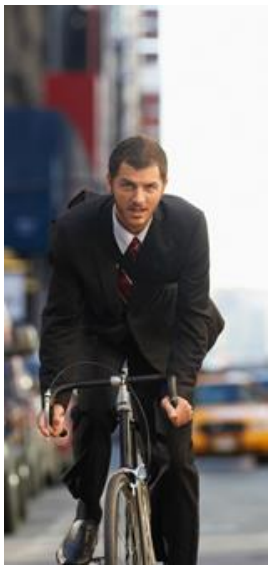
NHTS

Task C: Sample Design

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Sample Design: National Sample (Task C)

1. Overview

The National Household Travel Survey for 2016 will be conducted at the National level and in 13 specific study areas (referred to as Add-on areas) listed in Table 1-1. As described in detail below, the design will use a two-stage survey process, with an address-based sampling (ABS) frame. The two-stage process will include a mailout/mail back recruitment stage, and a primarily web-based travel day retrieval with telephone option. The study will use multiple modes for reminders at key points and cash incentives at key stages.

Table 1-1 summarizes the target sample sizes (completed household retrievals) specified for each study area where a household retrieval is considered to be complete if all of the eligible household members, (i.e., persons age 5 and older) complete the retrieval survey. An enumeration of all household members will be conducted[1] for participation in the survey.

Section 2 provides details of the ABS design for the National and Add-on samples. Section 3 discusses details of the sample design specific to each particular study area. Section 4 provides a preliminary overview of weighting and estimation procedures. The appendix includes tables that support the discussion of expected precision in section 2.4.

[1] The recruitment survey instrument will have space for up to nine household members. Respondents will be asked to provide information for any additional household members on a separate page.

Table 1-1 Study areas and target sample sizes

Study Area	Sample Size[1]
National	26,000
Arizona DOT	2,444
California DOT	24,000
Des Moines Area MPO	1,200
Georgia DOT	8,000
Indian Nations Council of Governments	1,000
Iowa Northland Regional Council of Governments	1,200
Maryland DOT	1,000
New York State DOT	15,851
North Carolina DOT	8,000
South Carolina DOT	6,500
Wisconsin DOT	11,000
Texas DOT	20,000
North Central Texas Council of Governments	2,917
TOTAL	129,112

[1]These are households for which all of the household members ages 5 and older complete the retrieval survey.

2. The ABS Sample Design

The National and Add-on samples will be selected using a single, unified design with a single selection (i.e., the Add-on samples will be embedded in the National sample design). Using a single selection avoids the complexities and reduction in precision that would result from separate, independent selections for the National and Add-on samples. In another major design difference from both the 2001 and 2009 NHTS, the National and 13 Add-on areas for the 2016 NHTS will comprise a sample of addresses that will be selected from the ABS frame maintained by Marketing Systems Group (MSG). MSG has a decades-long history of providing sampling frames to Westat, including both random digit dial (RDD) and ABS sampling frames, and we have collaborated with them extensively on research and enhancements to their frames. MSG's ABS frame originates from the U.S. Postal Service (USPS) Computerized Delivery Sequence file (CDS), and is updated on a monthly basis. Although several vendors license the CDS, Westat recognizes that MSG has taken great strides to evaluate and enhance the standard CDS-based list. One example is the work that MSG has done to augment simplified addresses (addresses with no specific street address, e.g., John Doe, Newtown, ST 12345). Section 2.2 discusses the coverage of the ABS frame.

Sampled addresses will be assigned a day of the week for which to log all travel. Section 2.5 below gives details on this assignment of travel days, for both the National sample and the Add-on areas.

2.1 Stratification of the ABS Sample

For the National study, because of the need to produce state-level estimates with adequate precision, state will be used for stratification. However, in order to support estimates for Add-on areas in states containing Add-ons, separate strata will be formed using the Add-on area(s) and the balance of the state. Thus the primary strata will consist of: (1) each Add-on area; (2) the balance of the state, for states with sub-state Add-ons; and (3) the state, for states without sub-state Add-ons. Additionally, the following four groups will be used to sub-stratify within each primary stratum:

- Counties in Metropolitan Statistical Areas (MSAs) of at least1 million people and containing heavy rail for transit use (14 such MSAs exist in the U.S.);
- Counties in MSAs of at least1 million people and not containing heavy rail for transit use;
- Counties in MSAs of less than 1 million people; and
- Counties not in MSAs.

The National sample size (specified in terms of responding households) will then be initially allocated among the strata according to the proportion of addresses falling in the stratum (determined by the counts of addresses from the ABS frame). A minimum allocation of 250 responding households per state will be used; states with initial allocations of fewer than 250 households will be increased to 250, and the remainder of the National sample will be re-allocated proportionally to the strata associated with the remaining states. For the Add-on areas, the Add-on sample size (as specified by memoranda of understanding (MOU) with the Add-on sponsor) will also be allocated among the four substrata above with potential additional substratification, with the allocation based on designated targets for each final substratum as specified in the Add-on MOU.

Once the sample of responding households has been allocated in the manner described above, these sample sizes will be inflated to account for expected losses due to ineligible addresses (an assumed rate of 11 percent of addresses, based on other National ABS mail studies conducted by Westat), non-response to the recruitment effort (an assumed non-response rate of 70 percent of eligible addresses), and non-response to the retrieval effort (an assumed non-response rate of 35 percent of recruited households). The departures from proportional allocation of responding households in the National sample and the supplementation of the sample for Add-ons will result in a sample of addresses selected with variable sampling rates. These variations in sampling rates will be properly accounted for in the computation of the survey weights, as discussed in section 4.

Within each substratum, the ABS frame will be sorted in a prescribed manner prior to sample selection. The sort used by MSG is geographic in nature, and addresses are sampled systematically using the geographic sort.

2.2 Coverage

Most studies of coverage of ABS frames have focused on in-person surveys that require locating the physical address in a specific geography (giving rise to problems with rural route addresses and PO boxes, as well as coverage issues resulting from geocoding errors). For a mail survey the household coverage rates are much higher, since the USPS delivers mail to almost all households, and households with mailing addresses that do not correspond to a physical location are covered. As reported by Iannacchione (2011), ABS frames that are derived from the USPS CDS file and its associated No-Stat file offer nearly complete coverage of households; however, since including the No-Stat file (a file of mostly inactive addresses) is estimated to increase the coverage by less than one percentage point (Shook-Sa et al.), the sampling frame for the 2016 NHTS will be derived from only the CDS file. Thus, the ABS sample used for the 2016 NHTS is expected to have substantially higher coverage than the 2009 NHTS landline RDD sample. (In 2009, about one-fourth of households did not have landline telephones, and it has been estimated that an additional 5 to 20 percent of landline households were excluded from landline RDD frames; see Blumberg and Luke (2009) for telephone service statistics, and Boyle et al. (2009), Fahimi, Kulp, and Brick (2009), Barron and Zhao (2010), and Barron et al. (2013) for discussion of landline RDD frame coverage of landline households.)

With the ABS approach, identifying targeted areas (e.g., states) that correspond to those for which estimates can be developed from the NHTS data is straightforward. Addresses are definitively linked to states, so state-level estimation is facilitated (unlike the situation with a random digit dial sample of telephone numbers such as that used for the 2009 NHTS). Geocoding and Geographic Information System (GIS) processing can be used to link addresses to counties in a highly reliable fashion. There can be some ambiguity for addresses that are P.O. Boxes or are listed as rural route addresses, since these addresses do not correspond to the physical location of the household. These types of addresses, while representing only a small proportion of a state's population, will be handled appropriately in a routine manner with a set of well-defined rules. For example, for sampling purposes, when Add-on areas are defined based on county or census tract boundaries, P.O. Box and rural route addresses will be associated with the census tract associated with the centroid of the ZIP or ZIP +4 code, whichever is available. Thus, no important issues arise in the definition of areas with an ABS sample design that relies on mail for data collection.

2.3. Two Part Sample Selection

The ABS samples described in Section 2 will be selected in two parts. In each sampling stratum, half the target number of sampled addresses will be selected prior to the start of fieldwork; the other half will be selected approximately 6 months later. This will allow the sample to reflect updates to the ABS frame after the original selection, and will also allow adjustment to the sampling rates as needed (e.g., to account for response rates that differ from prior expectations).

Sample monitoring will be performed throughout the data collection period in order to identify and try to address any potentially significant issues with response. To the extent possible, we will try to minimize the variance in each half sample's final yield, as an imbalance will mean that particular half of the year is over- or under-sampled, while still achieving the overall target annual yield.

2.4 Expected Precision

State and national level 2009 NHTS key estimates along with their standard errors, design effects and effective sample sizes were used in order to estimate the expected precision of estimates for the 2016 NHTS. For each estimate considered, the square root of the ratio of the 2009 NHTS effective sample size to the expected 2016 NHTS effective sample sizes was applied to the 2009 standard error to obtain an approximation of the expected standard error for the 2016 estimate. The final column of the table shows the ratio of the expected standard error of the 2016 estimate to the standard error of the 2009 estimate.

For this exercise, key estimates were taken from Tables 1, 3, and 5 of the Summary of Travel Trends Report from the 2009 NHTS[2]. From Table 1, they include:

- Total number of household vehicles;
- Total number of household vehicle miles traveled; and
- Total number of person miles traveled.

From Table 3, they include:

- Daily person trips per person;
- Daily person miles traveled per person;
- Daily vehicle trips per driver;
- Daily vehicle miles traveled per driver;
- Daily person trips per household;
- Daily person miles traveled per household;

[2] The 2009 NHTS Summary of Travel Trends report is available at http://nhts.ornl.gov/publications.shtml

- Daily vehicle trips per household;
- Daily vehicle miles traveled per household;
- Average person trip length (miles) per trip; and
- Average vehicle trip length (miles) per trip.

From Table 5, they include the average person trip length (miles) for:

- All purposes;
- To/from work;
- Work-related business;
- Shopping;
- Other family/personal errands;
- School/church;
- Social and recreational; and
- Other.

2.5. Assignment of Travel Day

The sample release process will control the balance of travel days by month. For the National sample, sampled addresses will be assigned a day of the week equally distributed across all days to ensure a balanced day of week distribution. This is a proven approach that has been used in all of our travel surveys. The following Add-on areas will also use this approach: California, Des Moines MPO, Iowa Northland Council of Governments, Maryland, and New York.

In the remaining Add-on areas, for Add-on sample cases only in the Add-on areas (i.e., not the National sample cases in the Add-on areas), weekend travel days (Saturday and Sunday) will be sampled at a rate of 7 percent each and weekdays (Monday through Friday) will be sampled at a rate of about 17 percent each. The areas include: Arizona, Georgia, Indian Nations Council of Governments, North Carolina, North Central Texas Council of Governments, South Carolina, Texas, and Wisconsin.

3. The National Sample Design

There will be a National sample with a target of 26,000 responding households. The National sample will have a total of 55 primary strata defined and described in Section 2: one for each Add-on area, one for the balance of the state (for each state with sub-state Add-ons), and one for each remaining state and the District of Columbia. Table 3-1 below presents the estimated sample sizes needed by stratum for the National sample to yield 26,000 completed household interviews. The assumptions given in the table are consistent with recent experience and include an estimated recruitment response rate of 30%, an estimated retrieval response rate of 65%

defining responding households as those that complete retrieval interviews for all of the recruited household members ages 5 and older, and an expected residency rate of 89%.

Table 3-2 presents the estimated sample sizes aggregated to the primary strata described in section 2.1.

Table 3-1 Expected sample sizes for the national sample by state

STATE	ABS 12/14 occupied housing units*	Retrieval completes assuming 65% response	Recruitment completes assuming 30% response	ABS address sample needed assuming 89% residency rate
Alabama	2,099,930	382	587	2,198
Alaska	245,754	250	385	1,441
Arizona	2,704,563	491	756	2,831
Arkansas	1,235,085	250	385	1,441
California	13,315,204	2,419	3,722	13,939
Colorado	2,104,380	382	588	2,203
Connecticut	1,459,660	265	408	1,528
Delaware	387,757	250	385	1,441
District of Columbia	301,320	250	385	1,441
Florida	8,797,039	1,598	2,459	9,209
Georgia	3,959,849	719	1,107	4,145
Hawaii	466,121	250	385	1,441
Idaho	598,298	250	385	1,441
Illinois	5,176,017	940	1,447	5,419
Indiana	2,761,832	502	772	2,891
Iowa	1,252,609	250	385	1,441
Kansas	1,175,772	250	385	1,441
Kentucky	1,843,639	335	515	1,930
Louisiana	1,931,525	351	540	2,022
Maine	575,676	250	385	1,441
Maryland	2,349,233	427	657	2,459
Massachusetts	2,774,255	504	775	2,904
Michigan	4,263,440	775	1,192	4,463
Minnesota	2,210,703	402	618	2,314
Mississippi	1,236,148	250	385	1,441
Missouri	2,575,052	468	720	2,696
Montana	389,691	250	385	1,441
Nebraska	743,212	250	385	1,441
Nevada	1,115,129	250	385	1,441
New Hampshire	530,210	250	385	1,441
New Jersey	3,514,537	639	982	3,679
New Mexico	775,084	250	385	1,441
New York	7,798,454	1,417	2,180	8,164
North Carolina	4,130,585	750	1,155	4,324
North Dakota	286,886	250	385	1,441
Ohio	5,082,240	923	1,421	5,320
Oklahoma	1,579,355	287	441	1,653
Oregon	1,576,258	286	441	1,650
Pennsylvania	5,425,758	986	1,517	5,680
Rhode Island	458,760	250	385	1,441

STATE	ABS 12/14 occupied housing units*	Retrieval completes assuming 65% response	Recruitment completes assuming 30% response	ABS address sample needed assuming 89% residency rate
South Carolina	2,044,349	371	571	2,140
South Dakota	316,742	250	385	1,441
Tennessee	2,769,775	503	774	2,900
Texas	10,058,020	1,827	2,811	10,529
Utah	945,196	250	385	1,441
Vermont	250,552	250	385	1,441
Virginia	3,286,115	597	919	3,440
Washington	2,785,131	506	778	2,916
West Virginia	780,380	250	385	1,441
Wisconsin	2,457,776	447	687	2,573
Wyoming	214,990	250	385	1,441
TOTAL	127,116,046	26,000	40,000	149,821

*Includes all address types except for augmented P.O. boxes.

Table 3-2 Expected sample sizes for the national sample by primary stratum

National sample stratum	ABS 12/14 occupied housing units	Proportion	Stratum sample size
Counties within MSAs > 1 million and heavy rail	31,070,705	24.4%	5,966
Counties within MSAs > 1 million and not heavy rail	38,036,786	29.9%	7,157
Counties within MSAs < 1 million	39,573,540	31.1%	8,509
Not in an MSA	18,435,015	14.5%	4,338
TOTAL	127,116,046		26,000

NOTE: The stratum sample size column indicates the expected number of completed household surveys.

3.1 Arizona DOT Study Area

The target number of completed household surveys is 2,444 for the Arizona Add-on area, with representation for the entire state. Maintaining the four main MSA/heavy rail sampling strata, twenty percent of the Add-on sample will be allocated to the three Sun Corridor counties, Maricopa, Pima, and Pinal, proportionally according to the number of households in each county. The remaining 80 percent of the Add-on sample will be allocated to the other 12 counties (not in the Sun corridor), proportional to the number of households in each county. A minimum Add-on sample size of 30 will be set for all counties and the remaining sample distributed within the Sun Corridor or not county groups. Table 3-3 shows the allocation of the National sample for Arizona within the main MSA/heavy rail sampling strata, the allocation for the Arizona DOT Add-on sample, and the total sample allocation.

Table 3-3 Arizona national sample and add-on allocation

County	National sample stratum	ABS 12/14 occupied housing units	National sample allocation	Add-on allocation	TOTAL sample
Maricopa County	Counties within MSAs > 1 million	1,636,725	297	361	658
Pinal County	Counties within MSAs > 1 million	131,974	24	30	54
Cochise County	Counties within MSAs < 1 million	52,369	10	205	215
Coconino County	Counties within MSAs < 1 million	46,776	8	184	192
Mohave County	Counties within MSAs < 1 million	99,046	18	388	406
Pima County	Counties within MSAs < 1 million	442,472	80	98	178
Yavapai County	Counties within MSAs < 1 million	96,328	17	378	395
Yuma County	Counties within MSAs < 1 million	86,222	16	337	353
Apache County	Not in an MSA	13,131	2	52	54
Gila County	Not in an MSA	23,767	4	93	97
Graham County	Not in an MSA	11,727	2	46	48
Greenlee County	Not in an MSA	1,915	0	30	30
La Paz County	Not in an MSA	9,615	2	37	39
Navajo County	Not in an MSA	38,084	7	149	156
Santa Cruz County	Not in an MSA	14,412	3	56	59
TOTAL		2,704,563	491	2,444	2,935

NOTE: The total sample column indicates the expected number of completed household surveys.

3.2 California DOT Study Area

The target number of completed household surveys is 24,000 for the California Add-on area, with representation for the entire state. Households will be selected from each of eight county groups, proportional to the number of households in each group. These groups are further subdivided to maintain the structure of the four main MSA/heavy rail sampling strata that will be used for the National sample as well. These groups are:

- San Diego
- SCAG (divided into a), b), and c))
- Central Coast (divided into a) and b))
- San Joaquin Valley
- MTC (divided into a), b), and c))
- SACOG/TMPO (divided into a) and b))
- Sierra (divided into a) and b))
- North State (divided into a) and b))

The Add-on sample has been distributed among these substrata to ensure that 20 percent of the sample is coming from rural areas and the remaining 80 percent from non-rural areas. Table 3-4 shows the definitions of the California Add-on substrata and the corresponding National sample

strata. Also shown are the allocation for the National sample within the main MSA/heavy rail sampling strata, the allocation for the Add-on substrata, and the total sample allocation.

Table 3-4 California national sample and add-on allocation

Substratum	National sample stratum	ABS 12/14 occupied housing units	National sample allocation	Add-on allocation	TOTAL sample
1: San Diego	Counties within MSAs > 1 million	1,147,361	208	2,434	2,642
2: SCAG (a)	Counties within MSAs >1 million and heavy rail	4,471,168	812	2,606	3,418
2: SCAG (b)	Counties within MSAs > 1 million	1,420,384	258	827	1,085
2: SCAG (c)	Counties within MSAs < 1 million	329,404	60	192	252
3: Central Coast (a)	Counties within MSAs > 1 million	16,487	3	100	103
3: Central Coast (b)	Counties within MSAs < 1 million	487,770	89	2,978	3,067
4: San Joaquin Valley	Counties within MSAs < 1 million	1,302,386	237	3,197	3,434
5: MTC (a)	Counties within MSAs >1 million and heavy rail	1,736,355	315	1,667	1,982
5: MTC (b)	Counties within MSAs > 1 million	640,892	116	615	731
5: MTC (c)	Counties within MSAs < 1 million	400,579	73	384	457
6: SACOG/TMPO (a)	Counties within MSAs > 1 million	838,119	152	3,553	3,705
6: SACOG/TMPO (b)	Counties within MSAs < 1 million	58,372	11	247	258
7: Sierra (a)	Counties within MSAs < 1 million	91,307	17	952	969
7: Sierra (b)	Not in an MSA	107,825	20	1,125	1,145
8: North State (a)	Counties within MSAs < 1 million	72,005	13	843	856
8: North State (b)	Not in an MSA	194,790	35	2,279	2,314
TOTAL		13,315,204	2,419	24,000	26,419

NOTE: The total sample column indicates the expected number of completed household surveys.

3.3 Des Moines MPO Study Area

The target number of completed household surveys is 1,200 for the Des Moines MPO Add-on area, covering portions of four counties including Dallas, Madison, Polk, and Warren. Shape files were provided by the Des Moines MPO for the exact area to be covered. These files were mapped to Census block boundaries, covering or partially covering a total of 10,750 blocks. Five blocks were dropped due to the block's area within the MPO boundary being less than 1 percent. An additional 33 blocks were dropped at the instruction of the MPO due to less than 60 percent of their areas being contained within the designated area. Three of the blocks with less than 60 percent of their area covered were retained at the MPO's instruction, due to having larger populations. The sample

of 1,200 will be distributed proportionally to the number of occupied housing units within each of the four county areas in those 10,712 Census blocks.

Table 3-5 shows the allocation of the National sample for Iowa for the four counties in the Des Moines MPO and the rest of Iowa, the allocation for the Des Moines MPO Add-on sample, and the total sample allocation.

Table 3-5. Des Moines MPO national sample and add-on allocation

County	National sample stratum	ABS 12/14 occupied housing units	ABS 12/14 occupied HUs for included Census blocks	National sample allocation	Add-on allocation	TOTAL sample
Dallas	Counties within MSAs < 1 million	29,066	19,259	6	108	114
Madison	Counties within MSAs < 1 million	5,914	79	1	1	2
Polk	Counties within MSAs < 1 million	190,344	187,949	38	1,053	1,091
Warren	Counties within MSAs < 1 million	18,097	6,833	4	38	42
Rest of Iowa	Counties within MSAs < 1 million	497,062		99	0	99
Rest of Iowa	Not in an MSA	512,126		102	0	102
TOTAL		1,252,609		250	1,200	1,450

NOTE: The total sample column indicates the expected number of completed household surveys.

3.4 Georgia DOT Study Area

The target number of completed household surveys is 8,000 for the Georgia Add-on area, covering 14 of the 16 MPOs in the state. The Chattanooga and Atlanta MPOs will be excluded as a specific MPO strata but will be included in the "other counties in the state" stratum. The Columbus MPO is also covered by Russell and Lee Counties in Alabama, and the Augusta MPO is covered by Aiken and Edgefield Counties in South Carolina.

Two groups of counties will be defined: one containing all counties in the 14 MPOs of interest and one containing all other counties in Georgia. Maintaining the bounds of the four main study strata, sixty-four percent of the sample of households will be allocated proportionally by county to the first group (n=5,120) and the remaining sample will be allocated proportionally by county to the second group (n=2,880). Table 3-6 shows the allocation of the National sample for Georgia, the allocation for the 14 MPOs of interest for the Add-on sample, and the total sample allocation.

Table 3-6 Georgia national sample and add-on allocation

Substrata defined by GA Add-on: MPOs	National sample stratum	ABS 12/14 occupied housing units	National sample allocation*	Add-on allocation*	TOTAL sample
Albany	Counties within MSAs < 1 million	51,455	9	235	245
Athens	Counties within MSAs < 1 million	81,223	15	371	386
Augusta	Counties within MSAs < 1 million	137,832	25	630	655
Brunswick	Counties within MSAs < 1 million	38,306	7	175	182
Cartersville	Counties within MSAs > 1 million and heavy rail	38,559	7	176	183
Columbus*	Counties within MSAs < 1 million	101,217	18	885	904
Dalton	Counties within MSAs < 1 million	53,274	10	244	253
Gainesville (a)	Counties within MSAs < 1 million	66,740	12	305	317
Gainesville (b)	Not in an MSA	22,851	4	104	109
Hinesville	Counties within MSAs < 1 million	29,478	5	135	140
Macon	Counties within MSAs < 1 million	91,113	17	417	433
Rome	Counties within MSAs < 1 million	39,831	7	182	189
Savannah	Counties within MSAs < 1 million	152,793	28	699	726
Valdosta	Counties within MSAs < 1 million	51,596	9	236	245
Warner Robins	Counties within MSAs < 1 million	71,164	13	325	338
All other areas (a)	Counties within MSAs > 1 million and heavy rail	2,143,587	389	2,105	2,494
All other areas (b)	Counties within MSAs < 1 million	124,329	23	122	145
All other areas (c)	Not in an MSA	664,501	121	653	773
TOTAL		3,959,849	719	8,000	8,719

NOTE: The total sample column indicates the expected number of completed household surveys.

*The Columbus MPO contains two counties from Alabama. The National sample allocation total for this MPO includes only Georgia county estimates. The Add-on allocation total for this MPO includes the AL county estimates and the GA county estimates, but the surveys are only being collected in the GA counties.

3.5 Indian Nations Council of Governments Study Area

The target number of completed household surveys is 1,000 for the Indian Nations Council of Governments Add-on area, covering portions of five counties in Oklahoma including Creek, Osage, Rogers, Tulsa, and Wagoner. Shape files were provided by the study area for the exact area to be covered. These files were mapped to Census block boundaries, covering or partially covering a total of 21,803 blocks. Seven blocks were dropped due to the block's area within the MPO boundary being less than 1 percent. One additional block was dropped due to less than 60 percent of its area being contained within the designated area. The sample of 1,000 will be distributed as follows to households in the 21,795 Census blocks within the five county areas as follows:

- Creek County: 12 percent
- Osage County: 10 percent
- Rogers County: 16 percent

- Tulsa County: 50 percent
- Wagoner County: 12 percent

Table 3-7 shows the allocation of the National sample for INCOG for the five included counties and the rest of Oklahoma, the allocation for the INCOG MPO Add-on sample, and the total sample allocation.

Table 3-7. Indian Nations Council of Governments (Oklahoma) national sample and add-on allocation

County	National sample stratum	ABS 12/14 occupied housing units	ABS 12/14 occupied HUs for included Census blocks	National sample allocation	Add-on allocation	TOTAL sample
Creek	Counties within MSAs < 1 million	26,570	15,732	5	120	125
Osage	Counties within MSAs < 1 million	17,148	9,291	3	100	103
Rogers	Counties within MSAs < 1 million	34,038	23,012	6	160	166
Tulsa	Counties within MSAs < 1 million	278,896	278,896	51	500	551
Wagoner	Counties within MSAs < 1 million	28,858	20,581	5	120	125
Rest of Oklahoma	Counties within MSAs > 1 million	557,801		101	0	101
Rest of Oklahoma	Counties within MSAs < 1 million	108,617		20	0	20
Rest of Oklahoma	Not in an MSA	527,427		96	0	96
TOTAL		1,579,355		287	1,000	1,287

NOTE: The total sample column indicates the expected number of completed household surveys.

3.6 Iowa Northland Regional Council of Governments Study Area

The target number of completed household surveys is 1,200 for the Iowa Northland Regional Council of Governments Add-on area, covering a portion of Black Hawk County. Shape files were provided by the INRCOG for the exact Black Hawk MPO area to be covered. These files were mapped to Census block boundaries, covering or partially covering a total of 3,724 blocks. Thirty-six blocks were dropped due to less than 60 percent of their area being contained within the designated MPO. The sample of 1,200 will be distributed proportional to the size of the places designated by the Add-on area in the remaining 3,688 blocks. Table 3-8 shows the allocation of the National sample for INRCOG for the Add-on places and the rest of Iowa, the allocation for the INRCOG Add-on sample, and the total sample allocation.

Table 3-8. Iowa Northland Regional Council of Governments national sample and add-on allocation

Place	National sample stratum	ABS 12/14 occupied housing units	National sample allocation	Add-on allocation	TOTAL sample
Cedar Falls	Counties within MSAs < 1 million	16,144	3	370	373
Elk Run Heights	Counties within MSAs < 1 million	449	0	10	10
Evansdale	Counties within MSAs < 1 million	2,107	0	48	49
Gilbertville	Counties within MSAs < 1 million	410	0	9	9
Hudson	Counties within MSAs < 1 million	562	0	13	13
Raymond	Counties within MSAs < 1 million	150	0	3	3
Waterloo	Counties within MSAs < 1 million	31,105	6	712	719
Rest of Black Hawk in MPO	Counties within MSAs < 1 million	1,463	0	34	34
Rest of Black Hawk not in MPO	Counties within MSAs < 1 million	4,032	1	0	1
Rest of Iowa	Counties within MSAs < 1 million	684,061	137	0	137
Rest of Iowa	Not in an MSA	512,126	102	0	102
TOTAL		1,252,609	250	1,200	1,450

NOTE: The total sample column indicates the expected number of completed household surveys.

3.7 Maryland DOT Study Area

The target number of completed household surveys is 1,000 for the Maryland Add-on area, with representation for the entire state. Households will be selected from each of three substrata: Central MD, Eastern Shore, and Western MD. Twenty percent of the sample will be allocated to the Western MD and Central MD substrata, and the remaining 60 percent will be allocated to the Eastern Shore substratum. The three substrata have been split where necessary to maintain the four main MSA/heavy rail sampling strata that will be used for the National Sample. (Note: Maryland does not contain any counties with more than 1 million people and no heavy rail.)

Table 3-9 shows the definitions of the Maryland Add-on substrata and the corresponding National sample strata. Also shown are the allocation for the National sample within the main MSA/heavy rail sampling strata, the allocation for the Add-on substrata, and the total sample allocation.

Table 3-9 Maryland national sample and add-on allocation

Substrata defined by MD Add-on	National sample stratum	ABS 12/14 occupied housing units	National sample allocation	Add-on allocation	TOTAL sample
Central MD (a)	Counties within MSAs > 1 million and heavy rail	2,007,631	365	196	561
Central MD (b)	Counties within MSAs < 1 million	38,790	7	4	11
Eastern Shore (a)	Counties within MSAs > 1 million and heavy rail	59,376	11	181	192
Eastern Shore (b)	Counties within MSAs < 1 million	86,016	16	262	278
Eastern Shore (c)	Not in an MSA	51,623	9	157	166
Western MD (a)	Counties within MSAs < 1 million	92,930	17	176	193
Western MD (b)	Not in an MSA	12,867	2	24	26
TOTAL		2,349,233	427	1,000	1,427

NOTE: The total sample column indicates the expected number of completed household surveys.

3.8 New York State DOT Study Area

The target number of completed household surveys is 15,851 for the New York Add-on area, with representation for the entire state. The four main MSA/heavy rail strata will be used to allocate the sample, proportionally to the number of households in each stratum for the National sample, and as specified by the New York DOT for the Add-on area. The allocation for the National sample, the Add-on area allocation, and the total sample allocation are given in table 3-10.[3]

Table 3-10 New York national sample and add-on allocation

County	National sample stratum	ABS 12/14 occupied housing units	National sample allocation	Add-on allocation	TOTAL sample
Bronx County	Counties within MSAs > 1 million and heavy rail	499,129	90	279	369
Dutchess County	Counties within MSAs > 1 million and heavy rail	112,161	20	800	820
Kings County	Counties within MSAs > 1 million and heavy rail	996,134	181	165	346
Nassau County	Counties within MSAs > 1 million and heavy rail	457,911	83	363	446
New York County	Counties within MSAs > 1 million and heavy rail	877,262	159	269	428

[3] The original table in this document incorrectly reflected a total add-on sample of 15,718 HH, which did not match the actual purchase of 15,851 HH as was correctly indicated in the text above. This table was updated by the editors to reflect the final distribution of the 15,851 HH purchased as documented by NYSDOT. Westat sampled using the outdated 15,718 distribution, which resulted in four counties being improperly sampled (Saratoga, Schenectady, St. Lawrence, and Seneca). The error was caused by multiple simultaneous factors and has been confirmed to only impact this portion of the sample.

County	National sample stratum	ABS 12/14 occupied housing units	National sample allocation	Add-on allocation	TOTAL sample
Orange County	Counties within MSAs > 1 million and heavy rail	135,030	25	767	792
Putnam County	Counties within MSAs > 1 million and heavy rail	36,046	7	733	740
Queens County	Counties within MSAs > 1 million and heavy rail	829,143	151	226	377
Richmond County	Counties within MSAs > 1 million and heavy rail	172,663	31	589	620
Rockland County	Counties within MSAs > 1 million and heavy rail	102,742	19	773	792
Suffolk County	Counties within MSAs > 1 million and heavy rail	529,440	96	355	451
Westchester County	Counties within MSAs > 1 million and heavy rail	365,069	66	381	447
Erie County	Counties within MSAs > 1 million	414,237	75	468	543
Livingston County	Counties within MSAs > 1 million	25,167	5	56	61
Monroe County	Counties within MSAs > 1 million	328,367	60	418	478
Niagara County	Counties within MSAs > 1 million	98,504	18	135	153
Ontario County	Counties within MSAs > 1 million	47,729	9	82	91
Orleans County	Counties within MSAs > 1 million	16,415	3	53	56
Wayne County	Counties within MSAs > 1 million	38,561	7	70	77
Yates County	Counties within MSAs > 1 million	10,485	2	25	27
Albany County	Counties within MSAs < 1 million	134,372	24	416	440
Broome County	Counties within MSAs < 1 million	86,523	16	504	520
Chemung County	Counties within MSAs < 1 million	37,647	6	750	756
Herkimer County	Counties within MSAs < 1 million	26,016	5	168	173
Jefferson County	Counties within MSAs < 1 million	47,457	9	473	482
Madison County	Counties within MSAs < 1 million	27,116	5	80	85

County	National sample stratum	ABS 12/14 occupied housing units	National sample allocation	Add-on allocation	TOTAL sample
Oneida County	Counties within MSAs < 1 million	95,936	17	567	584
Onondaga County	Counties within MSAs < 1 million	203,411	37	737	774
Oswego County	Counties within MSAs < 1 million	48,093	9	142	151
Rensselaer County	Counties within MSAs < 1 million	67,449	12	213	225
Saratoga County	Counties within MSAs < 1 million	67,373	18	745	763
Schenectady County	Counties within MSAs < 1 million	11,233	12	215	227
Schoharie County	Counties within MSAs < 1 million	8,078	2	35	37
Tioga County	Counties within MSAs < 1 million	20,589	4	138	142
Tompkins County	Counties within MSAs < 1 million	42,499	8	779	787
Ulster County	Counties within MSAs < 1 million	73,272	13	762	775
Warren County	Counties within MSAs < 1 million	29,128	5	268	273
Washington County	Counties within MSAs < 1 million	25,040	5	205	210
Allegany County	Not in an MSA	18,415	3	68	71
Cattaraugus County	Not in an MSA	35,232	6	108	114
Cayuga County	Not in an MSA	30,743	6	110	116
Chautauqua County	Not in an MSA	60,456	11	172	183
Chenango County	Not in an MSA	19,279	4	50	54
Clinton County	Not in an MSA	31,250	6	92	98
Columbia County	Not in an MSA	25,624	5	65	70
Cortland County	Not in an MSA	18,507	4	61	65
Delaware County	Not in an MSA	20,149	4	49	53
Essex County	Not in an MSA	15,008	3	38	41
Franklin County	Not in an MSA	19,586	4	56	60
Fulton County	Not in an MSA	23,679	4	63	67
Genesee County	Not in an MSA	23,599	4	55	59
Greene County	Not in an MSA	18,808	3	62	65

Table 3-10 New York national sample and add-on allocation (Cont.)

County	National sample stratum	ABS 12/14 occupied housing units	National sample allocation	Add-on allocation	TOTAL sample
Hamilton County	Not in an MSA	1,087	0	8	8
Lewis County	Not in an MSA	9,108	2	42	44
Montgomery County	Not in an MSA	20,998	4	35	39
Otsego County	Not in an MSA	22,116	4	94	98
Schuyler County	Not in an MSA	14,090	1	24	25
Seneca County	Not in an MSA	44,274	3	25	28
St. Lawrence County	Not in an MSA	96,401	8	141	149
Steuben County	Not in an MSA	42,009	8	121	129
Sullivan County	Not in an MSA	29,046	5	76	81
Wyoming County	Not in an MSA	15,563	3	32	35
TOTAL		7,798,454	1,417	15,851	17,268

NOTE: The total sample column indicates the expected number of completed household surveys.

3.9 North Carolina DOT Study Area

The target number of completed household surveys is 8,000 for the North Carolina Add-on area, with representation for the entire state. Households will be selected from each of 18 substrata. The NC DOT originally specified ten substrata, some of which had to be split to account for the hard boundaries of the four primary sampling strata. These splits are designated by (a), (b), or (c), following the original substratum description, resulting in a total of 18 substrata. The Triangle (c), Triad, and both Central Non-MPO (a) and (b) substrata all contain block-level portions of several counties. The other substrata contain full counties. The allocation for the National sample, the Add-on area allocation, and the total sample allocation are given in table 3-11.

Table 3-11 North Carolina national sample and add-on allocation

Substrata defined by NC Add-on	National sample stratum	ABS 12/14 occupied housing units	National sample allocation	Add-on allocation	TOTAL sample
1: Triangle (a)	Counties within MSAs > 1 million	489,808	89	336	425
1: Triangle (b)	Counties within MSAs < 1 million	231,517	42	159	201
1: Triangle (c)	Not in an MSA	6,615	1	5	6
2: Triad	Counties within MSAs < 1 million	541,666	98	500	598
3: Metrolina (a)	Counties within MSAs > 1 million	818,072	149	461	610
3: Metrolina (b)	Not in an MSA	68,668	12	39	51
4: MPO Group 1	Counties within MSAs < 1 million	266,000	48	1,200	1,248
5: MPO Group 2	Counties within MSAs < 1 million	274,318	62	700	762
6: MPO Group 3	Counties within MSAs < 1 million	203,866	3	900	903

Table 3-11 North Carolina national sample and add-on allocation (Cont.)

Substrata defined by NC Add-on	National sample stratum	ABS 12/14 occupied housing units	National sample allocation	Add-on allocation	TOTAL sample
7: Eastern Non-MPO (a)	Counties within MSAs > 1 million	14,500	5	51	56
7: Eastern Non-MPO (b)	Counties within MSAs < 1 million	30,660	7	108	115
7: Eastern Non-MPO (c)	Not in an MSA	310,294	61	1,091	1,153
8: Central Non-MPO (a)	Counties within MSAs < 1 million	127,274	18	411	429
8: Central Non-MPO (b)	Not in an MSA	259,835	45	839	884
9: Western Non-MPO (a)	Counties within MSAs < 1 million	29,380	4	52	56
9: Western Non-MPO (b)	Not in an MSA	240,724	74	848	921
10: FBRMPO (a)	Counties within MSAs < 1 million	202,833	28	288	316
10: FBRMPO (b)	Not in an MSA	14,555	3	12	14
TOTAL		4,130,585	750	8,000	8,750

NOTE: The total sample column indicates the expected number of completed household surveys.

3.10 South Carolina DOT Study Area

The target number of completed household surveys is 6,500 for the South Carolina Add-on area, covering substrata defined by rural and non-rural components of several Councils of Government (COGs) and MPOs. Sample sizes within each area were specifically defined by the Add-on area. Shape files were provided by the SCDOT for the exact areas to be covered. These files were mapped to Census block boundaries, such that the entire state was partitioned into the requested substrata. Some of the substrata had to be split further to account for the hard boundaries of the four primary sampling strata. These splits are designated by (a) or (b), following the original substratum description, resulting in a total of 31 substrata. The allocation for the National sample, the Add-on area allocation, and the total sample allocation are given in table 3-12.

Table 3-12 South Carolina national sample and add-on allocation

Substrata defined by SC Add-on: MPOs	National sample stratum	ABS 12/14 occupied housing units	National sample allocation	Add-on allocation	TOTAL sample
1: ACOG Rural (a)	Counties within MSAs < 1 million	32,882	6	79	85
1: ACOG Rural (b)	Not in an MSA	58,017	11	139	150
2: ACOG MPO	Counties within MSAs < 1 million	341,526	62	72	134

Table 3-12 South Carolina national sample and add-on allocation (Cont.)

Substrata defined by SC Add-on: MPOs	National sample stratum	ABS 12/14 occupied housing units	National sample allocation	Add-on allocation	TOTAL sample
3: ANATS	Counties within MSAs < 1 million	81,632	15	500	515
4: BCDCOG	Counties within MSAs < 1 million	27,156	5	200	205
5: CHATS	Counties within MSAs < 1 million	275,797	50	1,000	1,050
6: CRCP Rural (a)	Counties within MSAs > 1 million	54,857	10	158	168
6: CRCP Rural (b)	Counties within MSAs < 1 million	12,682	2	37	39
7: CRCP MPO	Counties within MSAs > 1 million	90,170	16	65	81
8: CMRCP (a)	Counties within MSAs < 1 million	23,428	4	118	122
8: CMRCP (b)	Not in an MSA	16,510	3	83	86
9: COATS (a)	Counties within MSAs < 1 million	287,801	52	1,200	1,252
9: COATS (b)	Not in an MSA	68	0	0	0
10: LCOG Rural (a)	Counties within MSAs < 1 million	11,820	2	75	77
10: LCOG Rural (b)	Not in an MSA	22,914	4	146	150
11: LCOG MPO	Counties within MSAs < 1 million	79,705	14	39	53
12: LSCOG (a)	Counties within MSAs < 1 million	5,388	1	18	19
12: LSCOG (b)	Not in an MSA	54,242	10	182	192
13: PDRCOG (a)	Counties within MSAs < 1 million	31,583	6	84	90
13: PDRCOG (b)	Not in an MSA	54,495	10	145	155
14: FLATS	Counties within MSAs < 1 million	52,785	10	470	480
15: SLCOG Rural (a)	Counties within MSAs < 1 million	14,183	3	45	48
15: SLCOG Rural (b)	Not in an MSA	20,929	4	65	69
16: SLCOG MPO	Counties within MSAs < 1 million	38,577	7	120	127
17: USCOG (a)	Counties within MSAs < 1 million	35,009	6	90	96
17: USCOG (b)	Not in an MSA	42,877	8	110	118
18: WRPDC Rural (a)	Counties within MSAs < 1 million	22,689	4	30	34
18: WRPDC Rural (b)	Not in an MSA	21,765	4	30	34

Table 3-12 South Carolina national sample and add-on allocation (Cont.)

Substrata defined by SC Add-on: MPOs	National sample stratum	ABS 12/14 occupied housing units	National sample allocation	Add-on allocation	TOTAL sample
19: WRPDC MPO (a)	Counties within MSAs < 1 million	131,036	24	174	198
19: WRPDC MPO (b)	Not in an MSA	19,862	4	26	30
20: ARTS	Counties within MSAs < 1 million	81,964	15	1,000	1,015
TOTAL		2,044,349	371	6,500	6,871

NOTE: The total sample column indicates the expected number of completed household surveys.

3.11 Wisconsin DOT Study Area

The target number of completed household surveys is 11,000 for the Wisconsin Add-on area, with representation for the entire state. Households will be selected from each of 16 substrata. The Wisconsin DOT originally specified nine substrata, some of which had to be split to account for the hard boundaries of the four primary sampling strata. These splits are designated by (a), (b), (c), or (d) following the original substratum description, resulting in a total of 16 substrata. The allocations for the National sample, the final substrata, and the total sample are given in table 3-13.

Table 3-13 Wisconsin national sample and add-on allocation

Substrata defined by WI Add-on	National sample stratum	ABS 12/14 occupied housing units	National sample allocation	Add-on allocation	TOTAL sample
St. Croix County	Counties within MSAs > 1 million and not heavy rail	33,574	6	150	156
Eau Claire MPO	Counties within MSAs < 1 million	67,891	12	304	316
Wausau, Stevens Point, and Wisconsin Rapids (a)	Counties within MSAs < 1 million	57,050	10	255	266
Wausau, Stevens Point, and Wisconsin Rapids (b)	Not in an MSA	64,382	12	288	300
Northeast Region (a)	Counties within MSAs < 1 million	395,350	72	1,769	1,841
Northeast Region (b)	Not in an MSA	91,517	17	410	426
Dane County	Counties within MSAs < 1 million	226,080	41	1,012	1,053
La Crosse County	Counties within MSAs < 1 million	50,414	9	226	235
Rock County	Counties within MSAs < 1 million	67,682	12	303	315
Southeast Region (a)	Counties within MSAs > 1 million and heavy rail	68,557	12	307	319

Substrata defined by WI Add-on	National sample stratum	ABS 12/14 occupied housing units	National sample allocation	Add-on allocation	TOTAL sample
Southeast Region (b)	Counties within MSAs > 1 million and not heavy rail	672,728	122	3,011	3,133
Southeast Region (c)	Counties within MSAs < 1 million	82,462	15	369	384
Southeast Region (d)	Not in an MSA	45,504	8	204	212
All other areas (a)	Counties within MSAs > 1 million and not heavy rail	15,289	3	68	71
All other areas (b)	Counties within MSAs < 1 million	67,829	12	304	316
All other areas(c)	Not in an MSA	451,467	82	2,021	2,103
TOTAL		2,457,776	447	11,000	11,447

NOTE: The total sample column indicates the expected number of completed household surveys.

3.12 Texas DOT and North Central Texas Council of Governments Study Areas

The target number of completed household surveys is 20,000 for the Texas DOT Add-on area, with representation for the entire state. Households will be selected from all Texas counties proportional to the number of households in each county.

The target number of completed household surveys is 2,917 for the North Central Texas Council of Governments Add-on area, with representation for twelve counties in the state: Collin, Dallas, Denton, Ellis, Hood, Hunt, Johnson, Kaufman, Parker, Rockwall, Tarrant, and Wise counties. Households will be selected from these Texas counties proportional to the number of households in each county. The allocations for the National sample, the Texas DOT sample, the NCTCOG sample, and the total sample are given in table 3-14.

Table 3-14 Texas national sample, Texas DOT add-on allocation, and NCTCOG add-on allocation

Place	National sample stratum	ABS 12/14 occupied housing units	National sample allocation	TXDOT Add-on allocation	NCTCOG Add-on allocation	TOTAL sample
Collin	Counties within MSAs > 1 million and not heavy rail	325,795	59	648	365	1,072
Dallas	Counties within MSAs > 1 million and not heavy rail	954,979	173	1,899	1,069	3,142
Denton	Counties within MSAs > 1 million and not heavy rail	277,877	50	553	311	914
Ellis	Counties within MSAs > 1 million and not heavy rail	55,197	10	110	62	182
Hood	Counties within MSAs > 1 million and not heavy rail	23,949	4	48	27	79

Hunt	Counties within MSAs > 1 million and not heavy rail	34,869	6	69	39	115
Johnson	Counties within MSAs > 1 million and not heavy rail	56,789	10	113	64	187
Kaufman	Counties within MSAs > 1 million and not heavy rail	39,692	7	79	44	131
Parker	Counties within MSAs > 1 million and not heavy rail	47,414	9	94	53	156
Rockwall	Counties within MSAs > 1 million and not heavy rail	30,932	6	62	35	102
Tarrant	Counties within MSAs > 1 million and not heavy rail	736,253	134	1,464	824	2,422
Wise	Counties within MSAs > 1 million and not heavy rail	21,518	4	43	24	71
Rest of Texas	Counties within MSAs > 1 million and not heavy rail	4,044,041	735	8,041	0	8,776
Rest of Texas	Counties within MSAs < 1 million	2,297,085	417	4,568	0	4,985
Rest of Texas	Not in an MSA	1,111,630	202	2,210	0	2,412
TOTAL		10,058,020	1,827	20,000	2,917	24,744

NOTE: The total sample column indicates the expected number of completed household surveys.

4. Weighting, Estimation, and Variance Estimation

Estimates will be generated at the National level and for each specified Add-on area separately. In general, the estimation procedure consists of taking appropriately weighted totals or averages of the sample data. These weights are designed to provide approximately unbiased estimators at the National level, the state level, and for each Add-on area. Several stages of non-response adjustment and poststratification will be done to reduce sampling error and bias. Separate sets of weights will be generated for the Add-on areas and for the National sample. The primary set of household weights is for completed households. Households are defined as completed when a retrieval survey is completed for all eligible persons age 5 and older in the household. Vehicle-level weights, person-level weights and travel-day trip-level weights will also be produced. The household-level weights are designed to represent all households in the study area. The vehicle-level weights are designed to represent all vehicles in the study area. The person-level weights are designed to represent all persons in the study area. The travel-day trip-level weights are designed to represent all trips in the designated time period in the study area.

An overview of the weighting methodology is given in the following sections. Additional details will be provided in the final weighting plan to be prepared at the conclusion of the study.

4.1 Initial Household Weight

Since addresses will be sampled simultaneously (i.e., in a single selection) for the National study and the Add-on areas, the base weight for all sampled addresses is simply the reciprocal of the probability of selection of each address. Weighting each sample unit by its base weight results in the traditional Horvitz-Thompson estimator, which is unbiased across all possible samples (see for example Cochran, 1977, Section 9A.7). The sampling rate for the address sample may vary considerably across strata[4].

4.2 Adjustments for Non-response

Non-response unfortunately is a major and continuously growing problem with every survey. Extensive work will be done to analyze non-response, and the potential for bias, and build in adjustments based on this analysis. Part of this analysis will be a non-response analysis similar to that done for NHTS 2009. This analysis will be commenced before the end of the study based on three quarters of data, and then revised with the final results. This will allow us to have the analysis completed in time to inform our non-response adjustment process.

The non-response adjustments are based on a paradigm generally used in survey research (see for example Oh and Scheuren, 1983). Under this paradigm, non-response is treated as a subsampling process within carefully specified non-response-adjustment cells. The non-response-adjustment cells are specified to be heterogeneous in response propensity (the probability of responding) across cells, and homogeneous in response propensity within cells, and the variables considered in forming the cells are variables associated with key survey outcomes. The non-response bias analysis to be conducted will inform this cell selection process by finding characteristics which are related to response propensity (propensity to be successfully contacted, propensity to cooperate at the recruitment level, propensity to cooperate at the retrieval interview level). The final non-response adjustments are equal to the inverse of the base-weighted response rates within the selected non-response cells.

For each of the two phases of non-response, the final selection of non-response cells will utilize a categorical search algorithm. The algorithm efficiently captures the complex interaction of factors associated with response propensity. These non-response cells will nest within the primary strata utilized in sample selection. The cells will not be smaller than 30 sample units, as

[4] It should be noted that this sampling rate is the 'final' sampling rate, including any reserve samples finally included with the original sample.

cells with limited numbers of sample units generate unreliable (highly variable) non-response adjustments. In addition, cells with very low weighted response rates will be collapsed with other cells to avoid extreme weighting adjustments which can increase variability to a greater extent.

Non-response adjustment will be done separately for non-response to the recruitment phase (recruitment non-response) and the retrieval phase (retrieval survey non-response among recruited households). In particular, the final non-response adjustments for recruitment non-response will include an adjustment reflecting estimated percentages of eligible addresses (i.e., addresses corresponding to households) among those with unknown eligibility status[5].

The variables considered in forming the cells for recruitment non-response include those available from the American Community Survey (ACS) at the tract level and data available from the ABS frame. The following are examples of variables that may be included in the weighting process:

- Type of location (central city, urban fringe, towns, rural)
- Whether or not a telephone number could be matched to the address;
- Tract-level percent Black, White, Hispanic, Asian;
- Tract-level median household income;
- Tract-level median years of education;
- Tract-level percent owner occupied housing;
- Tract-level percent college graduates;
- Tract-level percent in age groups (25-34, 35-64, 65 and over);

For the retrieval phase non-response-adjustment cells, we can also include information from the recruitment questionnaire, such as household size, race/ethnicity, age, gender, and level of education of the reference person, home ownership, location, home type, and number of vehicles in household.

4.3 Non-response Bias Analysis

Non-response may bias survey estimates if the characteristics of respondents differ from those of non-respondents. Traditionally, the size of the bias has been viewed as a deterministic function of the extent and size of the response difference and the response rate (see, for example, Sarndal& Lundström, 2005, for discussion). More recently, the emphasis has shifted toward a stochastic perspective that characterizes non-response bias by examining the relationship between the key variable and the response propensity (Groves et al., 2007; Montaquila et al., 2007). Adjustments to the survey weights (discussed in section 4.2) aim to reduce bias due to

[5] This needs to be estimated as we do not know whether postmaster returned mail is coming from eligible households or not, and can only estimate a percentage of eligibility for these outcomes.

non-response. However, even with such adjustments, it is important to have a plan to evaluate the potential for non-response bias.

A variety of methods are available to assess non-response bias. Previous research has suggested that each of these methods has strengths and weaknesses, thus a multi-method approach is recommended for a comprehensive evaluation of non-response bias. With respect to non-response, the largest concern for the NHTS is non-response in the recruitment phase. The recruitment phase is the phase that historically has yielded the bulk of the non-response, and that is expected to be the case for the 2016 survey as well, even with the shift to a mail-based ABS approach. The ABS approach affords the opportunity to link in covariates at both aggregate (e.g., tract-level characteristics from the American Community Survey) and address-level, for use in non-response adjustment and in bias analyses.

The recruitment survey will contain several variables (e.g., number of household members) that may be associated with non-response to the retrieval phase and are associated with key survey outcome variables. Having this rich set of variables will be very useful for non-response adjustment and non-response bias analysis at the retrieval phase. Our non-response bias analysis will incorporate techniques from a variety of approaches to study non-response at both the recruitment and retrieval phases.

4.4 Adjustments for Under- and Overcoverage

Nationally, ABS frames have been estimated to yield very high coverage (estimated at around 97-98 percent) when the survey mode(s) permit the inclusion of virtually all types of mailable household addresses, as is the case with mail as the primary mode for recruitment in the 2016 NHTS. The potential for undercoverage on the ABS frame lies mostly with housing units that cannot be associated with a mailable address. However, for sub-National estimates (e.g., estimates for Add-on areas), under- or over-coverage may occur due to households being linked to the wrong areas, either due to geocoding error or due to having a P.O. Box address located in an area that is different from their area of residence. It is possible to adjust for under- or overccoverage through a poststratification weighting process called "raking," where the weights are iteratively adjusted to independent control totals[6] for various demographic categories. The process has the effect of differentially adjusting the weights of the sampled households within groups of demographically similar households, so that the total sum of weights for the sampled households equals the corresponding independent control totals for all households (including those not covered by the ABS sample).

The raking process has a number of "dimensions." The weights are adjusted to equal the totals within the cells for each dimension in an iterative process, until the process converges, and every

[6] The independent control totals for households and persons will come from the most recent American Community Survey.

dimension's cell totals equal the independent control totals[7]. The dimensions at the household weighting level will include geography, race/ethnic percentages, household size, and household ownership (renter or owner). The dimensions for person-level weighting will also include sex, age categories, and personal race/ethnicity.

Raking to socioeconomic Census control totals is standard practice for large-scale surveys. This survey in particular also includes dimensions such as day of the week and month of the year. Each day of the week will be one level, and pairs of months of the year (Jan-Feb, Mar-Apr, etc.) will be levels. This helps ensure that each day is represented at its correct traffic level and each pair of months is represented at its correct traffic level, so that for example weekends or the winter are not over or under represented in the estimator. These control totals will be applied to the travel-day weights.

The raking procedure will be done for the National sample (either "stand-alone" or combined with the Add-on samples), and will also be done for each Add-on area separately. The procedure for each Add-on will be done entirely within the particular Add-on area to avoid altering the weights to satisfy a constraint across areas. The raking procedure for each Add-on area will have fewer dimensions and levels than the National sample as the samples in the Add-on areas are smaller than the full National sample plus the Add-on areas.

4.5 Variance Estimation

Variance estimation will be done by the generation of jackknife replicate weights (see, for example, Wolter, 2007, Section 4 for a general discussion of the jackknife method). For each jackknife replicate in each primary stratum a portion of the sample is deleted, with the remaining sample in the stratum reweighted[8], to generate a replicate estimate of the characteristic of interest. The squared differences between the replicate estimates and the full-sample estimates provide a consistent estimator of the variance[9]. For the Add-on studies, the jackknife strata will generally be the same as the sampling strata. There should be enough jackknife replicates to estimate variance reliably (with enough precision), but not so many that the data set acquires too many fields. Usually 100 jackknife replicates is a good balance. The "portion of the sample" deleted will roughly correspond to 10 interviewed households, or roughly 35 sampled households. For example, an Add-on stratum with a target of 600 interviewed households will roughly have 60 replicate weights. Of course, samples of size larger than 1,000 interviewed households will require more than 100 replicate weights by this criterion, but our maximum for

[7] In some cases, the process may not converge if there are 'irreconcilable contradictions' between adjusting for the various dimensions. This may happen if the cross-cells across dimension levels have too small a sample size. If convergence does not occur, then levels will be collapsed within dimensions, or dimensions could be dropped all together.

[8] By increasing the weights by a factor $n_s/(n_s-1)$, where n_s is the number of replicates for the stratum.

[9] The sum of squares needs to be multiplied by the factor $(n_s-1)/n_s$

operational reasons is 100. In this case we will combine sample portions so that the final replicate count is no larger than 100[10]. If the optimal replicate set is less than 100, then 100 replicate weights will be produced so that all of the delivery files have the same number of replicate weights (the extra replicate weights in this case will all be equal to the final weight, contributing zero sums of squares).

References

Barron, M., Barron, M., Kelly, J., Montgomery, R., Singleton, J., Shin, H. C., Skalland, B., Tao, X., and Wolter, K. (2013). More on the extent of undercoverage in RDD telephone surveys due to the omission of 0- banks. *Survey Practice*, *3*(2).

Barron, M. and Zhao, Z. (2010). Measuring undercoverage of landline telephone population in 1+ 100 bank surveys. Presented at the 65th Annual Conference of the American Association for Public Opinion Research.

Blumberg SJ, and Luke JV. Wireless substitution: Early release of estimates from the National Health Interview Survey, July-December 2009. National Center for Health Statistics. May 2010. Available from: /nchs/nhis.htm.

Boyle, J., Bucuvalas, M., Piekarski, L., and Weiss, A. (2009). Zero banks: Coverage error and bias in RDD samples based on hundred banks with listed numbers. *Public Opinion Quarterly, 73(4),* 729-750.

Cochran, William G. *Sampling techniques*. John Wiley & Sons, 1977.

Fahimi, M., Kulp, D., and Brick, J.M. (2009). A reassessment of list-assisted RDD methodology. *Public Opinion Quarterly, 73(4),* 751- 760.

Groves, R. M., Couper, M. P., Presser, S., Singer, E., Tourangeau, R., Acosta, G. P., and Nelson, L. (2006). Experiments in producing non-response bias. *Public Opinion Quarterly*, 70(5), 720-736.

Iannacchione, Vincent G. The changing role of address-based sampling in survey research. *Public Opinion Quarterly* 75.3 (2011): 556-575.

Montaquila, J. M., Brick, J. M., Hagedorn, M. C., Kennedy, C., and Keeter, S. (2007). Aspects of non-response bias in RDD telephone surveys. In *Advances in telephone survey methodology* (pp. 561-586). NJ: Wiley & Sons.

[10] The combinations introduce unwanted cross-product terms (with expected value 0), which introduce no bias but do reduce the precision of the variance estimator.

Oh, H. Lock, and Frederick J. Scheuren. Weighting adjustment for unit nonresponse. *Incomplete data in sample surveys* 2 (1983): 143-184.

Särndal, C. E., and Lundström, S. (2005). *Estimation in surveys with non-response*. John Wiley & Sons.

Shook-Sa, B. E., Currivan, D. B., McMichael, J. P., and Iannacchione, V. G. (2013). Extending the Coverage of Address-Based Sampling Frames Beyond the USPS Computerized Delivery Sequence File. *Public opinion quarterly*, *77*(4), 994-1005.

Wolter, Kirk. *Introduction to variance estimation*. Springer Science & Business Media, 2007.

Appendix A

Table 1. Key statistics involved in computing ratios of expected standard errors of NHTS 20162016 estimates to standard errors of NHTS 2009 estimates, for key estimates (national and by state)[1]

National	Sample size 2009	Estimate 2009*	s.e. 2009*	Sample size 20162016	Exp s.e. 20162016*	Ratio: se(20162016)/se(2009)
Household Vehides	150,154	210,778	465	129,112	501	1.08
Household VMT	741,173	2,245,112	28,306	637,308	30,525	
Person Miles of Travel	1,148,656	3,732,791	71,269	987,688	76,858	
Daily Person Trips Per Person	308,901	3.79	0.02	265,613	0.02	
Daily PMT Per Person	308,901	36.13	0.69	265,613	0.75	
Daily Vehide Trips Per Driver	249,882	3.02	0.02	214,865	0.02	
Daily VMT Per Driver	249,882	28.97	0.36	214,865	0.39	
Daily Person Trips Per Household	150,147	9.50	0.05	129,106	0.06	
Daily PMT Per Household	150,147	90.42	1.82	129,106	1.96	
Daily Vehide Trips Per Household	150,147	5.66	0.03	129,106	0.04	
Daily VMT Per Household	150,147	54.38	0.74	129,106	0.80	
Average person trip length (miles) Per Trip	1,148,656	9.75	0.18	987,688	0.20	
Average vehide trip length (miles) Per Trip	741,173	9.72	0.11	637,308	0.12	

Table 1. Key statistics involved in computing ratios of expected standard errors of NHTS 20162016 estimates to standard errors of NHTS 2009 estimates, for key estimates (national and by state)[1] (Cont.)

AK	Sample size 2009	Estimate 2009	s.e. 2009	Sample size 2016	Exp s.e. 2016	Ratio: se(2016)/se(2009)
Household Vehides	253	515	23	250	23	1.01
Household VMT	1,375	3,475	495	1,359	498	
Person Miles of Travel	2,295	13,755	4,768	2,268	4,796	
Daily Person Trips Per Person	563	1,502.77	53.93	556	54.25	
Daily PMT Per Person	563	21,534.16	7,449.09	556	7,493.65	
Daily Vehide Trips Per Driver	445	1,104.56	63.77	440	64.15	
Daily VMT Per Driver	445	7,014.04	855.67	440	860.79	
Daily Person Trips Per Household	253	4,038.74	216.52	250	217.82	
Daily PMT Per Household	253	57,873.70	21,408.60	250	21,536.67	
Daily Vehide Trips Per Household	253	2,302.75	127.68	250	128.44	
Daily VMT Per Household	253	14,622.67	1,636.77	250	1,646.56	
Average person trip length (miles) Per Trip	2,295	14.51	4.85	2,268	4.88	
Average vehide trip length (miles) Per Trip	1,375	6.41	0.69	1,359	0.70	

Table 1. Key statistics involved in computing ratios of expected standard errors of NHTS 2016 estimates to standard errors of NHTS 2009 estimates, for key estimates (national and by state)[1] (Cont.)

AL	Sample size 2009	Estimate 2009	s.e. 2009	Sample size 2016	Exp s.e. 2016	Ratio: se(2016)/se(2009)
Household Vehides	425	3,760	182	381	192	1.06
Household VMT	2,137	43,073	4,467	1,916	4,718	
Person Miles of Travel	3,001	62,783	10,387	2,690	10,971	
Daily Person Trips Per Person	829	1,249.55	60.70	743	64.11	
Daily PMT Per Person	829	14,402.40	2,382.87	743	2,516.71	
Daily Vehide Trips Per Driver	708	1,026.37	60.03	635	63.40	
Daily VMT Per Driver	708	12,250.04	1,366.67	635	1,443.43	
Daily Person Trips Per Household	425	2,996.75	178.57	381	188.60	
Daily PMT Per Household	425	34,540.74	6,173.64	381	6,520.39	
Daily Vehide Trips Per Household	425	1,985.43	98.23	381	103.75	
Daily VMT Per Household	425	23,696.69	2,615.73	381	2,762.64	
Average person trip length (miles) Per Trip	3,001	11.65	1.65	2,690	1.75	
Average vehide trip length (miles) Per Trip	2,137	12.03	0.87	1,916	0.92	

Table 1. Key statistics involved in computing ratios of expected standard errors of NHTS 2016 estimates to standard errors of NHTS 2009 estimates, for key estimates (national and by state)[1] (Cont.)

AR	Sample size 2009	Estimate 2009	s.e. 2009	Sample size 2016	Exp s.e. 2016	Ratio: se(2016)/se(2009)
Household Vehides	258	2,067	148	250	151	1.02
Household VMT	1,341	19,995	1,977	1,299	2,008	
Person Miles of Travel	2,071	36,818	3,975	2,007	4,038	
Daily Person Trips Per Person	531	1,417.82	67.88	515	68.96	
Daily PMT Per Person	531	13,798.84	1,497.45	515	1,521.22	
Daily Vehide Trips Per Driver	443	1,139.75	80.08	429	81.35	
Daily VMT Per Driver	443	10,577.82	1,008.97	429	1,024.99	
Daily Person Trips Per Household	258	3,395.79	267.07	250	271.31	
Daily PMT Per Household	258	33,049.18	4,208.11	250	4,274.91	
Daily Vehide Trips Per Household	258	1,933.85	142.05	250	144.30	
Daily VMT Per Household	258	17,947.73	1,931.21	250	1,961.87	
Average person trip length (miles) Per Trip	2,071	10.00	0.95	2,007	0.97	
Average vehide trip length (miles) Per Trip	1,341	9.46	0.86	1,299	0.88	

Table 1. Key statistics involved in computing ratios of expected standard errors of NHTS 2016 estimates to standard errors of NHTS 2009 estimates, for key estimates (national and by state)[1] (Cont.)

AZ	Sample size 2009	Estimate 2009	s.e. 2009	Sample size 2016	Exp s.e. 2016	Ratio: se(2016)/se(2009)
Household Vehides	7,157	3,999	46	2,935	71	1.56
Household VMT	35,477	49,266	6,038	14,549	9,428	
Person Miles of Travel	55,997	79,575	6,151	22,964	9,604	
Daily Person Trips Per Person	14,667	1,425.70	63.20	6,015	98.69	
Daily PMT Per Person	14,667	13,297.28	1,027.78	6,015	1,604.95	
Daily Vehide Trips Per Driver	11,887	1,140.22	43.88	4,875	68.52	
Daily VMT Per Driver	11,887	11,118.89	1,300.64	4,875	2,031.04	
Daily Person Trips Per Household	7,157	3,752.13	211.87	2,935	330.85	
Daily PMT Per Household	7,157	34,995.63	2,895.66	2,935	4,521.78	
Daily Vehide Trips Per Household	7,157	2,221.85	115.40	2,935	180.21	
Daily VMT Per Household	7,157	21,666.46	2,498.57	2,935	3,901.69	
Average person trip length (miles) Per Trip	55,997	9.53	0.94	22,964	1.46	
Average vehide trip length (miles) Per Trip	35,477	9.86	1.25	14,549	1.95	

Table 1. Key statistics involved in computing ratios of expected standard errors of NHTS 2016 estimates to standard errors of NHTS 2009 estimates, for key estimates (national and by state)[1] (Cont.)

CA	Sample size 2009	Estimate 2009	s.e. 2009	Sample size 2016	Exp s.e. 2016	Ratio: se(2016)/se(2009)
Household Vehides	21,225	23,069	52	26,420	46	0.90
Household VMT	103,845	230,190	3,302	129,262	2,960	
Person Miles of Travel	168,233	395,892	7,401	209,409	6,634	
Daily Person Trips Per Person	44,957	1,376.73	8.27	55,961	7.41	
Daily PMT Per Person	44,957	11,626.09	217.35	55,961	194.81	
Daily Vehide Trips Per Driver	35,390	1,064.89	7.88	44,052	7.06	
Daily VMT Per Driver	35,390	9,358.20	132.37	44,052	118.64	
Daily Person Trips Per Household	21,225	3,849.98	28.33	26,420	25.39	
Daily PMT Per Household	21,225	32,512.08	615.32	26,420	551.52	
Daily Vehide Trips Per Household	21,225	2,151.14	17.63	26,420	15.80	
Daily VMT Per Household	21,225	18,904.08	273.44	26,420	245.09	
Average person trip length (miles) Per Trip	168,233	8.76	0.16	209,409	0.14	
Average vehide trip length (miles) Per Trip	103,845	8.96	0.13	129,262	0.11	

Table 1. Key statistics involved in computing ratios of expected standard errors of NHTS 2016 estimates to standard errors of NHTS 2009 estimates, for key estimates (national and by state)[1] (Cont.)

CO	Sample size 2009	Estimate 2009	s.e. 2009	Sample size 2016	Exp s.e. 2016	Ratio: se(2016)/se(2009)
Household Vehides	306	4,106	222	382	199	0.90
Household VMT	1,710	39,170	4,283	2,135	3,833	
Person Miles of Travel	2,627	62,647	5,245	3,279	4,694	
Daily Person Trips Per Person	620	1,514.83	93.40	774	83.59	
Daily PMT Per Person	620	13,681.87	1,145.30	774	1,025.06	
Daily Vehide Trips Per Driver	521	1,201.34	75.23	650	67.33	
Daily VMT Per Driver	521	10,705.69	1,147.51	650	1,027.04	
Daily Person Trips Per Household	306	3,655.18	281.06	382	251.55	
Daily PMT Per Household	306	33,013.47	2,837.13	382	2,539.27	
Daily Vehide Trips Per Household	306	2,316.30	170.93	382	152.98	
Daily VMT Per Household	306	20,641.64	2,431.19	382	2,175.95	
Average person trip length (miles) Per Trip	2,627	9.05	0.86	3,279	0.77	
Average vehide trip length (miles) Per Trip	1,710	8.92	0.73	2,135	0.65	

Table 1. Key statistics involved in computing ratios of expected standard errors of NHTS 2016 estimates to standard errors of NHTS 2009 estimates, for key estimates (national and by state)[1] (Cont.)

CT	Sample size 2009	Estimate 2009	s.e. 2009	Sample size 2016	Exp s.e. 2016	Ratio: se(2016)/se(2009)
Household Vehides	275	2,406	25	265	26	1.02
Household VMT	1,440	30,855	3,503	1,388	3,569	
Person Miles of Travel	2,209	43,455	4,919	2,129	5,011	
Daily Person Trips Per Person	565	1,430.53	44.94	544	45.78	
Daily PMT Per Person	565	13,175.91	1,488.32	544	1,516.14	
Daily Vehide Trips Per Driver	449	1,189.62	58.72	433	59.82	
Daily VMT Per Driver	449	12,420.30	1,509.72	433	1,537.94	
Daily Person Trips Per Household	275	3,545.29	203.77	265	207.58	
Daily PMT Per Household	275	32,653.90	3,417.10	265	3,480.98	
Daily Vehide Trips Per Household	275	2,220.76	121.07	265	123.33	
Daily VMT Per Household	275	23,185.96	2,232.06	265	2,273.78	
Average person trip length (miles) Per Trip	2,209	9.44	1.08	2,129	1.10	
Average vehide trip length (miles) Per Trip	1,440	10.59	1.25	1,388	1.28	

Table 1. Key statistics involved in computing ratios of expected standard errors of NHTS 2016 estimates to standard errors of NHTS 2009 estimates, for key estimates (national and by state)[1] (Cont.)

DC	Sample size 2009	Estimate 2009	s.e. 2009	Sample size 2016	Exp s.e. 2016	Ratio: se(2016)/se(2009)
Household Vehides	264	214	7	250	7	1.03
Household VMT	729	1,399	217	690	223	
Person Miles of Travel	1,681	3,420	507	1,592	521	
Daily Person Trips Per Person	460	1,252.49	54.01	436	55.50	
Daily PMT Per Person	460	6,114.66	910.57	436	935.72	
Daily Vehide Trips Per Driver	346	560.07	70.88	328	72.84	
Daily VMT Per Driver	346	3,687.82	559.52	328	574.97	
Daily Person Trips Per Household	264	2,800.50	350.01	250	359.68	
Daily PMT Per Household	264	13,672.03	1,936.06	250	1,989.53	
Daily Vehide Trips Per Household	264	849.19	183.53	250	188.60	
Daily VMT Per Household	264	5,591.60	1,391.10	250	1,429.52	
Average person trip length (miles) Per Trip	1,681	5.29	0.73	1,592	0.75	
Average vehide trip length (miles) Per Trip	729	6.62	0.55	690	0.56	

Table 1. Key statistics involved in computing ratios of expected standard errors of NHTS 2016 estimates to standard errors of NHTS 2009 estimates, for key estimates (national and by state)[1] (Cont.)

DE	Sample size 2009	Estimate 2009	s.e. 2009	Sample size 2016	Exp s.e. 2016	Ratio: se(2016)/se(2009)
Household Vehides	245	593	8	250	8	0.99
Household VMT	1,285	7,317	895	1,311	886	
Person Miles of Travel	2,039	13,031	1,937	2,081	1,917	
Daily Person Trips Per Person	507	1,474.58	71.97	517	71.25	
Daily PMT Per Person	507	16,072.02	2,391.88	517	2,367.84	
Daily Vehide Trips Per Driver	417	1,117.96	54.74	426	54.19	
Daily VMT Per Driver	417	11,372.88	1,343.33	426	1,329.83	
Daily Person Trips Per Household	245	3,634.81	271.50	250	268.77	
Daily PMT Per Household	245	39,617.31	6,749.06	250	6,681.23	
Daily Vehide Trips Per Household	245	2,186.86	139.63	250	138.23	
Daily VMT Per Household	245	22,246.76	2,777.06	250	2,749.15	
Average person trip length (miles) Per Trip	2,039	10.98	1.58	2,081	1.56	
Average vehide trip length (miles) Per Trip	1,285	10.17	1.04	1,311	1.02	

Table 1. Key statistics involved in computing ratios of expected standard errors of NHTS 2016 estimates to standard errors of NHTS 2009 estimates, for key estimates (national and by state)[1] (Cont.)

FL	Sample size 2009	Estimate 2009	s.e. 2009	Sample size 2016	Exp s.e. 2016	Ratio: se(2016)/se(2009)
Household Vehides	15,884	11,848	26	1,598	82	3.15
Household VMT	72,956	127,391	2,382	7,340	7,509	
Person Miles of Travel	112,831	207,882	4,791	11,351	15,105	
Daily Person Trips Per Person	30,952	1,330.26	11.81	3,114	37.23	
Daily PMT Per Person	30,952	12,094.75	278.75	3,114	878.83	
Daily Vehide Trips Per Driver	25,758	1,075.08	10.96	2,591	34.55	
Daily VMT Per Driver	25,758	9,655.89	181.92	2,591	573.55	
Daily Person Trips Per Household	15,884	3,239.82	34.09	1,598	107.48	
Daily PMT Per Household	15,884	29,456.42	674.07	1,598	2,125.18	
Daily Vehide Trips Per Household	15,884	2,009.78	23.96	1,598	75.54	
Daily VMT Per Household	15,884	18,051.05	362.36	1,598	1,142.44	
Average person trip length (miles) Per Trip	112,831	9.34	0.22	11,351	0.69	
Average vehide trip length (miles) Per Trip	72,956	9.16	0.16	7,340	0.50	

Table 1. Key statistics involved in computing ratios of expected standard errors of NHTS 2016 estimates to standard errors of NHTS 2009 estimates, for key estimates (national and by state)[1] (Cont.)

GA	Sample size 2009	Estimate 2009	s.e. 2009	Sample size 2016	Exp s.e. 2016	Ratio: se(2016)/se(2009)
Household Vehides	7,502	6,874	29	8,719	27	0.93
Household VMT	36,011	81,574	2,645	41,853	2,454	
Person Miles of Travel	53,851	126,417	6,526	62,587	6,053	
Daily Person Trips Per Person	15,247	1,326.26	24.33	17,720	22.57	
Daily PMT Per Person	15,247	14,133.71	728.74	17,720	675.97	
Daily Vehide Trips Per Driver	12,385	1,105.50	17.18	14,394	15.94	
Daily VMT Per Driver	12,385	12,383.62	393.64	14,394	365.14	
Daily Person Trips Per Household	7,502	3,418.36	75.14	8,719	69.70	
Daily PMT Per Household	7,502	36,428.96	2,007.33	8,719	1,861.98	
Daily Vehide Trips Per Household	7,502	2,098.67	34.76	8,719	32.24	
Daily VMT Per Household	7,502	23,506.69	823.63	8,719	763.99	
Average person trip length (miles) Per Trip	53,851	10.96	0.52	62,587	0.49	
Average vehide trip length (miles) Per Trip	36,011	11.38	0.37	41,853	0.34	

Table 1. Key statistics involved in computing ratios of expected standard errors of NHTS 2016 estimates to standard errors of NHTS 2009 estimates, for key estimates (national and by state)[1] (Cont.)

HI	Sample size 2009	Estimate 2009	s.e. 2009	Sample size 2016	Exp s.e. 2016	Ratio: se(2016)/se(2009)
Household Vehides	254	771	34	250	34	1.01
Household VMT	1,177	5,649	476	1,158	480	
Person Miles of Travel	1,949	8,861	654	1,918	659	
Daily Person Trips Per Person	530	1,354.41	83.26	522	83.92	
Daily PMT Per Person	530	7,328.10	518.81	522	522.94	
Daily Vehide Trips Per Driver	418	1,044.59	76.38	411	76.99	
Daily VMT Per Driver	418	6,228.08	519.27	411	523.41	
Daily Person Trips Per Household	254	3,746.24	324.84	250	327.43	
Daily PMT Per Household	254	20,269.17	1,475.59	250	1,487.35	
Daily Vehide Trips Per Household	254	2,167.19	183.28	250	184.74	
Daily VMT Per Household	254	12,921.23	1,017.61	250	1,025.72	
Average person trip length (miles) Per Trip	1,949	5.48	0.39	1,918	0.39	
Average vehide trip length (miles) Per Trip	1,177	5.98	0.37	1,158	0.38	

Table 1. Key statistics involved in computing ratios of expected standard errors of NHTS 2016 estimates to standard errors of NHTS 2009 estimates, for key estimates (national and by state)[1] (Cont.)

IA	Sample size 2009	Estimate 2009	s.e. 2009	Sample size 2016	Exp s.e. 2016	Ratio: se(2016)/se(2009)
Household Vehides	3,752	2,818	33	2,650	40	1.19
Household VMT	20,122	21,188	1,256	14,212	1,495	
Person Miles of Travel	29,657	32,030	1,428	20,946	1,699	
Daily Person Trips Per Person	7,777	1,418.91	39.68	5,493	47.22	
Daily PMT Per Person	7,777	11,434.26	509.81	5,493	606.62	
Daily Vehide Trips Per Driver	6,445	1,109.42	36.38	4,552	43.29	
Daily VMT Per Driver	6,445	9,442.67	570.15	4,552	678.42	
Daily Person Trips Per Household	3,752	3,270.42	92.71	2,650	110.32	
Daily PMT Per Household	3,752	26,354.56	1,394.92	2,650	1,659.81	
Daily Vehide Trips Per Household	3,752	2,048.30	73.34	2,650	87.27	
Daily VMT Per Household	3,752	17,433.37	1,119.48	2,650	1,332.06	
Average person trip length (miles) Per Trip	29,657	8.12	0.35	20,946	0.42	
Average vehide trip length (miles) Per Trip	20,122	8.54	0.40	14,212	0.48	

Table 1. Key statistics involved in computing ratios of expected standard errors of NHTS 2016 estimates to standard errors of NHTS 2009 estimates, for key estimates (national and by state)[1] (Cont.)

ID	Sample size 2009	Estimate 2009	s.e. 2009	Sample size 2016	Exp s.e. 2016	Ratio: se(2016)/se(2009)
Household Vehides	259	1,376	58	250	59	1.02
Household VMT	1,390	12,140	2,175	1,342	2,214	
Person Miles of Travel	2,183	17,314	2,905	2,107	2,956	
Daily Person Trips Per Person	573	1,497.40	75.42	553	76.77	
Daily PMT Per Person	573	12,350.72	2,070.97	553	2,107.92	
Daily Vehide Trips Per Driver	467	1,149.41	65.21	451	66.37	
Daily VMT Per Driver	467	10,677.06	1,956.44	451	1,991.34	
Daily Person Trips Per Household	259	3,709.96	316.19	250	321.83	
Daily PMT Per Household	259	30,600.03	5,783.09	250	5,886.27	
Daily Vehide Trips Per Household	259	2,309.84	200.04	250	203.61	
Daily VMT Per Household	259	21,456.39	4,241.83	250	4,317.51	
Average person trip length (miles) Per Trip	2,183	8.30	1.33	2,107	1.35	
Average vehide trip length (miles) Per Trip	1,390	9.36	1.74	1,342	1.77	

Table 1. Key statistics involved in computing ratios of expected standard errors of NHTS 2016 estimates to standard errors of NHTS 2009 estimates, for key estimates (national and by state)[1] (Cont.)

IL	Sample size 2009	Estimate 2009	s.e. 2009	Sample size 2016	Exp s.e. 2016	Ratio: se(2016)/se(2009)
Household Vehides	809	8,498	80	941	74	0.93
Household VMT	4,258	81,395	3,731	4,953	3,459	
Person Miles of Travel	6,839	189,484	44,582	7,955	41,337	
Daily Person Trips Per Person	1,707	1,400.82	41.32	1,986	38.31	
Daily PMT Per Person	1,707	15,781.11	3,713.02	1,986	3,442.76	
Daily Vehide Trips Per Driver	1,342	1,121.15	43.22	1,561	40.07	
Daily VMT Per Driver	1,342	9,293.45	460.24	1,561	426.74	
Daily Person Trips Per Household	809	3,528.93	149.52	941	138.64	
Daily PMT Per Household	809	39,755.56	9,964.54	941	9,239.25	
Daily Vehide Trips Per Household	809	2,060.19	88.86	941	82.39	
Daily VMT Per Household	809	17,077.41	919.89	941	852.93	
Average person trip length (miles) Per Trip	6,839	11.38	2.59	7,955	2.40	
Average vehide trip length (miles) Per Trip	4,258	8.33	0.36	4,953	0.34	

Table 1. Key statistics involved in computing ratios of expected standard errors of NHTS 2016 estimates to standard errors of NHTS 2009 estimates, for key estimates (national and by state)[1] (Cont.)

IN	Sample size 2009	Estimate 2009	s.e. 2009	Sample size 2016	Exp s.e. 2016	Ratio: se(2016)/se(2009)
Household Vehides	3,458	4,857	21	1,502	32	1.52
Household VMT	17,822	45,988	1,290	7,741	1,958	
Person Miles of Travel	26,836	71,377	2,419	11,656	3,671	
Daily Person Trips Per Person	7,224	1,356.63	17.20	3,138	26.10	
Daily PMT Per Person	7,224	12,029.03	407.75	3,138	618.69	
Daily Vehide Trips Per Driver	5,921	1,127.45	17.86	2,572	27.10	
Daily VMT Per Driver	5,921	10,109.79	282.10	2,572	428.04	
Daily Person Trips Per Household	3,458	3,245.15	51.63	1,502	78.34	
Daily PMT Per Household	3,458	28,774.32	973.03	1,502	1,476.40	
Daily Vehide Trips Per Household	3,458	2,067.51	35.45	1,502	53.79	
Daily VMT Per Household	3,458	18,539.29	498.46	1,502	756.32	
Average person trip length (miles) Per Trip	26,836	9.00	0.29	11,656	0.44	
Average vehide trip length (miles) Per Trip	17,822	9.06	0.21	7,741	0.32	

Table 1. Key statistics involved in computing ratios of expected standard errors of NHTS 2016 estimates to standard errors of NHTS 2009 estimates, for key estimates (national and by state)[1] (Cont.)

KS	Sample size 2009	Estimate 2009	s.e. 2009	Sample size 2016	Exp s.e. 2016	Ratio: se(2016)/se(2009)
Household Vehides	263	2,514	56	250	58	1.03
Household VMT	1,497	25,535	2,960	1,423	3,036	
Person Miles of Travel	2,202	38,743	4,467	2,093	4,582	
Daily Person Trips Per Person	549	1,426.07	75.25	522	77.18	
Daily PMT Per Person	549	14,963.74	1,716.55	522	1,760.61	
Daily Vehide Trips Per Driver	457	1,170.81	92.31	434	94.68	
Daily VMT Per Driver	457	11,802.84	1,384.50	434	1,420.04	
Daily Person Trips Per Household	263	3,324.25	323.36	250	331.66	
Daily PMT Per Household	263	34,881.33	3,711.27	250	3,806.54	
Daily Vehide Trips Per Household	263	2,280.56	234.88	250	240.91	
Daily VMT Per Household	263	22,990.04	2,468.41	250	2,531.78	
Average person trip length (miles) Per Trip	2,202	10.64	1.19	2,093	1.22	
Average vehide trip length (miles) Per Trip	1,497	10.23	1.17	1,423	1.20	

Table 1. Key statistics involved in computing ratios of expected standard errors of NHTS 2016 estimates to standard errors of NHTS 2009 estimates, for key estimates (national and by state)[1] (Cont.)

KY	Sample size 2009	Estimate 2009	s.e. 2009	Sample size 2016	Exp s.e. 2016	Ratio: se(2016)/se(2009)
Household Vehides	271	3,232	130	335	117	0.90
Household VMT	1,274	34,066	3,275	1,575	2,946	
Person Miles of Travel	1,914	56,045	5,702	2,366	5,129	
Daily Person Trips Per Person	540	1,372.34	46.03	668	41.40	
Daily PMT Per Person	540	14,041.31	1,424.50	668	1,281.22	
Daily Vehide Trips Per Driver	436	1,124.72	57.88	539	52.06	
Daily VMT Per Driver	436	10,949.01	1,104.34	539	993.26	
Daily Person Trips Per Household	271	3,248.65	188.67	335	169.69	
Daily PMT Per Household	271	33,239.09	3,526.24	335	3,171.57	
Daily Vehide Trips Per Household	271	2,075.38	153.34	335	137.92	
Daily VMT Per Household	271	20,203.57	2,225.43	335	2,001.59	
Average person trip length (miles) Per Trip	1,914	10.41	1.03	2,366	0.93	
Average vehide trip length (miles) Per Trip	1,274	9.82	0.78	1,575	0.70	

Table 1. Key statistics involved in computing ratios of expected standard errors of NHTS 2016 estimates to standard errors of NHTS 2009 estimates, for key estimates (national and by state)[1] (Cont.)

LA	Sample size 2009	Estimate 2009	s.e. 2009	Sample size 2016	Exp s.e. 2016	Ratio: se(2016)/se(2009)
Household Vehides	292	2,955	128	351	117	0.91
Household VMT	1,530	34,620	4,430	1,839	4,041	
Person Miles of Travel	2,372	64,857	11,500	2,851	10,489	
Daily Person Trips Per Person	600	1,420.02	77.94	721	71.09	
Daily PMT Per Person	600	15,832.49	2,798.13	721	2,552.15	
Daily Vehide Trips Per Driver	487	1,196.83	106.91	585	97.51	
Daily VMT Per Driver	487	11,774.42	1,424.01	585	1,298.83	
Daily Person Trips Per Household	292	3,579.34	231.84	351	211.46	
Daily PMT Per Household	292	39,907.82	7,562.39	351	6,897.58	
Daily Vehide Trips Per Household	292	2,165.31	179.00	351	163.26	
Daily VMT Per Household	292	21,302.23	2,812.45	351	2,565.21	
Average person trip length (miles) Per Trip	2,372	11.26	1.83	2,851	1.67	
Average vehide trip length (miles) Per Trip	1,530	9.93	1.17	1,839	1.06	

Table 1. Key statistics involved in computing ratios of expected standard errors of NHTS 2016 estimates to standard errors of NHTS 2009 estimates, for key estimates (national and by state)[1] (Cont.)

MA	Sample size 2009	Estimate 2009	s.e. 2009	Sample size 2016	Exp s.e. 2016	Ratio: se(2016)/se(2009)
Household Vehides	412	4,069	52	504	47	0.90
Household VMT	2,068	51,672	3,875	2,530	3,504	
Person Miles of Travel	3,328	79,766	9,616	4,071	8,694	
Daily Person Trips Per Person	859	1,378.86	60.76	1,051	54.94	
Daily PMT Per Person	859	13,043.33	1,572.96	1,051	1,422.17	
Daily Vehide Trips Per Driver	691	1,037.66	49.03	845	44.33	
Daily VMT Per Driver	691	11,083.12	808.37	845	730.88	
Daily Person Trips Per Household	412	3,422.52	147.14	504	133.03	
Daily PMT Per Household	412	32,375.41	4,088.20	504	3,696.29	
Daily Vehide Trips Per Household	412	1,963.55	83.46	504	75.46	
Daily VMT Per Household	412	20,972.48	1,502.18	504	1,358.17	
Average person trip length (miles) Per Trip	3,328	9.61	1.39	4,071	1.26	
Average vehide trip length (miles) Per Trip	2,068	10.72	0.97	2,530	0.87	

Table 1. Key statistics involved in computing ratios of expected standard errors of NHTS 2016 estimates to standard errors of NHTS 2009 estimates, for key estimates (national and by state)[1] (Cont.)

MD	Sample size 2009	Estimate 2009	s.e. 2009	Sample size 2016	Exp s.e. 2016	Ratio: se(2016)/se(2009)
Household Vehides	355	3,729	33	1,427	17	0.50
Household VMT	1,672	48,427	2,948	6,721	1,470	
Person Miles of Travel	2,855	77,897	6,573	11,476	3,279	
Daily Person Trips Per Person	763	1,341.20	42.43	3,067	21.16	
Daily PMT Per Person	763	14,815.26	1,250.63	3,067	623.78	
Daily Vehide Trips Per Driver	607	994.06	22.61	2,440	11.28	
Daily VMT Per Driver	607	11,887.39	729.38	2,440	363.79	
Daily Person Trips Per Household	355	3,370.02	143.29	1,427	71.47	
Daily PMT Per Household	355	37,226.10	3,179.41	1,427	1,585.80	
Daily Vehide Trips Per Household	355	1,935.27	78.93	1,427	39.37	
Daily VMT Per Household	355	23,142.72	1,455.44	1,427	725.93	
Average person trip length (miles) Per Trip	2,855	11.34	0.89	11,476	0.44	
Average vehide trip length (miles) Per Trip	1,672	12.03	0.62	6,721	0.31	

Table 1. Key statistics involved in computing ratios of expected standard errors of NHTS 2016 estimates to standard errors of NHTS 2009 estimates, for key estimates (national and by state)[1] (Cont.)

ME	Sample size 2009	Estimate 2009	s.e. 2009	Sample size 2016	Exp s.e. 2016	Ratio: se(2016)/se(2009)
Household Vehides	277	1,005	15	250	16	1.05
Household VMT	1,449	11,057	739	1,308	778	
Person Miles of Travel	2,209	17,524	1,331	1,994	1,401	
Daily Person Trips Per Person	550	1,457.61	76.92	496	80.97	
Daily PMT Per Person	550	14,171.55	1,085.40	496	1,142.51	
Daily Vehide Trips Per Driver	460	1,171.61	59.29	415	62.41	
Daily VMT Per Driver	460	11,468.78	723.48	415	761.55	
Daily Person Trips Per Household	277	3,332.29	245.48	250	258.40	
Daily PMT Per Household	277	32,398.15	2,497.00	250	2,628.38	
Daily Vehide Trips Per Household	277	2,088.26	119.53	250	125.82	
Daily VMT Per Household	277	20,441.78	1,348.82	250	1,419.79	
Average person trip length (miles) Per Trip	2,209	9.88	0.88	1,994	0.92	
Average vehide trip length (miles) Per Trip	1,449	9.97	0.80	1,308	0.84	

Table 1. Key statistics involved in computing ratios of expected standard errors of NHTS 2016 estimates to standard errors of NHTS 2009 estimates, for key estimates (national and by state)[1] (Cont.)

MI	Sample size 2009	Estimate 2009	s.e. 2009	Sample size 2016	Exp s.e. 2016	Ratio: se(2016)/se(2009)
Household Vehides	643	6,970	57	775	52	0.91
Household VMT	3,569	79,196	4,686	4,302	4,268	
Person Miles of Travel	5,514	132,469	14,390	6,646	13,107	
Daily Person Trips Per Person	1,386	1,562.96	40.98	1,671	37.33	
Daily PMT Per Person	1,386	14,125.67	1,534.46	1,671	1,397.69	
Daily Vehide Trips Per Driver	1,119	1,254.62	40.79	1,349	37.15	
Daily VMT Per Driver	1,119	10,964.68	682.78	1,349	621.92	
Daily Person Trips Per Household	643	3,846.23	214.65	775	195.52	
Daily PMT Per Household	643	34,761.31	3,819.62	775	3,479.16	
Daily Vehide Trips Per Household	643	2,377.95	115.25	775	104.98	
Daily VMT Per Household	643	20,781.97	1,146.90	775	1,044.67	
Average person trip length (miles) Per Trip	5,514	9.10	1.00	6,646	0.91	
Average vehide trip length (miles) Per Trip	3,569	8.77	0.51	4,302	0.47	

Table 1. Key statistics involved in computing ratios of expected standard errors of NHTS 2016 estimates to standard errors of NHTS 2009 estimates, for key estimates (national and by state)[1] (Cont.)

MN	Sample size 2009	Estimate 2009	s.e. 2009	Sample size 2016	Exp s.e. 2016	Ratio: se(2016)/se(2009)
Household Vehides	340	4,154	121	402	111	0.92
Household VMT	1,737	36,036	3,361	2,054	3,091	
Person Miles of Travel	2,769	61,457	6,246	3,274	5,744	
Daily Person Trips Per Person	723	1,401.07	61.93	855	56.95	
Daily PMT Per Person	723	12,629.73	1,283.73	855	1,180.59	
Daily Vehide Trips Per Driver	586	1,105.91	58.09	693	53.42	
Daily VMT Per Driver	586	9,463.02	883.88	693	812.87	
Daily Person Trips Per Household	340	3,263.22	202.77	402	186.48	
Daily PMT Per Household	340	29,415.92	3,059.07	402	2,813.30	
Daily Vehide Trips Per Household	340	2,015.75	128.16	402	117.86	
Daily VMT Per Household	340	17,248.31	1,421.23	402	1,307.05	
Average person trip length (miles) Per Trip	2,769	9.07	0.88	3,274	0.81	
Average vehide trip length (miles) Per Trip	1,737	8.57	0.73	2,054	0.67	

Table 1. Key statistics involved in computing ratios of expected standard errors of NHTS 2016 estimates to standard errors of NHTS 2009 estimates, for key estimates (national and by state)[1] (Cont.)

MO	Sample size 2009	Estimate 2009	s.e. 2009	Sample size 2016	Exp s.e. 2016	Ratio: se(2016)/se(2009)
Household Vehides	389	4,608	152	468	138	0.91
Household VMT	2,102	58,304	10,413	2,529	9,494	
Person Miles of Travel	3,192	104,634	26,227	3,840	23,911	
Daily Person Trips Per Person	825	1,479.40	62.12	993	56.63	
Daily PMT Per Person	825	18,962.04	4,755.16	993	4,335.28	
Daily Vehide Trips Per Driver	672	1,255.00	58.60	808	53.43	
Daily VMT Per Driver	672	13,478.06	2,422.56	808	2,208.65	
Daily Person Trips Per Household	389	3,503.17	150.79	468	137.48	
Daily PMT Per Household	389	44,901.55	14,523.23	468	13,240.83	
Daily Vehide Trips Per Household	389	2,329.74	130.52	468	119.00	
Daily VMT Per Household	389	25,020.16	5,360.98	468	4,887.60	
Average person trip length (miles) Per Trip	3,192	12.92	3.12	3,840	2.84	
Average vehide trip length (miles) Per Trip	2,102	10.81	1.86	2,529	1.70	

Table 1. Key statistics involved in computing ratios of expected standard errors of NHTS 2016 estimates to standard errors of NHTS 2009 estimates, for key estimates (national and by state)[1] (Cont.)

MS	Sample size 2009	Estimate 2009	s.e. 2009	Sample size 2016	Exp s.e. 2016	Ratio: se(2016)/se(2009)
Household Vehides	257	2,317	122	250	124	1.01
Household VMT	1,214	29,499	4,808	1,181	4,875	
Person Miles of Travel	1,784	46,429	5,829	1,735	5,910	
Daily Person Trips Per Person	478	1,369.98	147.97	465	150.03	
Daily PMT Per Person	478	17,177.77	2,132.92	465	2,162.57	
Daily Vehide Trips Per Driver	414	1,034.26	92.78	403	94.07	
Daily VMT Per Driver	414	14,295.61	2,268.08	403	2,299.61	
Daily Person Trips Per Household	257	3,384.46	348.14	250	352.98	
Daily PMT Per Household	257	42,436.82	7,638.65	250	7,744.85	
Daily Vehide Trips Per Household	257	1,950.71	173.93	250	176.35	
Daily VMT Per Household	257	26,962.79	5,307.94	250	5,381.74	
Average person trip length (miles) Per Trip	1,784	12.90	1.78	1,735	1.80	
Average vehide trip length (miles) Per Trip	1,214	14.50	2.19	1,181	2.22	

Table 1. Key statistics involved in computing ratios of expected standard errors of NHTS 2016 estimates to standard errors of NHTS 2009 estimates, for key estimates (national and by state)[1] (Cont.)

MT	Sample size 2009	Estimate 2009	s.e. 2009	Sample size 2016	Exp s.e. 2016	Ratio: se(2016)/se(2009)
Household Vehides	256	946	59	250	59	1.01
Household VMT	1,368	10,875	2,543	1,336	2,573	
Person Miles of Travel	2,015	15,298	3,298	1,968	3,338	
Daily Person Trips Per Person	528	1,494.44	49.81	516	50.40	
Daily PMT Per Person	528	16,881.31	3,640.70	516	3,684.13	
Daily Vehide Trips Per Driver	447	1,198.26	67.70	437	68.51	
Daily VMT Per Driver	447	14,028.21	3,263.38	437	3,302.31	
Daily Person Trips Per Household	256	3,605.45	305.65	250	309.30	
Daily PMT Per Household	256	40,727.31	8,335.41	250	8,434.84	
Daily Vehide Trips Per Household	256	2,473.12	232.61	250	235.38	
Daily VMT Per Household	256	28,953.30	6,542.88	250	6,620.93	
Average person trip length (miles) Per Trip	2,015	11.47	2.52	1,968	2.55	
Average vehide trip length (miles) Per Trip	1,368	11.80	2.70	1,336	2.73	

Table 1. Key statistics involved in computing ratios of expected standard errors of NHTS 2016 estimates to standard errors of NHTS 2009 estimates, for key estimates (national and by state)[1] (Cont.)

NC	Sample size 2009	Estimate 2009	s.e. 2009	Sample size 2016	Exp s.e. 2016	Ratio: se(2016)/se(2009)
Household Vehides	11,096	7,026	22	8,750	25	1.13
Household VMT	55,383	75,059	2,537	43,674	2,857	
Person Miles of Travel	82,662	116,849	3,322	65,185	3,741	
Daily Person Trips Per Person	22,075	1,357.81	18.88	17,408	21.26	
Daily PMT Per Person	22,075	13,635.28	387.69	17,408	436.58	
Daily Vehide Trips Per Driver	18,265	1,123.62	16.71	14,403	18.82	
Daily VMT Per Driver	18,265	11,572.93	394.77	14,403	444.55	
Daily Person Trips Per Household	11,096	3,236.52	44.10	8,750	49.66	
Daily PMT Per Household	11,096	32,501.56	878.59	8,750	989.39	
Daily Vehide Trips Per Household	11,096	2,027.01	32.13	8,750	36.18	
Daily VMT Per Household	11,096	20,877.59	683.52	8,750	769.72	
Average person trip length (miles) Per Trip	82,662	10.33	0.24	65,185	0.27	
Average vehide trip length (miles) Per Trip	55,383	10.46	0.34	43,674	0.38	

Table 1. Key statistics involved in computing ratios of expected standard errors of NHTS 2016 estimates to standard errors of NHTS 2009 estimates, for key estimates (national and by state)[1] (Cont.)

ND	Sample size 2009	Estimate 2009	s.e. 2009	Sample size 2016	Exp s.e. 2016	Ratio: se(2016)/se(2009)
Household Vehides	256	692	46	250	47	1.01
Household VMT	1,416	4,021	464	1,383	469	
Person Miles of Travel	2,107	7,338	906	2,058	917	
Daily Person Trips Per Person	540	1,400.16	80.29	527	81.25	
Daily PMT Per Person	540	12,230.30	1,509.31	527	1,527.31	
Daily Vehide Trips Per Driver	452	1,065.86	66.08	441	66.87	
Daily VMT Per Driver	452	8,326.84	893.84	441	904.50	
Daily Person Trips Per Household	256	3,057.02	362.22	250	366.54	
Daily PMT Per Household	256	26,702.82	4,517.44	250	4,571.33	
Daily Vehide Trips Per Household	256	1,872.83	174.94	250	177.03	
Daily VMT Per Household	256	14,631.18	2,148.11	250	2,173.73	
Average person trip length (miles) Per Trip	2,107	8.94	1.01	2,058	1.02	
Average vehide trip length (miles) Per Trip	1,416	7.90	0.92	1,383	0.94	

Table 1. Key statistics involved in computing ratios of expected standard errors of NHTS 2016 estimates to standard errors of NHTS 2009 estimates, for key estimates (national and by state)[1] (Cont.)

NE	Sample size 2009	Estimate 2009	s.e. 2009	Sample size 2016	Exp s.e. 2016	Ratio: se(2016)/se(2009)
Household Vehides	1,289	1,642	50	250	115	2.27
Household VMT	7,308	15,710	1,092	1,417	2,480	
Person Miles of Travel	10,875	23,214	1,425	2,109	3,235	
Daily Person Trips Per Person	2,781	1,495.53	54.58	539	123.93	
Daily PMT Per Person	2,781	14,057.53	862.65	539	1,958.80	
Daily Vehide Trips Per Driver	2,221	1,270.10	50.56	431	114.81	
Daily VMT Per Driver	2,221	12,108.84	863.45	431	1,960.62	
Daily Person Trips Per Household	1,289	3,507.29	178.88	250	406.18	
Daily PMT Per Household	1,289	32,967.39	2,803.24	250	6,365.27	
Daily Vehide Trips Per Household	1,289	2,340.20	127.65	250	289.85	
Daily VMT Per Household	1,289	22,310.91	2,100.66	250	4,769.93	
Average person trip length (miles) Per Trip	10,875	9.61	0.55	2,109	1.25	
Average vehide trip length (miles) Per Trip	7,308	9.65	0.66	1,417	1.49	

Table 1. Key statistics involved in computing ratios of expected standard errors of NHTS 2016 estimates to standard errors of NHTS 2009 estimates, for key estimates (national and by state)[1] (Cont.)

NH	Sample size 2009	Estimate 2009	s.e. 2009	Sample size 2016	Exp s.e. 2016	Ratio: se(2016)/se(2009)
Household Vehides	254	990	16	250	16	1.01
Household VMT	1,361	11,801	1,428	1,340	1,440	
Person Miles of Travel	2,036	17,373	1,645	2,004	1,658	
Daily Person Trips Per Person	517	1,449.65	69.40	509	69.95	
Daily PMT Per Person	517	13,982.64	1,327.39	509	1,337.97	
Daily Vehide Trips Per Driver	439	1,150.85	67.27	432	67.81	
Daily VMT Per Driver	439	12,142.59	1,525.05	432	1,537.20	
Daily Person Trips Per Household	254	3,539.87	246.64	250	248.61	
Daily PMT Per Household	254	34,144.05	3,298.63	250	3,324.91	
Daily Vehide Trips Per Household	254	2,198.10	132.76	250	133.82	
Daily VMT Per Household	254	23,192.18	2,371.29	250	2,390.19	
Average person trip length (miles) Per Trip	2,036	9.93	0.83	2,004	0.84	
Average vehide trip length (miles) Per Trip	1,361	10.81	0.98	1,340	0.99	

Table 1. Key statistics involved in computing ratios of expected standard errors of NHTS 2016 estimates to standard errors of NHTS 2009 estimates, for key estimates (national and by state)[1] (Cont.)

NJ	Sample size 2009	Estimate 2009	s.e. 2009	Sample size 2016	Exp s.e. 2016	Ratio: se(2016)/se(2009)
Household Vehides	559	5,330	57	639	53	0.94
Household VMT	2,937	71,893	6,606	3,357	6,179	
Person Miles of Travel	4,612	118,622	12,342	5,272	11,544	
Daily Person Trips Per Person	1,190	1,403.63	57.75	1,360	54.01	
Daily PMT Per Person	1,190	14,599.76	1,519.00	1,360	1,420.74	
Daily Vehide Trips Per Driver	924	1,183.16	56.51	1,056	52.85	
Daily VMT Per Driver	924	12,686.02	1,356.15	1,056	1,268.42	
Daily Person Trips Per Household	559	3,615.80	156.18	639	146.08	
Daily PMT Per Household	559	37,609.54	4,465.37	639	4,176.50	
Daily Vehide Trips Per Household	559	2,125.88	115.20	639	107.75	
Daily VMT Per Household	559	22,794.09	2,524.10	639	2,360.82	
Average person trip length (miles) Per Trip	4,612	10.54	1.28	5,272	1.20	
Average vehide trip length (miles) Per Trip	2,937	10.78	1.29	3,357	1.21	

Table 1. Key statistics involved in computing ratios of expected standard errors of NHTS 2016 estimates to standard errors of NHTS 2009 estimates, for key estimates (national and by state)[1] (Cont.)

NM	Sample size 2009	Estimate 2009	s.e. 2009	Sample size 2016	Exp s.e. 2016	Ratio: se(2016)/se(2009)
Household Vehides	251	1,263	58	250	58	1.00
Household VMT	1,214	16,032	2,995	1,209	3,001	
Person Miles of Travel	1,808	25,238	3,835	1,801	3,843	
Daily Person Trips Per Person	482	1,465.68	125.01	480	125.26	
Daily PMT Per Person	482	13,738.11	2,088.78	480	2,092.95	
Daily Vehide Trips Per Driver	405	1,255.69	81.67	403	81.83	
Daily VMT Per Driver	405	12,399.82	2,214.47	403	2,218.89	
Daily Person Trips Per Household	251	3,630.47	433.33	250	434.20	
Daily PMT Per Household	251	34,029.11	5,374.90	250	5,385.64	
Daily Vehide Trips Per Household	251	2,188.99	267.79	250	268.33	
Daily VMT Per Household	251	21,616.09	4,256.00	250	4,264.50	
Average person trip length (miles) Per Trip	1,808	9.56	1.31	1,801	1.31	
Average vehide trip length (miles) Per Trip	1,214	10.01	1.78	1,209	1.78	

Table 1. Key statistics involved in computing ratios of expected standard errors of NHTS 2016 estimates to standard errors of NHTS 2009 estimates, for key estimates (national and by state)[1] (Cont.)

NV	Sample size 2009	Estimate 2009	s.e. 2009	Sample size 2016	Exp s.e. 2016	Ratio: se(2016)/se(2009)
Household Vehides	256	1,874	83	250	84	1.01
Household VMT	1,267	15,156	1,712	1,237	1,733	
Person Miles of Travel	1,946	23,792	2,530	1,900	2,560	
Daily Person Trips Per Person	537	1,236.99	97.90	524	99.07	
Daily PMT Per Person	537	9,903.42	1,053.51	524	1,066.08	
Daily Vehide Trips Per Driver	434	1,073.85	96.61	424	97.76	
Daily VMT Per Driver	434	8,953.28	1,028.79	424	1,041.06	
Daily Person Trips Per Household	256	3,117.90	268.32	250	271.52	
Daily PMT Per Household	256	24,962.12	2,568.18	250	2,598.82	
Daily Vehide Trips Per Household	256	1,907.12	158.24	250	160.13	
Daily VMT Per Household	256	15,900.80	1,724.32	250	1,744.89	
Average person trip length (miles) Per Trip	1,946	8.45	0.68	1,900	0.69	
Average vehide trip length (miles) Per Trip	1,267	8.44	0.70	1,237	0.70	

Table 1. Key statistics involved in computing ratios of expected standard errors of NHTS 2016 estimates to standard errors of NHTS 2009 estimates, for key estimates (national and by state)[1] (Cont.)

NY	Sample size 2009	Estimate 2009	s.e. 2009	Sample size 2016	Exp s.e. 2016	Ratio: se(2016)/se(2009)
Household Vehides	16,165	9,117	22	17,268	22	0.97
Household VMT	76,072	92,171	2,379	81,263	2,302	
Person Miles of Travel	123,053	171,875	5,378	131,449	5,203	
Daily Person Trips Per Person	33,435	1,328.14	13.84	35,716	13.39	
Daily PMT Per Person	33,435	9,401.42	294.16	35,716	284.61	
Daily Vehide Trips Per Driver	26,423	847.23	14.44	28,226	13.97	
Daily VMT Per Driver	26,423	7,179.59	190.72	28,226	184.53	
Daily Person Trips Per Household	16,165	3,401.88	42.92	17,268	41.53	
Daily PMT Per Household	16,165	24,080.60	725.67	17,268	702.11	
Daily Vehide Trips Per Household	16,165	1,523.88	26.50	17,268	25.64	
Daily VMT Per Household	16,165	12,913.68	344.28	17,268	333.10	
Average person trip length (miles) Per Trip	123,053	7.49	0.24	131,449	0.24	
Average vehide trip length (miles) Per Trip	76,072	8.62	0.24	81,263	0.23	

Table 1. Key statistics involved in computing ratios of expected standard errors of NHTS 2016 estimates to standard errors of NHTS 2009 estimates, for key estimates (national and by state)[1] (Cont.)

OH	Sample size 2009	Estimate 2009	s.e. 2009	Sample size 2016	Exp s.e. 2016	Ratio: se(2016)/se(2009)
Household Vehides	724	8,325	85	924	75	0.89
Household VMT	3,824	103,910	12,435	4,880	11,007	
Person Miles of Travel	5,862	154,823	15,810	7,481	13,995	
Daily Person Trips Per Person	1,523	1,420.68	48.91	1,944	43.29	
Daily PMT Per Person	1,523	14,412.37	1,471.72	1,944	1,302.74	
Daily Vehide Trips Per Driver	1,204	1,163.07	42.09	1,537	37.26	
Daily VMT Per Driver	1,204	12,701.37	1,493.54	1,537	1,322.06	
Daily Person Trips Per Household	724	3,384.76	158.24	924	140.07	
Daily PMT Per Household	724	34,337.28	3,547.59	924	3,140.27	
Daily Vehide Trips Per Household	724	2,110.29	82.74	924	73.24	
Daily VMT Per Household	724	23,045.54	2,712.16	924	2,400.76	
Average person trip length (miles) Per Trip	5,862	10.34	0.94	7,481	0.84	
Average vehide trip length (miles) Per Trip	3,824	11.00	1.21	4,880	1.07	

Table 1. Key statistics involved in computing ratios of expected standard errors of NHTS 2016 estimates to standard errors of NHTS 2009 estimates, for key estimates (national and by state)[1] (Cont.)

OK	Sample size 2009	Estimate 2009	s.e. 2009	Sample size 2016	Exp s.e. 2016	Ratio: se(2016)/se(2009)
Household Vehides	261	2,975	157	287	150	0.95
Household VMT	1,290	29,097	2,220	1,419	2,117	
Person Miles of Travel	1,951	52,234	6,521	2,145	6,218	
Daily Person Trips Per Person	525	1,389.63	91.33	577	87.09	
Daily PMT Per Person	525	15,524.95	1,932.80	577	1,843.17	
Daily Vehide Trips Per Driver	434	1,081.60	76.67	477	73.11	
Daily VMT Per Driver	434	10,884.89	955.27	477	910.97	
Daily Person Trips Per Household	261	3,320.86	320.67	287	305.80	
Daily PMT Per Household	261	37,100.66	4,401.01	287	4,196.93	
Daily Vehide Trips Per Household	261	2,053.58	205.55	287	196.02	
Daily VMT Per Household	261	20,666.64	1,716.64	287	1,637.04	
Average person trip length (miles) Per Trip	1,951	11.31	1.49	2,145	1.42	
Average vehide trip length (miles) Per Trip	1,290	10.09	0.98	1,419	0.93	

Table 1. Key statistics involved in computing ratios of expected standard errors of NHTS 2016 estimates to standard errors of NHTS 2009 estimates, for key estimates (national and by state)[1] (Cont.)

OR	Sample size 2009	Estimate 2009	s.e. 2009	Sample size 2016	Exp s.e. 2016	Ratio: se(2016)/se(2009)
Household Vehides	264	2,760	93	286	90	0.96
Household VMT	1,382	23,805	2,456	1,497	2,360	
Person Miles of Travel	2,425	40,761	4,442	2,627	4,267	
Daily Person Trips Per Person	572	1,588.00	65.24	620	62.68	
Daily PMT Per Person	572	11,497.70	1,253.33	620	1,204.16	
Daily Vehide Trips Per Driver	449	1,119.72	77.81	486	74.76	
Daily VMT Per Driver	449	8,462.46	876.95	486	842.55	
Daily Person Trips Per Household	264	3,818.44	271.35	286	260.70	
Daily PMT Per Household	264	27,646.80	3,360.45	286	3,228.62	
Daily Vehide Trips Per Household	264	2,136.41	178.41	286	171.41	
Daily VMT Per Household	264	16,146.23	2,009.57	286	1,930.73	
Average person trip length (miles) Per Trip	2,425	7.32	0.76	2,627	0.73	
Average vehide trip length (miles) Per Trip	1,382	7.59	0.67	1,497	0.65	

Table 1. Key statistics involved in computing ratios of expected standard errors of NHTS 2016 estimates to standard errors of NHTS 2009 estimates, for key estimates (national and by state)[1] (Cont.)

PA	Sample size 2009	Estimate 2009	s.e. 2009	Sample size 2016	Exp s.e. 2016	Ratio: se(2016)/se(2009)
Household Vehides	804	8,632	138	986	124	0.90
Household VMT	4,111	92,224	5,885	5,042	5,315	
Person Miles of Travel	6,235	145,994	10,647	7,646	9,615	
Daily Person Trips Per Person	1,655	1,395.81	38.44	2,030	34.71	
Daily PMT Per Person	1,655	12,466.19	909.13	2,030	820.95	
Daily Vehide Trips Per Driver	1,351	1,118.89	44.62	1,657	40.29	
Daily VMT Per Driver	1,351	10,583.06	639.88	1,657	577.81	
Daily Person Trips Per Household	804	3,332.94	111.36	986	100.56	
Daily PMT Per Household	804	29,767.03	2,257.08	986	2,038.15	
Daily Vehide Trips Per Household	804	1,988.02	67.65	986	61.09	
Daily VMT Per Household	804	18,803.81	1,169.90	986	1,056.42	
Average person trip length (miles) Per Trip	6,235	9.13	0.65	7,646	0.59	
Average vehide trip length (miles) Per Trip	4,111	9.57	0.59	5,042	0.53	

Table 1. Key statistics involved in computing ratios of expected standard errors of NHTS 2016 estimates to standard errors of NHTS 2009 estimates, for key estimates (national and by state)[1] (Cont.)

RI	Sample size 2009	Estimate 2009	s.e. 2009	Sample size 2016	Exp s.e. 2016	Ratio: se(2016)/se(2009)
Household Vehides	256	701	23	250	23	1.01
Household VMT	1,253	6,587	532	1,224	538	
Person Miles of Travel	1,958	11,670	1,343	1,912	1,359	
Daily Person Trips Per Person	527	1,341.93	62.44	515	63.18	
Daily PMT Per Person	527	11,826.63	1,339.86	515	1,355.84	
Daily Vehide Trips Per Driver	426	1,057.11	63.40	416	64.16	
Daily VMT Per Driver	426	8,690.25	575.15	416	582.01	
Daily Person Trips Per Household	256	3,317.94	242.39	250	245.28	
Daily PMT Per Household	256	29,241.59	3,405.35	250	3,445.97	
Daily Vehide Trips Per Household	256	2,007.58	136.85	250	138.48	
Daily VMT Per Household	256	16,503.86	1,339.84	250	1,355.82	
Average person trip length (miles) Per Trip	1,958	9.12	1.01	1,912	1.02	
Average vehide trip length (miles) Per Trip	1,253	8.44	0.69	1,224	0.70	

Table 1. Key statistics involved in computing ratios of expected standard errors of NHTS 2016 estimates to standard errors of NHTS 2009 estimates, for key estimates (national and by state)[1] (Cont.)

SC	Sample size 2009	Estimate 2009	s.e. 2009	Sample size 2016	Exp s.e. 2016	Ratio: se(2016)/se(2009)
Household Vehides	5,209	3,198	12	6,871	11	0.87
Household VMT	26,283	37,131	1,020	34,669	888	
Person Miles of Travel	39,368	56,248	1,461	51,929	1,272	
Daily Person Trips Per Person	10,391	1,376.58	19.68	13,706	17.14	
Daily PMT Per Person	10,391	13,462.90	349.81	13,706	304.58	
Daily Vehide Trips Per Driver	8,652	1,147.87	19.62	11,413	17.08	
Daily VMT Per Driver	8,652	11,673.68	321.45	11,413	279.89	
Daily Person Trips Per Household	5,209	3,382.30	60.56	6,871	52.73	
Daily PMT Per Household	5,209	33,078.85	928.44	6,871	808.39	
Daily Vehide Trips Per Household	5,209	2,147.14	40.54	6,871	35.30	
Daily VMT Per Household	5,209	21,836.14	650.92	6,871	566.75	
Average person trip length (miles) Per Trip	39,368	9.96	0.28	51,929	0.24	
Average vehide trip length (miles) Per Trip	26,283	10.27	0.29	34,669	0.26	

Table 1. Key statistics involved in computing ratios of expected standard errors of NHTS 2016 estimates to standard errors of NHTS 2009 estimates, for key estimates (national and by state)[1] (Cont.)

SD	Sample size 2009	Estimate 2009	s.e. 2009	Sample size 2016	Exp s.e. 2016	Ratio: se(2016)/se(2009)
Household Vehides	1,798	848	46	250	124	2.68
Household VMT	9,821	6,403	744	1,366	1,997	
Person Miles of Travel	15,011	9,644	1,032	2,087	2,766	
Daily Person Trips Per Person	3,803	1,439.48	67.00	529	179.68	
Daily PMT Per Person	3,803	12,933.62	1,383.49	529	3,710.23	
Daily Vehide Trips Per Driver	3,098	1,126.60	49.41	431	132.51	
Daily VMT Per Driver	3,098	10,617.86	1,188.33	431	3,186.85	
Daily Person Trips Per Household	1,798	3,354.90	161.73	250	433.73	
Daily PMT Per Household	1,798	30,143.44	3,764.09	250	10,094.50	
Daily Vehide Trips Per Household	1,798	2,123.53	107.64	250	288.67	
Daily VMT Per Household	1,798	20,012.94	2,422.92	250	6,497.76	
Average person trip length (miles) Per Trip	15,011	9.09	0.81	2,087	2.18	
Average vehide trip length (miles) Per Trip	9,821	9.51	0.94	1,366	2.53	

Table 1. Key statistics involved in computing ratios of expected standard errors of NHTS 2016 estimates to standard errors of NHTS 2009 estimates, for key estimates (national and by state)[1] (Cont.)

TN	Sample size 2009	Estimate 2009	s.e. 2009	Sample size 2016	Exp s.e. 2016	Ratio: se(2016)/se(2009)
Household Vehides	2,552	4,902	31	503	70	2.25
Household VMT	12,242	53,808	2,193	2,413	4,940	
Person Miles of Travel	18,142	79,709	3,183	3,576	7,170	
Daily Person Trips Per Person	5,131	1,325.78	25.34	1,011	57.08	
Daily PMT Per Person	5,131	13,746.28	548.98	1,011	1,236.55	
Daily Vehide Trips Per Driver	4,224	1,130.79	21.08	833	47.48	
Daily VMT Per Driver	4,224	12,027.37	481.99	833	1,085.66	
Daily Person Trips Per Household	2,552	3,157.55	71.58	503	161.23	
Daily PMT Per Household	2,552	32,738.79	1,357.57	503	3,057.87	
Daily Vehide Trips Per Household	2,552	2,077.87	43.70	503	98.43	
Daily VMT Per Household	2,552	22,100.68	910.37	503	2,050.57	
Average person trip length (miles) Per Trip	18,142	10.57	0.40	3,576	0.89	
Average vehide trip length (miles) Per Trip	12,242	10.76	0.41	2,413	0.91	

Table 1. Key statistics involved in computing ratios of expected standard errors of NHTS 2016 estimates to standard errors of NHTS 2009 estimates, for key estimates (national and by state)[1] (Cont.)

TX	Sample size 2009	Estimate 2009	s.e. 2009	Sample size 2016	Exp s.e. 2016	Ratio: se(2016)/se(2009)
Household Vehides	22,255	15,797	28	24,742	26	0.95
Household VMT	112,037	180,704	3,219	124,557	3,053	
Person Miles of Travel	171,481	290,866	5,303	190,644	5,029	
Daily Person Trips Per Person	46,423	1,358.79	9.09	51,611	8.62	
Daily PMT Per Person	46,423	13,043.53	237.80	51,611	225.53	
Daily Vehide Trips Per Driver	37,068	1,130.82	8.80	41,210	8.35	
Daily VMT Per Driver	37,068	11,131.60	197.38	41,210	187.20	
Daily Person Trips Per Household	22,255	3,597.67	29.98	24,742	28.43	
Daily PMT Per Household	22,255	34,535.48	665.81	24,742	631.46	
Daily Vehide Trips Per Household	22,255	2,179.64	17.67	24,742	16.76	
Daily VMT Per Household	22,255	21,455.57	412.36	24,742	391.09	
Average person trip length (miles) Per Trip	171,481	9.96	0.19	190,644	0.18	
Average vehide trip length (miles) Per Trip	112,037	10.06	0.19	124,557	0.18	

Table 1. Key statistics involved in computing ratios of expected standard errors of NHTS 2016 estimates to standard errors of NHTS 2009 estimates, for key estimates (national and by state)[1] (Cont.)

UT	Sample size 2009	Estimate 2009	s.e. 2009	Sample size 2016	Exp s.e. 2016	Ratio: se(2016)/se(2009)
Household Vehides	261	1,869	117	250	120	1.02
Household VMT	1,491	17,280	1,585	1,428	1,619	
Person Miles of Travel	2,765	39,270	12,302	2,648	12,570	
Daily Person Trips Per Person	689	1,507.43	62.30	660	63.66	
Daily PMT Per Person	689	15,912.45	4,985.16	660	5,093.65	
Daily Vehide Trips Per Driver	482	1,223.71	57.41	462	58.66	
Daily VMT Per Driver	482	9,717.20	838.46	462	856.71	
Daily Person Trips Per Household	261	4,355.66	388.64	250	397.10	
Daily PMT Per Household	261	45,978.52	13,016.68	250	13,299.96	
Daily Vehide Trips Per Household	261	2,549.31	223.97	250	228.84	
Daily VMT Per Household	261	20,231.79	1,691.00	250	1,727.80	
Average person trip length (miles) Per Trip	2,765	10.62	3.38	2,648	3.45	
Average vehide trip length (miles) Per Trip	1,491	7.96	0.70	1,428	0.72	

Table 1. Key statistics involved in computing ratios of expected standard errors of NHTS 2016 estimates to standard errors of NHTS 2009 estimates, for key estimates (national and by state)[1] (Cont.)

VA	Sample size 2009	Estimate 2009	s.e. 2009	Sample size 2016	Exp s.e. 2016	Ratio: se(2016)/se(2009)
Household Vehides	15,231	6,173	21	597	109	5.05
Household VMT	76,238	60,092	1,021	2,988	5,156	
Person Miles of Travel	116,078	96,706	2,242	4,550	11,323	
Daily Person Trips Per Person	31,592	1,346.20	13.99	1,238	70.66	
Daily PMT Per Person	31,592	13,345.38	309.36	1,238	1,562.58	
Daily Vehide Trips Per Driver	25,848	1,070.45	13.67	1,013	69.05	
Daily VMT Per Driver	25,848	10,669.68	183.73	1,013	928.02	
Daily Person Trips Per Household	15,231	3,294.46	44.72	597	225.88	
Daily PMT Per Household	15,231	32,659.07	812.49	597	4,103.88	
Daily Vehide Trips Per Household	15,231	2,036.03	29.32	597	148.10	
Daily VMT Per Household	15,231	20,294.06	388.76	597	1,963.63	
Average person trip length (miles) Per Trip	116,078	10.09	0.24	4,550	1.21	
Average vehide trip length (miles) Per Trip	76,238	10.06	0.18	2,988	0.92	

Table 1. Key statistics involved in computing ratios of expected standard errors of NHTS 2016 estimates to standard errors of NHTS 2009 estimates, for key estimates (national and by state)[1] (Cont.)

VT	Sample size 2009	Estimate 2009	s.e. 2009	Sample size 2016	Exp s.e. 2016	Ratio: se(2016)/se(2009)
Household Vehides	1,690	472	3	250	9	2.60
Household VMT	8,346	4,986	183	1,235	477	
Person Miles of Travel	13,005	8,008	417	1,924	1,084	
Daily Person Trips Per Person	3,434	1,368.63	27.96	508	72.70	
Daily PMT Per Person	3,434	13,604.36	708.31	508	1,841.61	
Daily Vehide Trips Per Driver	2,842	1,069.67	24.58	420	63.91	
Daily VMT Per Driver	2,842	10,491.50	388.58	420	1,010.31	
Daily Person Trips Per Household	1,690	3,222.66	79.08	250	205.61	
Daily PMT Per Household	1,690	32,033.80	1,626.31	250	4,228.41	
Daily Vehide Trips Per Household	1,690	2,033.67	53.80	250	139.88	
Daily VMT Per Household	1,690	19,946.61	768.47	250	1,998.02	
Average person trip length (miles) Per Trip	13,005	10.02	0.52	1,924	1.34	
Average vehide trip length (miles) Per Trip	8,346	9.85	0.35	1,235	0.91	

Table 1. Key statistics involved in computing ratios of expected standard errors of NHTS 2016 estimates to standard errors of NHTS 2009 estimates, for key estimates (national and by state)[1] (Cont.)

WA	Sample size 2009	Estimate 2009	s.e. 2009	Sample size 2016	Exp s.e. 2016	Ratio: se(2016)/se(2009)
Household Vehides	415	5,421	199	506	180	0.91
Household VMT	2,035	43,768	3,623	2,481	3,281	
Person Miles of Travel	3,287	82,502	16,918	4,008	15,322	
Daily Person Trips Per Person	891	1,326.83	48.60	1,086	44.01	
Daily PMT Per Person	891	13,514.35	2,772.07	1,086	2,510.46	
Daily Vehide Trips Per Driver	702	1,071.64	44.79	856	40.56	
Daily VMT Per Driver	702	9,395.78	771.07	856	698.30	
Daily Person Trips Per Household	415	3,179.05	126.92	506	114.94	
Daily PMT Per Household	415	32,380.03	6,500.61	506	5,887.12	
Daily Vehide Trips Per Household	415	1,959.24	89.91	506	81.42	
Daily VMT Per Household	415	17,178.02	1,386.72	506	1,255.85	
Average person trip length (miles) Per Trip	3,287	10.28	2.01	4,008	1.82	
Average vehide trip length (miles) Per Trip	2,035	8.83	0.57	2,481	0.52	

Table 1. Key statistics involved in computing ratios of expected standard errors of NHTS 2016 estimates to standard errors of NHTS 2009 estimates, for key estimates (national and by state)[1] (Cont.)

WI	Sample size 2009	Estimate 2009	s.e. 2009	Sample size 2016	Exp s.e. 2016	Ratio: se(2016)/se(2009)
Household Vehides	1,707	4,498	34	11,447	13	0.39
Household VMT	8,763	43,799	1,612	58,764	623	
Person Miles of Travel	13,763	70,144	3,324	92,294	1,284	
Daily Person Trips Per Person	3,646	1,373.06	25.15	24,450	9.71	
Daily PMT Per Person	3,646	13,320.94	631.30	24,450	243.78	
Daily Vehide Trips Per Driver	2,947	1,097.42	17.23	19,762	6.65	
Daily VMT Per Driver	2,947	10,643.84	385.15	19,762	148.73	
Daily Person Trips Per Household	1,707	3,213.91	73.31	11,447	28.31	
Daily PMT Per Household	1,707	31,180.20	1,636.15	11,447	631.82	
Daily Vehide Trips Per Household	1,707	2,007.38	40.05	11,447	15.47	
Daily VMT Per Household	1,707	19,469.47	803.80	11,447	310.40	
Average person trip length (miles) Per Trip	13,763	9.96	0.44	92,294	0.17	
Average vehide trip length (miles) Per Trip	8,763	9.84	0.35	58,764	0.13	

Table 1. Key statistics involved in computing ratios of expected standard errors of NHTS 2016 estimates to standard errors of NHTS 2009 estimates, for key estimates (national and by state)[1] (Cont.)

WV	Sample size 2009	Estimate 2009	s.e. 2009	Sample size 2016	Exp s.e. 2016	Ratio: se(2016)/se(2009)
Household Vehides	253	1,458	17	250	17	1.01
Household VMT	1,063	15,599	1,471	1,050	1,480	
Person Miles of Travel	1,657	22,747	1,823	1,637	1,834	
Daily Person Trips Per Person	508	1,241.23	67.43	502	67.83	
Daily PMT Per Person	508	13,286.12	1,066.91	502	1,073.29	
Daily Vehide Trips Per Driver	410	1,043.79	73.91	405	74.35	
Daily VMT Per Driver	410	12,203.89	1,148.80	405	1,155.67	
Daily Person Trips Per Household	253	2,836.06	176.90	250	177.96	
Daily PMT Per Household	253	30,357.07	2,570.24	250	2,585.62	
Daily Vehide Trips Per Household	253	1,780.50	107.39	250	108.03	
Daily VMT Per Household	253	20,817.45	2,103.91	250	2,116.50	
Average person trip length (miles) Per Trip	1,657	10.82	1.16	1,637	1.17	
Average vehide trip length (miles) Per Trip	1,063	11.85	1.23	1,050	1.23	

Table 1. Key statistics involved in computing ratios of expected standard errors of NHTS 2016 estimates to standard errors of NHTS 2009 estimates, for key estimates (national and by state)[1] (Cont.)

WY	Sample size 2009	Estimate 2009	s.e. 2009	Sample size 2016	Exp s.e. 2016	Ratio: se(2016)/se(2009)
Household Vehides	260	545	25	250	25	1.02
Household VMT	1,481	4,724	390	1,424	398	
Person Miles of Travel	2,116	7,305	860	2,035	877	
Daily Person Trips Per Person	524	1,438.34	85.74	504	87.44	
Daily PMT Per Person	524	14,780.06	1,739.84	504	1,774.30	
Daily Vehide Trips Per Driver	464	1,194.87	92.46	446	94.29	
Daily VMT Per Driver	464	10,940.62	971.37	446	990.61	
Daily Person Trips Per Household	260	3,407.78	343.69	250	350.50	
Daily PMT Per Household	260	35,017.49	5,621.23	250	5,732.55	
Daily Vehide Trips Per Household	260	2,473.19	269.55	250	274.89	
Daily VMT Per Household	260	22,645.32	2,666.29	250	2,719.09	
Average person trip length (miles) Per Trip	2,116	10.40	1.36	2,035	1.39	
Average vehide trip length (miles) Per Trip	1,481	9.26	0.95	1,424	0.97	

Table 2. Average Annual PMT, Person Trips and Trip Length by Trip Purpose.

National	Sample size 2009	Estimate 2009	s.e. 2009	Sample size 2016	Exp s.e. 2016	Ratio: se(2016) /se(2009)
Average Person Trip Length (miles) All Purposes	1,148,656	9.7	0.18	987,688	0.20	1.08
To/From Work	150,068	11.8	0.14	129,038	0.16	
Work Related Business	32,391	20.0	1.03	27,852	1.11	
Shopping	262,103	6.5	0.13	225,373	0.14	
Other Family/Personal Errands	258,384	7.0	0.14	222,175	0.15	
School/Church	96,619	6.3	0.17	83,079	0.18	
Social and Recreational	333,574	10.7	0.31	286,828	0.34	
Other	15,517	51.5	7.29	13,343	7.86	

Table 2. Average Annual PMT, Person Trips and Trip Length by Trip Purpose (Cont.).

AK	Sample size 2009	Estimate 2009	s.e. 2009	Sample size 2016	Exp s.e. 2016	Ratio: se(2016) /se(2009)
Average Person Trip Length (miles) All Purposes	2,295	14.5	4.85	2,268	4.88	1.01
To/From Work	366	27.0	22.57	362	22.70	
Work Related Business	70	8.5	3.20	69	3.22	
Shopping	476	5.3	1.31	470	1.32	
Other Family/Personal Errands	576	4.7	0.76	569	0.76	
School/Church	168	4.6	1.21	166	1.21	
Social and Recreational	612	12.7	3.02	605	3.04	
Other	27	214.4	143.12	27	143.98	
AL	**Sample size 2009**	**Estimate 2009**	**s.e. 2009**	**Sample size 2016**	**Exp s.e. 2016**	**Ratio: se(2016) /se(2009)**
Average Person Trip Length (miles) All Purposes	3,001	11.6	1.65	2,690	1.75	1.06
To/From Work	447	16.3	1.59	401	1.68	
Work Related Business	77	9.7	2.27	69	2.40	
Shopping	694	8.7	1.36	622	1.44	
Other Family/Personal Errands	660	10.5	1.43	592	1.51	
School/Church	306	6.2	0.69	274	0.73	
Social and Recreational	775	13.6	5.16	695	5.45	
Other	42	13.7	4.36	38	4.60	
AR	**Sample size 2009**	**Estimate 2009**	**s.e. 2009**	**Sample size 2016**	**Exp s.e. 2016**	**Ratio: se(2016) /se(2009)**
Average Person Trip Length (miles) All Purposes	2,071	10.0	0.95	2,007	0.97	1.02
To/From Work	257	10.7	1.18	249	1.20	
Work Related Business	76	25.2	8.33	74	8.46	
Shopping	489	8.7	1.33	474	1.35	
Other Family/Personal Errands	416	7.9	1.12	403	1.14	
School/Church	242	8.0	1.55	234	1.58	
Social and Recreational	565	11.3	1.95	547	1.98	
Other	26	8.4	2.54	25	2.58	

Table 2. Average Annual PMT, Person Trips and Trip Length by Trip Purpose (Cont.)

AZ	Sample size 2009	Estimate 2009	s.e. 2009	Sample size 2016	Exp s.e. 2016	Ratio: se(2016) /se(2009)
Average Person Trip Length (miles) All Purposes	55,997	9.5	0.94	22,964	1.46	1.56
To/From Work	7,006	12.2	1.59	2,873	2.48	
Work Related Business	1,329	21.8	9.24	545	14.43	
Shopping	12,467	6.0	0.59	5,113	0.92	
Other Family/Personal Errands	13,093	8.5	1.52	5,369	2.38	
School/Church	5,161	5.7	0.96	2,116	1.50	
Social and Recreational	16,243	10.7	2.41	6,661	3.76	
Other	698	33.6	15.29	286	23.88	
CA	**Sample size 2009**	**Estimate 2009**	**s.e. 2009**	**Sample size 2016**	**Exp s.e. 2016**	**Ratio: se(2016) /se(2009)**
Average Person Trip Length (miles) All Purposes	168,233	8.8	0.16	209,409	0.14	0.90
To/From Work	21,146	12.0	0.27	26,322	0.25	
Work Related Business	4,489	18.1	1.84	5,588	1.65	
Shopping	37,115	5.3	0.15	46,199	0.14	
Other Family/Personal Errands	38,926	6.0	0.23	48,453	0.21	
School/Church	13,428	5.2	0.18	16,715	0.16	
Social and Recreational	50,751	9.6	0.27	63,173	0.24	
Other	2,378	53.8	6.69	2,960	6.00	
CO	**Sample size 2009**	**Estimate 2009**	**s.e. 2009**	**Sample size 2016**	**Exp s.e. 2016**	**Ratio: se(2016) /se(2009)**
Average Person Trip Length (miles) All Purposes	2,627	9.1	0.86	3,279	0.77	0.90
To/From Work	360	11.3	0.80	449	0.71	
Work Related Business	112	19.2	6.57	140	5.88	
Shopping	548	8.0	1.16	684	1.04	
Other Family/Personal Errands	636	6.1	1.13	794	1.01	
School/Church	160	4.2	0.70	200	0.62	
Social and Recreational	785	8.4	1.98	980	1.77	
Other	26	48.9	44.69	32	40.00	

Table 2. Average Annual PMT, Person Trips and Trip Length by Trip Purpose (Cont.).

CT	Sample size 2009	Estimate 2009	s.e. 2009	Sample size 2016	Exp s.e. 2016	Ratio: se(2016) /se(2009)
Average Person Trip Length (miles) All Purposes	2,209	9.4	1.08	2,129	1.10	1.02
To/From Work	316	12.8	1.55	305	1.58	
Work Related Business	46	35.1	19.57	44	19.94	
Shopping	466	5.9	0.82	449	0.84	
Other Family/Personal Errands	474	6.8	1.35	457	1.37	
School/Church	184	4.8	1.07	177	1.09	
Social and Recreational	694	11.1	1.79	669	1.82	
Other	29	14.9	7.82	28	7.96	
DC	**Sample size 2009**	**Estimate 2009**	**s.e. 2009**	**Sample size 2016**	**Exp s.e. 2016**	**Ratio: se(2016) /se(2009)**
Average Person Trip Length (miles) All Purposes	1,681	5.3	0.73	1,592	0.75	1.03
To/From Work	230	5.5	1.25	218	1.28	
Work Related Business	74	5.2	1.33	70	1.36	
Shopping	368	4.6	1.79	348	1.84	
Other Family/Personal Errands	430	2.4	0.39	407	0.41	
School/Church	127	3.7	0.89	120	0.91	
Social and Recreational	435	9.2	2.97	412	3.05	
Other	17	3.0	2.52	16	2.59	
DE	**Sample size 2009**	**Estimate 2009**	**s.e. 2009**	**Sample size 2016**	**Exp s.e. 2016**	**Ratio: se(2016) /se(2009)**
Average Person Trip Length (miles) All Purposes	2,039	11.0	1.58	2,081	1.56	0.99
To/From Work	194	12.2	1.76	198	1.75	
Work Related Business	48	21.5	6.05	49	5.99	
Shopping	501	4.7	0.70	511	0.69	
Other Family/Personal Errands	464	9.1	2.47	473	2.44	
School/Church	116	7.4	2.37	118	2.35	
Social and Recreational	669	15.9	3.59	683	3.55	
Other	47	14.3	6.76	48	6.69	

Table 2. Average Annual PMT, Person Trips and Trip Length by Trip Purpose (Cont.)

FL	Sample size 2009	Estimate 2009	s.e. 2009	Sample size 2016	Exp s.e. 2016	Ratio: se(2016) /se(2009)
Average Person Trip Length (miles) All Purposes	112,831	9.3	0.22	11,351	0.69	3.15
To/From Work	12,923	11.5	0.28	1,300	0.88	
Work Related Business	2,764	19.1	1.99	278	6.28	
Shopping	27,931	6.4	0.25	2,810	0.78	
Other Family/Personal Errands	25,700	7.0	0.20	2,586	0.65	
School/Church	7,667	6.7	0.23	771	0.72	
Social and Recreational	34,381	9.5	0.34	3,459	1.07	
Other	1,465	52.8	7.98	147	25.15	
GA	**Sample size 2009**	**Estimate 2009**	**s.e. 2009**	**Sample size 2016**	**Exp s.e. 2016**	**Ratio: se(2016) /se(2009)**
Average Person Trip Length (miles) All Purposes	53,851	11.0	0.52	62,587	0.49	0.93
To/From Work	6,939	15.4	0.89	8,065	0.83	
Work Related Business	1,671	30.4	5.81	1,942	5.39	
Shopping	12,851	7.8	0.70	14,936	0.65	
Other Family/Personal Errands	11,783	7.9	0.41	13,694	0.38	
School/Church	5,437	7.5	0.48	6,319	0.44	
Social and Recreational	14,560	11.0	0.89	16,922	0.83	
Other	610	33.3	5.36	709	4.97	
HI	**Sample size 2009**	**Estimate 2009**	**s.e. 2009**	**Sample size 2016**	**Exp s.e. 2016**	**Ratio: se(2016) /se(2009)**
Average Person Trip Length (miles) All Purposes	1,949	5.5	0.39	1,918	0.39	1.01
To/From Work	264	7.2	0.66	260	0.67	
Work Related Business	56	7.0	2.82	55	2.84	
Shopping	438	4.0	0.68	431	0.68	
Other Family/Personal Errands	396	4.8	0.52	390	0.52	
School/Church	137	7.1	1.17	135	1.18	
Social and Recreational	639	5.4	0.79	629	0.79	
Other	19	16.9	10.61	19	10.69	

Table 2. Average Annual PMT, Person Trips and Trip Length by Trip Purpose (Cont.)

IA	Sample size 2009	Estimate 2009	s.e. 2009	Sample size 2016	Exp s.e. 2016	Ratio: se(2016) /se(2009)
Average Person Trip Length (miles) All Purposes	29,657	8.1	0.35	20,946	0.42	1.19
To/From Work	4,735	10.3	0.82	3,344	0.98	
Work Related Business	1,049	15.9	5.18	741	6.16	
Shopping	6,277	6.6	0.64	4,433	0.76	
Other Family/Personal Errands	6,714	6.7	0.45	4,742	0.53	
School/Church	2,776	5.3	0.44	1,961	0.53	
Social and Recreational	7,734	7.6	0.49	5,462	0.58	
Other	372	22.7	9.60	263	11.43	
ID	**Sample size 2009**	**Estimate 2009**	**s.e. 2009**	**Sample size 2016**	**Exp s.e. 2016**	**Ratio: se(2016) /se(2009)**
Average Person Trip Length (miles) All Purposes	2,183	8.3	1.33	2,107	1.35	1.02
To/From Work	251	8.2	0.66	242	0.67	
Work Related Business	69	13.0	3.83	67	3.90	
Shopping	522	6.7	2.23	504	2.27	
Other Family/Personal Errands	514	5.8	0.62	496	0.64	
School/Church	196	4.7	1.01	189	1.03	
Social and Recreational	596	11.7	3.23	575	3.29	
Other	35	7.8	1.13	34	1.15	
IL	**Sample size 2009**	**Estimate 2009**	**s.e. 2009**	**Sample size 2016**	**Exp s.e. 2016**	**Ratio: se(2016) /se(2009)**
Average Person Trip Length (miles) All Purposes	6,839	11.4	2.59	7,955	2.40	0.93
To/From Work	907	11.2	0.77	1,055	0.71	
Work Related Business	194	18.7	5.20	226	4.82	
Shopping	1,445	5.9	0.83	1,681	0.77	
Other Family/Personal Errands	1,531	5.4	0.45	1,781	0.42	
School/Church	558	3.6	0.47	649	0.44	
Social and Recreational	2,086	7.5	0.67	2,426	0.62	
Other	118	209.0	85.79	137	79.55	

Table 2. Average Annual PMT, Person Trips and Trip Length by Trip Purpose (Cont.)

IN	Sample size 2009	Estimate 2009	s.e. 2009	Sample size 2016	Exp s.e. 2016	Ratio: se(2016) /se(2009)
Average Person Trip Length (miles) All Purposes	26,836	9.0	0.29	11,656	0.44	1.52
To/From Work	3,838	11.4	0.54	1,667	0.82	
Work Related Business	790	17.8	3.35	343	5.09	
Shopping	5,854	5.9	0.34	2,543	0.52	
Other Family/Personal Errands	5,894	7.4	0.48	2,560	0.73	
School/Church	2,328	5.9	0.32	1,011	0.49	
Social and Recreational	7,771	9.6	0.49	3,375	0.74	
Other	361	32.0	8.41	157	12.76	
KS	**Sample size 2009**	**Estimate 2009**	**s.e. 2009**	**Sample size 2016**	**Exp s.e. 2016**	**Ratio: se(2016) /se(2009)**
Average Person Trip Length (miles) All Purposes	2,202	10.6	1.19	2,093	1.22	1.03
To/From Work	349	9.9	1.26	332	1.29	
Work Related Business	70	15.0	10.96	67	11.24	
Shopping	425	8.5	2.16	404	2.21	
Other Family/Personal Errands	564	10.8	2.28	536	2.34	
School/Church	175	9.5	2.47	166	2.54	
Social and Recreational	598	12.2	3.19	568	3.27	
Other	21	19.1	13.23	20	13.57	
KY	**Sample size 2009**	**Estimate 2009**	**s.e. 2009**	**Sample size 2016**	**Exp s.e. 2016**	**Ratio: se(2016) /se(2009)**
Average Person Trip Length (miles) All Purposes	1,914	10.4	1.03	2,366	0.93	0.90
To/From Work	258	13.0	1.88	319	1.69	
Work Related Business	53	22.6	10.21	66	9.19	
Shopping	417	9.5	1.92	515	1.72	
Other Family/Personal Errands	446	9.4	1.54	551	1.39	
School/Church	207	7.0	1.00	256	0.90	
Social and Recreational	507	9.8	1.38	627	1.24	
Other	26	29.0	6.14	32	5.52	

Table 2. Average Annual PMT, Person Trips and Trip Length by Trip Purpose (Cont.)

LA	Sample size 2009	Estimate 2009	s.e. 2009	Sample size 2016	Exp s.e. 2016	Ratio: se(2016) /se(2009)
Average Person Trip Length (miles) All Purposes	2,372	11.3	1.83	2,851	1.67	0.91
To/From Work	307	12.5	1.53	369	1.39	
Work Related Business	65	37.6	23.98	78	21.87	
Shopping	553	7.4	1.21	665	1.10	
Other Family/Personal Errands	536	5.4	0.50	644	0.46	
School/Church	218	6.6	0.68	262	0.62	
Social and Recreational	655	19.1	6.55	787	5.97	
Other	38	7.7	1.23	46	1.12	
MA	**Sample size 2009**	**Estimate 2009**	**s.e. 2009**	**Sample size 2016**	**Exp s.e. 2016**	**Ratio: se(2016) /se(2009)**
Average Person Trip Length (miles) All Purposes	3,328	9.6	1.39	4,071	1.26	0.90
To/From Work	443	12.5	1.04	542	0.94	
Work Related Business	123	15.6	1.82	150	1.65	
Shopping	781	5.5	0.41	955	0.37	
Other Family/Personal Errands	695	5.8	0.76	850	0.69	
School/Church	216	4.9	1.75	264	1.58	
Social and Recreational	1,016	12.9	3.72	1,243	3.36	
Other	54	21.4	10.10	66	9.13	
MD	**Sample size 2009**	**Estimate 2009**	**s.e. 2009**	**Sample size 2016**	**Exp s.e. 2016**	**Ratio: se(2016) /se(2009)**
Average Person Trip Length (miles) All Purposes	2,855	11.3	0.89	11,476	0.44	0.50
To/From Work	382	14.9	1.29	1,536	0.64	
Work Related Business	74	18.1	3.39	297	1.69	
Shopping	594	8.2	2.39	2,388	1.19	
Other Family/Personal Errands	633	7.0	0.68	2,544	0.34	
School/Church	274	8.4	1.59	1,101	0.79	
Social and Recreational	833	12.8	2.31	3,348	1.15	
Other	65	40.5	17.74	261	8.85	

Table 2. Average Annual PMT, Person Trips and Trip Length by Trip Purpose (Cont.)

ME	Sample size 2009	Estimate 2009	s.e. 2009	Sample size 2016	Exp s.e. 2016	Ratio: se(2016) /se(2009)
Average Person Trip Length (miles) All Purposes	2,209	9.9	0.88	1,994	0.92	1.05
To/From Work	274	14.0	2.14	247	2.25	
Work Related Business	91	12.5	2.31	82	2.44	
Shopping	486	6.2	0.49	439	0.52	
Other Family/Personal Errands	529	8.4	1.36	477	1.43	
School/Church	126	6.1	2.10	114	2.21	
Social and Recreational	669	12.8	2.28	604	2.40	
Other	34	11.2	6.37	31	6.70	
MI	**Sample size 2009**	**Estimate 2009**	**s.e. 2009**	**Sample size 2016**	**Exp s.e. 2016**	**Ratio: se(2016) /se(2009)**
Average Person Trip Length (miles) All Purposes	5,514	9.1	1.00	6,646	0.91	0.91
To/From Work	602	13.2	1.18	726	1.08	
Work Related Business	149	15.0	2.71	180	2.46	
Shopping	1,262	5.9	0.53	1,521	0.48	
Other Family/Personal Errands	1,307	6.9	0.71	1,575	0.64	
School/Church	402	5.9	0.70	485	0.64	
Social and Recreational	1,727	9.4	2.04	2,082	1.86	
Other	65	59.5	41.66	78	37.95	
MN	**Sample size 2009**	**Estimate 2009**	**s.e. 2009**	**Sample size 2016**	**Exp s.e. 2016**	**Ratio: se(2016) /se(2009)**
Average Person Trip Length (miles) All Purposes	2,769	9.1	0.88	3,274	0.81	0.92
To/From Work	359	9.4	1.23	424	1.13	
Work Related Business	93	8.9	1.38	110	1.27	
Shopping	587	6.9	1.34	694	1.23	
Other Family/Personal Errands	538	6.8	0.78	636	0.71	
School/Church	187	4.9	0.93	221	0.85	
Social and Recreational	926	9.7	1.29	1,095	1.19	
Other	79	37.2	18.42	93	16.94	

Table 2. Average Annual PMT, Person Trips and Trip Length by Trip Purpose (Cont.)

MO	Sample size 2009	Estimate 2009	s.e. 2009	Sample size 2016	Exp s.e. 2016	Ratio: se(2016) /se(2009)
Average Person Trip Length (miles) All Purposes	3,192	12.9	3.12	3,840	2.84	0.91
To/From Work	369	11.4	1.69	444	1.54	
Work Related Business	102	16.7	6.43	123	5.86	
Shopping	773	7.2	0.77	930	0.71	
Other Family/Personal Errands	693	6.2	0.71	834	0.65	
School/Church	311	7.9	1.27	374	1.16	
Social and Recreational	895	16.0	5.87	1,077	5.35	
Other	49	138.6	66.59	59	60.71	
MS	**Sample size 2009**	**Estimate 2009**	**s.e. 2009**	**Sample size 2016**	**Exp s.e. 2016**	**Ratio: se(2016) /se(2009)**
Average Person Trip Length (miles) All Purposes	1,784	12.9	1.78	1,735	1.80	1.01
To/From Work	179	11.2	1.35	174	1.37	
Work Related Business	57	20.7	7.02	55	7.12	
Shopping	438	9.0	2.07	426	2.10	
Other Family/Personal Errands	370	9.6	1.55	360	1.57	
School/Church	201	23.1	8.17	196	8.28	
Social and Recreational	507	13.1	2.94	493	2.98	
Other	32	11.7	9.90	31	10.03	
MT	**Sample size 2009**	**Estimate 2009**	**s.e. 2009**	**Sample size 2016**	**Exp s.e. 2016**	**Ratio: se(2016) /se(2009)**
Average Person Trip Length (miles) All Purposes	2,015	11.5	2.52	1,968	2.55	1.01
To/From Work	311	8.4	1.04	304	1.05	
Work Related Business	65	47.1	27.04	63	27.36	
Shopping	444	12.2	5.36	434	5.43	
Other Family/Personal Errands	428	4.6	0.61	418	0.62	
School/Church	180	5.9	0.75	176	0.75	
Social and Recreational	559	12.6	3.86	546	3.91	
Other	28	59.2	31.27	27	31.65	

Table 2. Average Annual PMT, Person Trips and Trip Length by Trip Purpose (Cont.)

NC	Sample size 2009	Estimate 2009	s.e. 2009	Sample size 2016	Exp s.e. 2016	Ratio: se(2016) /se(2009)
Average Person Trip Length (miles) All Purposes	82,662	10.3	0.24	65,185	0.27	1.13
To/From Work	10,304	12.2	0.37	8,125	0.42	
Work Related Business	2,390	20.0	2.06	1,885	2.32	
Shopping	18,910	7.8	0.42	14,912	0.47	
Other Family/Personal Errands	18,035	9.0	0.40	14,222	0.45	
School/Church	7,327	7.3	0.38	5,778	0.42	
Social and Recreational	24,721	10.8	0.68	19,494	0.76	
Other	975	43.2	8.82	769	9.93	
ND	**Sample size 2009**	**Estimate 2009**	**s.e. 2009**	**Sample size 2016**	**Exp s.e. 2016**	**Ratio: se(2016) /se(2009)**
Average Person Trip Length (miles) All Purposes	2,107	8.9	1.01	2,058	1.02	1.01
To/From Work	389	7.0	1.27	380	1.29	
Work Related Business	79	30.8	8.62	77	8.73	
Shopping	441	6.5	1.05	431	1.06	
Other Family/Personal Errands	455	6.2	1.28	444	1.30	
School/Church	164	9.0	2.58	160	2.61	
Social and Recreational	547	10.8	1.73	534	1.75	
Other	32	28.8	18.41	31	18.63	
NE	**Sample size 2009**	**Estimate 2009**	**s.e. 2009**	**Sample size 2016**	**Exp s.e. 2016**	**Ratio: se(2016) /se(2009)**
Average Person Trip Length (miles) All Purposes	10,875	9.6	0.55	2,109	1.25	2.27
To/From Work	1,734	8.8	1.09	336	2.48	
Work Related Business	355	25.4	8.46	69	19.22	
Shopping	2,304	7.2	0.79	447	1.80	
Other Family/Personal Errands	2,311	6.6	0.62	448	1.41	
School/Church	863	5.0	0.62	167	1.42	
Social and Recreational	3,181	11.6	1.61	617	3.65	
Other	127	39.0	19.68	25	44.68	

Table 2. Average Annual PMT, Person Trips and Trip Length by Trip Purpose (Cont.)

NH	Sample size 2009	Estimate 2009	s.e. 2009	Sample size 2016	Exp s.e. 2016	Ratio: se(2016) /se(2009)
Average Person Trip Length (miles) All Purposes	2,036	9.9	0.83	2,004	0.84	1.01
To/From Work	323	13.8	1.93	318	1.94	
Work Related Business	86	11.4	1.89	85	1.90	
Shopping	428	7.4	1.31	421	1.32	
Other Family/Personal Errands	461	7.0	1.21	454	1.22	
School/Church	123	7.9	1.93	121	1.95	
Social and Recreational	577	11.0	0.92	568	0.93	
Other	38	30.5	11.81	37	11.90	
NJ	**Sample size 2009**	**Estimate 2009**	**s.e. 2009**	**Sample size 2016**	**Exp s.e. 2016**	**Ratio: se(2016) /se(2009)**
Average Person Trip Length (miles) All Purposes	4,612	10.5	1.28	5,272	1.20	0.94
To/From Work	524	13.5	1.03	599	0.97	
Work Related Business	119	12.0	2.91	136	2.72	
Shopping	1,107	4.8	0.32	1,265	0.30	
Other Family/Personal Errands	1,019	5.8	0.97	1,165	0.90	
School/Church	342	6.5	2.44	391	2.28	
Social and Recreational	1,427	15.9	4.09	1,631	3.82	
Other	74	59.8	21.54	85	20.15	
NM	**Sample size 2009**	**Estimate 2009**	**s.e. 2009**	**Sample size 2016**	**Exp s.e. 2016**	**Ratio: se(2016) /se(2009)**
Average Person Trip Length (miles) All Purposes	1,808	9.6	1.31	1,801	1.31	1.00
To/From Work	211	11.8	1.72	210	1.73	
Work Related Business	53	74.6	24.23	53	24.28	
Shopping	446	6.6	1.32	444	1.32	
Other Family/Personal Errands	429	7.5	1.91	427	1.92	
School/Church	122	10.0	4.74	122	4.75	
Social and Recreational	529	7.1	1.30	527	1.31	
Other	18	23.4	19.91	18	19.95	

Table 2. Average Annual PMT, Person Trips and Trip Length by Trip Purpose (Cont.)

NV	Sample size 2009	Estimate 2009	s.e. 2009	Sample size 2016	Exp s.e. 2016	Ratio: se(2016) /se(2009)
Average Person Trip Length (miles) All Purposes	1,946	8.4	0.68	1,900	0.69	1.01
To/From Work	247	9.6	1.75	241	1.77	
Work Related Business	60	12.4	3.78	59	3.83	
Shopping	462	4.5	0.56	451	0.56	
Other Family/Personal Errands	424	9.2	2.06	414	2.09	
School/Church	116	6.5	1.52	113	1.54	
Social and Recreational	608	9.5	1.86	594	1.89	
Other	29	35.3	16.00	28	16.19	
NY	**Sample size 2009**	**Estimate 2009**	**s.e. 2009**	**Sample size 2016**	**Exp s.e. 2016**	**Ratio: se(2016) /se(2009)**
Average Person Trip Length (miles) All Purposes	123,053	7.5	0.24	131,449	0.24	0.97
To/From Work	16,884	10.2	0.29	18,036	0.28	
Work Related Business	3,204	16.9	2.39	3,423	2.32	
Shopping	28,618	4.6	0.16	30,571	0.15	
Other Family/Personal Errands	27,795	5.4	0.24	29,692	0.23	
School/Church	9,685	4.6	0.23	10,346	0.23	
Social and Recreational	35,019	8.3	0.59	37,408	0.57	
Other	1,848	32.1	6.69	1,974	6.47	
OH	**Sample size 2009**	**Estimate 2009**	**s.e. 2009**	**Sample size 2016**	**Exp s.e. 2016**	**Ratio: se(2016) /se(2009)**
Average Person Trip Length (miles) All Purposes	5,862	10.3	0.94	7,481	0.84	0.89
To/From Work	762	10.8	0.73	972	0.65	
Work Related Business	145	50.6	20.47	185	18.12	
Shopping	1,306	7.8	1.11	1,667	0.98	
Other Family/Personal Errands	1,262	7.7	1.25	1,611	1.11	
School/Church	547	6.0	1.09	698	0.97	
Social and Recreational	1,771	10.3	1.27	2,260	1.13	
Other	69	61.3	62.84	88	55.62	

Table 2. Average Annual PMT, Person Trips and Trip Length by Trip Purpose (Cont.)

OK	Sample size 2009	Estimate 2009	s.e. 2009	Sample size 2016	Exp s.e. 2016	Ratio: se(2016) /se(2009)
Average Person Trip Length (miles) All Purposes	1,951	11.3	1.49	2,145	1.42	0.95
To/From Work	252	9.0	0.83	277	0.79	
Work Related Business	56	22.1	6.57	62	6.26	
Shopping	426	7.8	1.43	468	1.37	
Other Family/Personal Errands	475	10.1	3.27	522	3.12	
School/Church	154	5.4	0.83	169	0.79	
Social and Recreational	556	15.9	2.89	611	2.76	
Other	32	34.1	28.45	35	27.13	
OR	**Sample size 2009**	**Estimate 2009**	**s.e. 2009**	**Sample size 2016**	**Exp s.e. 2016**	**Ratio: se(2016) /se(2009)**
Average Person Trip Length (miles) All Purposes	2,425	7.3	0.76	2,627	0.73	0.96
To/From Work	276	8.2	0.74	299	0.71	
Work Related Business	66	9.5	2.21	72	2.12	
Shopping	538	5.3	0.80	583	0.77	
Other Family/Personal Errands	515	6.4	1.45	558	1.40	
School/Church	197	4.1	0.73	213	0.70	
Social and Recreational	792	7.7	1.46	858	1.40	
Other	41	43.1	32.85	44	31.56	
PA	**Sample size 2009**	**Estimate 2009**	**s.e. 2009**	**Sample size 2016**	**Exp s.e. 2016**	**Ratio: se(2016) /se(2009)**
Average Person Trip Length (miles) All Purposes	6,235	9.1	0.65	7,646	0.59	0.90
To/From Work	916	10.6	0.65	1,123	0.59	
Work Related Business	199	14.1	5.39	244	4.87	
Shopping	1,417	7.0	1.46	1,738	1.31	
Other Family/Personal Errands	1,310	7.1	1.23	1,607	1.11	
School/Church	490	5.3	0.61	601	0.55	
Social and Recreational	1,822	9.8	1.16	2,234	1.05	
Other	81	51.3	23.57	99	21.29	

Table 2. Average Annual PMT, Person Trips and Trip Length by Trip Purpose (Cont.)

RI	Sample size 2009	Estimate 2009	s.e. 2009	Sample size 2016	Exp s.e. 2016	Ratio: se(2016) /se(2009)
Average Person Trip Length (miles) All Purposes	1,958	9.1	1.01	1,912	1.02	1.01
To/From Work	255	10.3	1.49	249	1.50	
Work Related Business	42	9.1	2.02	41	2.04	
Shopping	403	6.3	0.82	394	0.83	
Other Family/Personal Errands	431	4.5	0.79	421	0.80	
School/Church	137	6.7	2.17	134	2.19	
Social and Recreational	671	9.5	1.33	655	1.35	
Other	19	99.4	51.14	19	51.75	
SC	**Sample size 2009**	**Estimate 2009**	**s.e. 2009**	**Sample size 2016**	**Exp s.e. 2016**	**Ratio: se(2016) /se(2009)**
Average Person Trip Length (miles) All Purposes	39,368	10.0	0.28	51,929	0.24	0.87
To/From Work	4,677	13.3	0.50	6,169	0.43	
Work Related Business	1,034	24.5	3.27	1,364	2.85	
Shopping	9,128	7.1	0.37	12,040	0.32	
Other Family/Personal Errands	8,856	7.5	0.34	11,682	0.30	
School/Church	3,595	6.9	0.52	4,742	0.45	
Social and Recreational	11,592	10.6	0.60	15,291	0.52	
Other	486	26.5	4.42	641	3.85	
SD	**Sample size 2009**	**Estimate 2009**	**s.e. 2009**	**Sample size 2016**	**Exp s.e. 2016**	**Ratio: se(2016) /se(2009)**
Average Person Trip Length (miles) All Purposes	15,011	9.1	0.81	2,087	2.18	2.68
To/From Work	2,347	7.7	0.69	326	1.84	
Work Related Business	517	13.2	4.72	72	12.65	
Shopping	3,052	7.3	1.14	424	3.05	
Other Family/Personal Errands	3,247	5.4	0.82	451	2.21	
School/Church	1,409	5.0	1.16	196	3.11	
Social and Recreational	4,246	11.9	1.93	590	5.17	
Other	193	80.4	28.74	27	77.07	

Table 2. Average Annual PMT, Person Trips and Trip Length by Trip Purpose (Cont.)

TN	Sample size 2009	Estimate 2009	s.e. 2009	Sample size 2016	Exp s.e. 2016	Ratio: se(2016) /se(2009)
Average Person Trip Length (miles) All Purposes	18,142	10.6	0.40	3,576	0.89	2.25
To/From Work	2,393	13.5	0.60	472	1.35	
Work Related Business	509	23.4	5.08	100	11.43	
Shopping	4,152	7.7	0.47	818	1.05	
Other Family/Personal Errands	4,100	9.1	0.66	808	1.48	
School/Church	1,752	8.4	0.54	345	1.23	
Social and Recreational	4,961	10.6	0.80	978	1.81	
Other	275	28.4	5.31	54	11.97	
TX	**Sample size 2009**	**Estimate 2009**	**s.e. 2009**	**Sample size 2016**	**Exp s.e. 2016**	**Ratio: se(2016) /se(2009)**
Average Person Trip Length (miles) All Purposes	171,481	10.0	0.19	190,644	0.18	0.95
To/From Work	22,417	12.4	0.19	24,922	0.18	
Work Related Business	4,937	22.8	1.57	5,489	1.49	
Shopping	38,575	6.8	0.22	42,886	0.21	
Other Family/Personal Errands	39,091	7.5	0.18	43,459	0.17	
School/Church	15,501	6.8	0.24	17,233	0.22	
Social and Recreational	48,690	10.6	0.30	54,131	0.28	
Other	2,270	47.1	6.51	2,524	6.18	
UT	**Sample size 2009**	**Estimate 2009**	**s.e. 2009**	**Sample size 2016**	**Exp s.e. 2016**	**Ratio: se(2016) /se(2009)**
Average Person Trip Length (miles) All Purposes	2,765	10.6	3.38	2,648	3.45	1.02
To/From Work	325	12.1	2.18	311	2.23	
Work Related Business	61	25.4	12.94	58	13.22	
Shopping	511	4.2	0.45	489	0.46	
Other Family/Personal Errands	517	5.3	0.65	495	0.66	
School/Church	366	3.9	0.68	351	0.70	
Social and Recreational	943	18.3	11.19	903	11.44	
Other	42	10.8	4.78	40	4.88	

Table 2. Average Annual PMT, Person Trips and Trip Length by Trip Purpose (Cont.)

VA	Sample size 2009	Estimate 2009	s.e. 2009	Sample size 2016	Exp s.e. 2016	Ratio: se(2016) /se(2009)
Average Person Trip Length (miles) All Purposes	116,078	10.1	0.24	4,550	1.21	5.05
To/From Work	15,839	12.9	0.28	621	1.43	
Work Related Business	3,508	18.5	1.46	138	7.39	
Shopping	27,076	6.7	0.18	1,061	0.89	
Other Family/Personal Errands	25,427	8.1	0.28	997	1.43	
School/Church	9,834	7.0	0.28	385	1.43	
Social and Recreational	32,770	10.5	0.57	1,284	2.89	
Other	1,624	39.9	6.85	64	34.62	
VT	**Sample size 2009**	**Estimate 2009**	**s.e. 2009**	**Sample size 2016**	**Exp s.e. 2016**	**Ratio: se(2016) /se(2009)**
Average Person Trip Length (miles) All Purposes	13,005	10.0	0.52	1,924	1.34	2.60
To/From Work	1,995	11.0	0.51	295	1.33	
Work Related Business	511	17.9	2.96	76	7.70	
Shopping	2,866	7.0	0.45	424	1.16	
Other Family/Personal Errands	2,950	8.8	1.45	436	3.77	
School/Church	775	7.5	0.67	115	1.74	
Social and Recreational	3,736	11.0	0.74	553	1.92	
Other	172	34.8	11.58	25	30.11	
WA	**Sample size 2009**	**Estimate 2009**	**s.e. 2009**	**Sample size 2016**	**Exp s.e. 2016**	**Ratio: se(2016) /se(2009)**
Average Person Trip Length (miles) All Purposes	3,287	10.3	2.01	4,008	1.82	0.91
To/From Work	442	9.4	0.65	539	0.59	
Work Related Business	100	16.0	6.09	122	5.52	
Shopping	750	7.0	1.02	914	0.93	
Other Family/Personal Errands	683	5.7	0.79	833	0.72	
School/Church	246	5.7	0.98	300	0.89	
Social and Recreational	1,028	14.6	5.74	1,253	5.20	
Other	38	51.2	31.07	46	28.13	

Table 2. Average Annual PMT, Person Trips and Trip Length by Trip Purpose (Cont.)

WI	Sample size 2009	Estimate 2009	s.e. 2009	Sample size 2016	Exp s.e. 2016	Ratio: se(2016) /se(2009)
Average Person Trip Length (miles) All Purposes	13,763	10.0	0.44	92,294	0.17	0.39
To/From Work	1,998	10.6	0.51	13,398	0.20	
Work Related Business	374	18.4	4.49	2,508	1.74	
Shopping	3,139	6.8	0.39	21,050	0.15	
Other Family/Personal Errands	2,767	7.4	0.50	18,555	0.19	
School/Church	1,133	6.7	1.10	7,598	0.42	
Social and Recreational	4,140	12.7	1.23	27,762	0.48	
Other	212	30.2	7.22	1,422	2.79	
WV	**Sample size 2009**	**Estimate 2009**	**s.e. 2009**	**Sample size 2016**	**Exp s.e. 2016**	**Ratio: se(2016) /se(2009)**
Average Person Trip Length (miles) All Purposes	1,657	10.8	1.16	1,637	1.17	1.01
To/From Work	186	16.5	2.62	184	2.63	
Work Related Business	47	22.3	16.71	46	16.81	
Shopping	410	8.7	1.05	405	1.05	
Other Family/Personal Errands	356	11.3	1.73	352	1.74	
School/Church	145	6.0	1.14	143	1.15	
Social and Recreational	483	7.7	1.25	477	1.26	
Other	30	61.0	30.96	30	31.15	
WY	**Sample size 2009**	**Estimate 2009**	**s.e. 2009**	**Sample size 2016**	**Exp s.e. 2016**	**Ratio: se(2016) /se(2009)**
Average Person Trip Length (miles) All Purposes	2,116	10.4	1.36	2,035	1.39	1.02
To/From Work	360	8.7	1.44	346	1.47	
Work Related Business	83	23.4	5.17	80	5.28	
Shopping	436	10.4	4.08	419	4.16	
Other Family/Personal Errands	522	6.7	0.85	502	0.87	
School/Church	108	9.6	4.45	104	4.54	
Social and Recreational	576	12.0	1.79	554	1.83	
Other	31	22.6	10.86	30	11.07	