewed using the questionnaire. The questionnaire focuses on the respondent's attitudes and behavior regarding speeding and countermeasure strategies to reduce speeding.

- The cell phone only sample

- The oversample of drivers 16-34 which will help reduce bias in age associated with a strict cross-section of landline households in the US.

- The survey will include a Spanish language version of the questionnaire used by bilingual interviewers to minimize language barriers.

- Professional interviewers who are experienced in conducting interviews will carry out the interviews, using computer assisted telephone interviewing.

- The completed data sets will be weighted to correct for disproportionate sampling and non-response bias.

B.2.a. Sampling Frame

The purpose of this study is to generate accurate estimates of the non-institutionalized driver population, age 16 and older, currently living in the United States and the District of Columbia, on the basis of a survey sample. An efficient method of constructing national area probability surveys involves multi-stage stratified sampling. The sample is first stratified by NHTSA region, with sample allocation proportionate to target population distribution. The second stage involves random selection of hundred banks with one or more directory-listed telephone numbers within the NHTSA regions. The third stage involves appending a two-digit random number to each selected hundred bank to form complete ten-digit telephone numbers for household contact. The fourth stage requires the random selection of one age-eligible respondent within each household as the designated respondent.

The specific steps that will be used to construct this type of sample are outlined in detail below.

B.2.b. National Population Sample Design

A national sample of assigned telephone banks will be randomly selected from the active telephone exchanges within the United States. Phone numbers in the United States are 10 digits long - where the first three numbers are the area code, the next three are the exchange, and the last four numbers are the number within the exchange. The first two digits of the four digit number define a cluster, with each cluster containing 100 numbers or a "100-bank" (the last two digits). Selection will be made from those 100-banks containing one or more residential listings.

In the second sampling stage, a two-digit number is randomly generated for each 100-bank selected in the first stage. This second stage sampling technique is known as random digit dialing (RDD). Every telephone number within a given 100-bank has an equal probability of selection, regardless of whether it is listed or unlisted. The use of RDD sampling eliminates the otherwise serious problem of not covering unlisted telephone numbers.

B.2.c.1 Selection of Respondent Within Households Reached on Landline Phone

The sample construction described above yields a population-based, random digit dialing sample of telephone numbers. The systematic dialing of those numbers to obtain a residential contact should yield a random sample of telephone households. Next, a random selection procedure will be used to select one designated respondent for each household sampled. The "most recent/next birthday method" will be used for within household selection among multiple eligible respondents. Salmon and Nichols (1983[3]) proposed the birthday selection method as a less obtrusive method of selection than the traditional grid selections of Kish, et al. In theory, birthday selection methods represent true random selection (Lavrakas, 1987[4]). Empirical studies indicate that the birthday method produces shorter interviews with higher response rates than grid selection (Tarnai, Rosa and Scott, 1987[5]).

Upon contacting the household, interviewers will briefly state the purpose of their call (including noting the privacy of the information collected during the interview), and then request to speak to the person in the household within the eligible age range who has had the most recent birthday, or will have the next birthday. The CATI system will randomly rotate whether the interviewer asks for the most recent or next birthday. If the person who answered the phone is the selected respondent, then the interviewer will proceed with the interview. If the selected respondent is someone else who then comes to the phone, then the interviewer will again introduce the survey and proceed with the interview. If the selected respondent is not available, then the interviewer will arrange a callback.

[3] Salmon, C. and Nichols, J. *The Next-Birthday Method of Respondent Selection*. Public Opinion Quarterly, 1983, Vol. 47, pp. 270-276.

[4] Lavrakas, P. *Telephone Survey Methods: Sampling, Selection and Supervision*. Beverly Hills: Sage Publications, 1987.

[5] Tarnai, J., Rosa, E. and Scott, L. *An Empirical Comparison of the Kish and the Most Recent Birthday Method for Selecting a Random Household Respondent in Telephone Surveys*. Presented at the Annual Meeting of the American Association for Public Opinion Research. Hershey, PA, 1987.

B.2.c.2 Contact Procedure for Cell Phone Only Sample

Upon reaching a respondent on their cell phone, the interviewer will first ask whether the respondent is in a safe place to conduct the interview and ensure that that respondent is not driving or otherwise distracted. Once the respondent has confirmed that they are in a safe place to conduct the interview, the interviewer will begin the interview. Since the cell phone is used by most people as a personal device, there will not be a procedure for the selection of respondent when reached on their cell phone.

B.2.d. Precision of Sample Estimates

The objective of the sampling procedures described above is to produce a random sample of the target population. This means that with a randomly drawn sample, one can make inferences about population characteristics within certain specified limits of certainty and sampling variability.

The margin of error, d, of the sample estimate of a population proportion, P, equals:

$$d = (t_{\alpha})se(P)$$

Where t_α equals 1.96 for $1\text{-}\alpha = 0.95$, and the standard error of P equals:

$$se(P) = \sqrt{deff}\sqrt{\frac{P(1-P)}{n}}$$

Where:
deff = design effect arising from the combined impact of the random selection of one eligible individual from a sample household, and unequal weights from other aspects of the sample design and weighting methodology, and
n = the size of the sample (i.e., number of interviews)

Using these formulas, the margin of error for a sample size of 6,000 interviews is $d = 0.015$, using an average deff of 1.5. and setting P equal to 0.50. The Pew Research Center, the Kaiser Family Foundation and AP/GfK report average design effects for their overlapping dual frame sample designs of 1.39, 1.33 and 1.68, respectively (Lambert et al. 2010[6]), making it reasonable to assume that the average design effect will be around 1.5 or possibly a little higher.

The total sample size for the survey is also large enough to permit estimates for subgroup analysis including driver type, age, gender, income and other demographics.

B.2.e Data Collection

Data collection for the National Survey of Speeding Attitudes and Behavior will be conducted

[6] Lambert D, Langer G, McMenemy M. 2010. *"CellPhone Sampling: An Alternative Approach"* Paper presented at 2010 AAPOR Conference, Chicago IL.

from the telephone call center of Abt SRBI. The contractor will administer the survey using computer-assisted telephone interviewing (CATI), and will have sufficient numbers of CATI stations to conduct large numbers of interviews in short periods of time.

All interviewers on the project will have been previously trained in effective interviewing techniques as a condition of their employment. The contractor will develop an interview manual for this survey, and conduct a training session specific to this study with all interviewers prior to their conducting any interviews.

Interviewing will be conducted on a schedule designed to facilitate successful contact with targeted households (concentrating on weekends and weekday evenings). Interviewers will make up to twenty-five (25) call attempts before the number is classified as a permanent no answer. This extended callback protocol will increase the proportion of younger male respondents, and minorities in the final sample. Call attempts will be made at different times, on different days over a number of weeks, according to a standard call attempt strategy. However, the 25 call attempt protocol shall only apply to telephone numbers where nobody picks up the telephone. If someone picks up the phone but terminates the contact before in-house selection of a subject can be made, then the alternative protocol of five additional contact attempts, designed not to repeatedly call and annoy the prospective household participant, will be implemented for the specific household.

When an answering machine is reached on a landline or cell phone for the third time the interviewer will leave a message on the machine encouraging survey participation and providing information that the household member can use to verify the legitimacy of the survey and contact the research organization or NHTSA. A toll free number will be set up that the prospective survey participants can call. In addition, NHTSA will place a statement on its Web site that the prospective survey participant can visit to verify the legitimacy of the survey. The interviewer may also note these sources of verification to persons directly contacted on the phone if that would be deemed helpful in getting their participation.

When the household selected from the landline sample is reached, the interviewer will use a systematic procedure to randomly select one respondent from the household. If the respondent is reached but an interview at that time is inconvenient or inappropriate, the interviewer will set up an appointment with the respondent. If contact is made with the household, but not the designated respondent, the interviewer will probe for an appropriate callback time to set up an appointment. Once a household is reached, a minimum of five additional contact attempts will be made to identify and interview the designated respondents. If contact is made with the eligible respondent, but the respondent refuses to participate, then the interviewer will record information for use in refusal conversion to be conducted at a later time (see Section B.3).

If the interviewer encounters a language barrier, either with the person answering the phone or with the designated respondent, the interviewer will thank the person and terminate the call. If the case is designated as Spanish language, it will be turned over to a Spanish-speaking interviewer.

All interviewers on the study will be supervised in a manner designed to maintain high quality

control. One component of this supervision will entail periodic monitoring of interviewers while they are working. Through computer and phone technology, supervisors can silently monitor an interviewer's work without the awareness of either the interviewer or respondent. Second, supervisors will check interviewers' completed work for accuracy and completeness.

B.2.f. Sample Weighting

Weights will be calculated for the landline RDD sample and for the combined landline and cellular telephone samples.

Landline Sample Weighting Methodology

A sequential process of weighting will be applied to the final data. In general, the base sampling weight equals the reciprocal of the initial probability of selection. For most households (and their respondents) the base sampling weight will be equal to the reciprocal of the probability of selecting the household's telephone number in its geographic sampling stratum. Thus, the base sampling weight will be equal to the ratio of the number of telephone numbers in the 1+ working banks for that geographic stratum to the number of telephone numbers drawn from those banks and actually released for use. Then a subsampling weight to compensate for any oversampling of households containing drivers aged 16-34 years will be calculated.

The reciprocal of the number of voice-use landline telephone numbers in the household (up to a maximum of three such numbers) will be calculated. It will compensate for a household's higher probability of selection when it has multiple voice-use residential telephone lines.

Next, a weighting factor to account for the random selection of one individual age 16 years or older from the household will be calculated. This weighting factor equals the number of individuals age 16 years or older in the household. The design weight then equals the product of each of the three weight components described above.

The adjustment for interview nonresponse will be based on at least two nonresponse adjustment cells (also referred to as weighting classes) within each of the NHTSA regions. The nonresponse adjustment cells within each NHTSA region will be defined by whether or not the sample telephone number is a residential directory-listed number. We will also consider other telephone exchange variables, such as the race/ethnic distribution of the population of the telephone exchange, in the development of additional nonresponse adjustment cells within each NHTSA Region. For each nonresponse adjustment cell we will calculate a nonresponse adjustment factor equal to the ratio of the sum of the base sampling weights for all eligible sample individuals (completed interviews + partial interviews + screener terminates) to the sum of the design weights for the eligible sample individuals that completed the interview. The nonresponse adjusted weight of a completed interview equals their design weight times the nonresponse adjustment factor for their nonresponse adjustment cell.

The population control totals for the raking will be based primarily on the latest Census Bureau annual population estimates (age by gender by race/ethnicity). A survey sample may cover

segments of the target population in proportions that do not match the proportions of those segments in the population itself. The differences may arise, for example, from sampling fluctuations, from nonresponse, or because the sample design was not able to cover the entire target population. In such situations one can often improve the relation between the sample and the population by adjusting the sampling weights of the cases in the sample so that the marginal totals of the adjusted weights on specified characteristics, referred to as control variables, agree with the corresponding totals for the population. This operation is known as raking ratio estimation or raking, and the population totals are usually referred to as control totals. Raking is most often used to reduce biases from nonresponse and noncoverage in sample surveys. Raking is an iterative procedure that usually proceeds one variable at a time, applying a proportional adjustment to the weights of the cases that belong to the same category of the control variable.

We will also consider using the American Community Survey (ACS) to develop additional population control totals for socioeconomic variables such as education and marital status Battaglia et al. (2008) have shown the potential for strong bias reduction from the inclusion of a socioeconomic variable in the raking.

Approximately 2% of households in the U.S. do not have telephone service. We will therefore follow the commonly used practice of developing a nontelephone adjustment margin to compensate for the exclusion of nontelephone households (Frankel et al. 2003). This raking margin will use information from the ACS on the number of nontelephone adults in the U.S., and information from the survey question on whether the household experienced an interruption in landline telephone service of one week or longer in the past 12 months.

To develop the final weights, we will rake the nonresponse adjusted weight, iterating to get close agreement on the margins for gender by age by race/ethnicity, nontelephone adjustment, marital status and education. We will use the latest version of the Izrael, Battaglia and Frankel (IBF) SAS raking macro (Izrael et al. 2009[7]) to implement the raking. The IBF SAS raking macro also allows for weight trimming during the iterations to avoid ending up with extreme weights. We will also examine whether any additional margins should be included in the raking. e.g., presence of children in the household, home ownership, and household size.

Combined Sample Weighting Methodology

A second final weight will be created for the combined landline sample of adults and the cell phone-only and cell-mostly adults (but will screen out adults who are not cell-mostly) from the cell phone sample. This type of sample design is referred to as a partially overlapping dual frame design, because the landline RDD sample and the cell phone sample will both contain cell-mostly adults.

For the landline sample of adults the calculation of the design weight and the nonresponse adjusted weight would proceed as described above. For the cell phone sample the first step is to assign a base sampling weight that equals the reciprocal of the probability of selection of the

[7] David Izrael, Michael P. Battaglia, Martin R. Frankel. Extreme Survey Weight Adjustment as a Component of Sample Balancing (a.k.a. Raking). *Presented at SAS Global Forum 2009*, March 2009, Washington, D.C

cellular telephone number. Cellular telephones are most often used as personal communication devices and are not shared with other individuals in the household on a regular basis. The random selection of a respondent will therefore not take place in the cellular telephone number sample and thus no adjustment to the design weights is needed (i.e., the design weight equals the base sampling weight).

The design weights will however be adjusted for interview nonresponse separately for cell phone-only drivers and for cell-mostly drivers. For the cell-only drivers the nonresponse adjustment factor equal to the ratio of the sum of the design weights for all eligible cell-only sample individuals (completed interviews + partial interviews + screener terminates) to the sum of the design weights for the eligible cell-only sample individuals that completed the interview. The nonresponse adjusted weight equals the design weight times the nonresponse adjustment factor. For the cell-mostly drivers the nonresponse adjustment factor equal to the ratio of the sum of the design weights for all eligible cell-mostly sample individuals (completed interviews + partial interviews + screener terminates) to the sum of the design weights for the eligible cell-mostly sample individuals that completed the interview. The nonresponse adjusted weight of a completed interview equals their design weight times the nonresponse adjustment factor for their nonresponse adjustment cell. At this point we have nonresponse adjusted weights for the two samples.

Some have attempted to use internal weighted sample estimates on size of the telephone usage groups but research has shown (Brick et al. 2006[8]) that this will lead to an overestimation of the number of cell phone-only adults, because in the cell phone sample it is easier to make contact with cell phone-only adults than with adults that also have a voice-use landline telephone in their household. It is therefore important to have control totals related to telephone usage: number of adults that only have landline telephone service, number of adults that only have cellular telephone service, and number of adults that have dual (landline and cellular) telephone service, with this last group split in cell-mostly and not cell-mostly subgroups. Such estimates can be obtained for the U.S. and for the four Census regions from the National Health Interview Survey (NHIS). We therefore plan to use the latest available NHIS estimates to create telephone usage control totals that will allow the two samples to be combined. It is however important to also examine the characteristics of the cell-mostly adults in the landline RDD sample and cell-mostly adults in the cell phone sample. The usual dual frame estimator is unbiased only if these two groups are equivalent (i.e., they are random samples from the same population). Because the NHIS does not directly identify vehicle drivers we will need to use data from the current survey to adjust the NHIS estimates. The final step in the process is to rake the combined sample to the control totals discussed above.

Variance estimation for a dual frame design is somewhat more complex than for a single-frame design. The proportion of drivers, p, with a characteristic of interest equals:

$$p = W_{LO}\,p_{LO} + W_{CO}\,p_{CO} + W_{LC-NOT}\,p_{LC-NOT} + \lambda W_{LC-MOSTLY}\,p^{L}_{LC-MOSTLY} + (1-\lambda)W_{LC-MOSTLY}\,p^{C}_{LC-MOSTLY}$$

where

[8] Brick M, Dipko S, Presser S, Tucker C, Yuan Y. 2006. Nonresponse Bias in a Dual Frame Sample of Cell and Landline Numbers. Public Opinion Quarterly, 70 (5) 780-793.

W_{LO} = proportion of persons who are landline only,
W_{CO} = proportion of persons who are cell only,
$W_{LC\text{-}NOT}$ = proportion of persons who are dual service and are not cell mostly,
$W_{LC\text{-}MOSTLY}$ = proportion of persons who are dual service and are cell mostly,
λ = compositing factor for the cell mostly domain, where $\lambda + (1-\lambda) = 1$,
p_{LO}, p_{CO}, $p_{LC\text{-}NOT}$ are the proportions of drivers with a characteristic of interest for the landline only, cell-only and dual service, not cell mostly domains, respectively, and
$p^{L}_{LC\text{-}MOSTLY}$ and $p^{C}_{LC\text{-}MOSTLY}$ are the proportions of drivers with a characteristic of interest for the cell mostly domain from the landline sample and from the cell sample, respectively.

The variance of p can be written as:

$$\text{var}(p) = W^2_{LO}\,\text{var}(p_{LO}) + W^2_{CO}\,\text{var}(p_{CO}) + W^2_{LC\text{-}NOT}\,\text{var}(p_{LC\text{-}NOT}) + \lambda^2 W^2_{LC\text{-}MOSTLY}\,\text{var}(p^{L}_{LC\text{-}MOSTLY}) + (1-\lambda)^2 W^2$$

Each of the variances will be computed using a variance estimation method appropriate for the sample design. The planned approach is to use SUDAAN to estimate the individual variances and then use the formula above to calculate the variance of p.

B.3. Describe methods to maximize response rates and to deal with issues of non-response.

In order to attain the highest possible response rate, an interviewing strategy with the following major components will be followed. The initial contact script has been carefully developed and refined to be persuasive and appealing to the sample. Only thoroughly trained and experienced interviewers, highly motivated and carefully monitored, will conduct the interviewing. Interviewers will be trained on how to overcome initial reluctance, lack of interest or hostility during the contact phase of the interview. The interviewing corps will include Spanish-speaking interviewers to ensure that Spanish language is not a barrier to survey participation. Twenty-five call attempts will be made to ring-no-answer numbers, and interviewers will leave an approved message on answering machines according to study protocol (see Section B.2.e).

The CATI program will record all refusals and interview terminations in a permanent file, including the nature, reason, time, and the interviewer. This information will be reviewed on an ongoing basis to identify any problems with the contact script, interviewing procedures, questionnaire items, etc. Also, the refusal rate by interviewer will be closely monitored. Using these analyses, a "Conversion Script" will be developed. This script will provide interviewers with responses to the more common reasons given by persons for not wanting to participate in the survey. The responses are designed to allay concerns or problems expressed by the telephone contacts.

A refusal conversion plan will be implemented in which each person selected for the sample who refuses to participate will be re-contacted approximately one-to-two weeks following the refusal. A conversion script will be utilized in an attempt to convince the individual to reconsider and participate in the survey. Only the most experienced and skilled interviewers will conduct the refusal conversions. Exceptions to refusal conversion will be allowed on an individual basis if for some reason the refusal conversion effort is deemed inappropriate.

There will be maintenance and regular review of field outcome data in the sample reporting file, derived from both the sample control and CATI files, so that patterns and problems in both response rate and production rates can be detected and analyzed. Meetings will be held with the interviewing and field supervisory staff and the study management staff to discuss problems with contact and interviewing procedures and to share methods of successful persuasion and conversion.

The procedures described above resulted in a response rate for the cross-sectional sample of between 45% and 50% percent for past NHTSA surveys. Sample will be released gradually and conservatively for the current survey and the 20 plus 5 call protocol will be utilized to improve response rates for this survey. The sampling methods described above will yield reliable data that can be generalized to the universe studied (the general population of drivers age 16 and older).

Non-Response Analysis

A comparison of the characteristics of the completed and non-completed cases from the random digit dialing sample will be conducted to determine whether there is any evidence of significant non-response bias in the completed sample. There are three points at which sample characteristics are collected in the course of the telephone survey: prior to household contact; at respondent selection for the survey; and after beginning the interview. Analysis will be conducted with the data available for respondents and non-respondents at each of these points.

The drawn sample of random digit dialing numbers from the landline frame that are released to telephone interviewers for contact attempts can be coded for certain contextual characteristics. The "hundreds bank" from which the RDD number is drawn (e.g., 301-608-38xx) is classified geographically according to the unit from which the majority of listed numbers in that bank are located. This permits us to classify all of the numbers drawn by NHTSA region, State, and urbanicity (central city, metro remainder, and non-metropolitan area). It also permits us to classify those numbers by demographic characteristics, such as percentage of African-American and Hispanic, based on Census data linked to telephone exchanges. A comparison of the characteristics of all dialed residential numbers in which an interview had not been completed with those that had been completed can be done with these variables.

Once contact is achieved with a household in the landline sample, one adult is selected in each household as the designated respondent. If there is more than one eligible respondent per household, then a random selection is done for the individual with the most recent/next birthday. The age and gender of this individual is obtained so that they can be identified if callbacks are necessary. This information permits additional comparisons of any differences in the age and gender of respondents in the completed sample and those in the non-completed sample after household contact and respondent selection had been made.

For the cell phone sample we will have less information available to assess nonresponse bias. Cell phone area codes can be assigned to NHTSA Regions and to States. A comparison of the characteristics of all dialed residential numbers in which an interview had not been completed with those that had been completed can be done with these variables.

Finally, we expect there will be a small percentage (~5.36%) of terminated interviews based on a past survey we conducted for NHTSA (MVOSS 2007[9]) throughout the course of data collection. A terminated interview is one in which the designated respondent begins the interview (answers the first question) but refuses to complete the interview at some point after the first question. Some key motor vehicle and driving characteristics are collected at the very beginning of the interview. Differences in driver characteristics can be analyzed at this third stage between those who terminate the interview and those who complete the interview.

This three-step process of analyzing the characteristics of respondents and non-respondents to the survey should identify whether there is any evidence of significant non-response bias in the most likely areas: region, size of place, minority communities, age, gender, and driving

[9] Boyle, John and Patricia Vanderwolf. 2007 Motor Vehicle Occupant Safety Survey. June, 2008.

characteristics. This analysis will suggest whether any weighting or other statistical adjustment needs to be made to correct for non-response bias in the completed sample.

Additionally, Abt SRBI will conduct a study where auxiliary data (e.g., Hispanic ethnicity, income level, percentage of African-Americans) is compared to 2011 NSSAB survey data. The auxiliary data will be purchased from an external vendor and will represent the latest and most recent population information at the zip code level. We will ask respondents for their zip code at towards the end of the interview. The auxiliary data will establish a standard against which to compare the demographic composition of the 2011 NSSAB sample. In this way, we will be able to infer whether the nonrespondents are demographically different from those in the sample and we will be able to infer whether some of the estimates are correlated with the propensity to respond. If some of the estimates are correlated with the propensity to respond, there is a chance that there might be some bias in those estimates.

B.4. Describe any tests of procedures or methods to be undertaken.

A pretest will be conducted among 30 people, to ensure the CATI script is functioning properly and the data is being collected accurately. The pretest will consist of the entire survey process, from sample management to tabulation of results. Any problems encountered during the pretest of the questionnaire will be resolved before the survey is put into the Field.

B.5. Provide the name and telephone number of individuals consulted on statistical aspects of the design.

The following individuals have reviewed technical and statistical aspects of procedures that will be used to conduct the 2011 National Survey of Speeding Attitudes and Behavior:

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