CHICAGO REGIONAL HOUSEHOLD TRAVEL INVENTORY

FINAL REPORT

PREPARED FOR

CHICAGO METROPOLITAN AGENCY FOR PLANNING

TRAVEL TRACKER SURVEY

Your Travel Counts!

Prepared by
NuStats
206 Wild Basin Road ▪ Building A, Suite 300 ▪ Austin, Texas 78746
(512) 306-9065 ▪ fax (512) 306-9077
w w w . n u s t a t s . c o m

Contact: Stacey Bricka, Vice President of Research
sbricka@nustats.com
512-306-9065, Extension 2240

NuStats
A PTV Group Company

TABLE OF CONTENTS

Introduction **4**

Sample Methods **5**

Design 5

Sampling Frame 6

Sample Stratification 6

Sample Size and Distribution 10

Final Sample Composition 11

Weight Calculations 13

Sampling Weight 13

Adjustment for Unknown Eligibility and Non-Response 17

Adjustment for Multiple Phone Numbers 20

Dual Sampling Frame Weight 21

Raking Adjustment 21

Final Household Weight 24

Expansion 24

Response Rates 24

Survey Promotions 26

Survey Methods **27**

Data Collection Overview 27

Pilot Test 27

White Papers 32

Peer Review 35

Survey Process and Procedures 37

Advance Notification Mailing 37

Recruitment Interview 37

Placement of Materials 38

Reminder Calls 38

Retrieval Interviews 38

Processing 39

Geocoding 39

Quality Standards 41

Non-Response Assessment 41

Unit Non-Response 41

Item Non-Response 43

Results **44**

Demographic Characteristics 47

Household Characteristics 47

Person Characteristics 51
Travel Behavior Characteristics 59
Household Trip Rates 59
Person Trip Rates 64
Trip Characteristics 68

INTRODUCTION

The Chicago Regional Household Travel Inventory (CRHTI) is a comprehensive study of the demographic and travel behavior characteristics of residents in the greater Chicago area. Sponsored by the Chicago Metropolitan Agency for Planning (CMAP), the Northwestern Indiana Regional Planning Commission (NIRPC), and the Illinois and Indiana Departments of Transportation, the study universe is defined as households residing in the Illinois counties of Cook, DuPage, Grundy, Kane, Kendall, Lake, McHenry, and Will and in the Indiana counties of Lake, LaPorte, and Porter.

The primary objective of the study was to provide data for the continuing development and refinement of the regional travel demand forecast models. Data were obtained using standard travel survey methods through the Travel Tracker Survey. This survey entailed the collection of activity and travel information for all household members regardless of age during a randomly assigned 24-hour or 48-hour period. The survey relied on the willingness of regional households to (1) provide demographic information about the household, its members and its vehicles and (2) have all household members record all travel and activity for the travel period, including address information for all locations visited, trip purpose, mode, and travel times.

The study began with design activities in the summer of 2006, followed by a pilot study in the fall of 2006. The full study ran from January 2007 through March 2008. In total, 25,845 households were recruited to participate in the study and 14,390 provided travel data. The overall response rate, calculated according to standards established by the Council of American Survey Research Organizations, was 11% (this included a 19% recruitment rate and a 56% retrieval rate). The CASRO formula for calculating response rates considers the number of households recruited divided by the number of eligible sample plus a portion of the eligibility unknown sample assumed to become eligible if dialing continued. Although this formula assumes a proportion of the eligibility unknown sample in the denominator, it does not include a similar consideration in the numerator, resulting in an under-stated response rate. A simple calculation of the number recruited to number eligible indicates a recruitment rate of 53%, with an overall response rate of 30% (53% times 56% retrieval rate). Thus, the true response rate lies somewhere between 10% and 30%.

The CRHTI was designed by a team of consultants, led by NuStats. NuStats led the survey design effort, managed data collection, processed and geocoded the data, provided quality control and assurance, summarized the survey data, and created the weighting and expansion factors. PTV DataSource conducted the telephone interviews and mailed the travel log packets. GeoStats fielded the GPS survey supplement and prompted-recall survey. PB Consult updated the inventory with modeling-enhanced data and conducted independent assessments of the data quality. In addition, the project team included independent consultants: Mark Bradley, Dr. Chandra Bhat, Mary Kay Christopher, and Keith Lawton; and input from an expert peer panel.

This report documents the methods and implementation of the Travel Tracker Survey, the main tool for populating the CRHTI, and summarizes the contents of the inventory. Additional reports include a data user's manual and an independent report on the GPS study.

SAMPLE METHODS

The purpose of the CRHTI was to document the demographic and travel behavior characteristics of the region, from which inferences can be drawn to inform the regional travel demand modeling process. The purpose of the sampling design was to guide data collection such that sufficient samples were obtained and that the documented characteristics obtained from that sample were representative of the study region.

The particular concerns in this region were to ensure that sufficient transit-using households were sampled, to minimize non-response among minority households, and to minimize coverage bias associated with the limitations of RDD sample. To address these concerns, the stratified probability sample of households was drawn based on an index reflecting population density and access to transit, using a disproportionate sampling approach to over-sample census tracts with high proportions of minorities. To minimize coverage bias, a dual sampling frame was used, combining the traditional RDD sample with an address-based sample.

DESIGN

Given the study objectives of providing statistically valid data for the development and refinement of regional travel demand forecast models, it was necessary to design a sampling approach reflective of the full diversity of behavioral determinants of travel activity. The survey population was defined as all households residing in the CMAP modeling area, currently defined by eight Illinois counties: Cook, DuPage, Grundy, Kane, Kendall, Lake, McHenry, and Will, and the NIRPC modeling area (Lake, LaPorte, and Porter counties in Indiana). The population or the study universe is thus comprised of over 3.2 million households, distributed across the counties as shown in Table S-1.

TABLE S-1: COUNTIES IN THE STUDY AREA

County	Total Households	% of Total Households in Study Area
Cook (IL)	1,974,181	61.4%
DuPage (IL)	325,601	10.1%
Grundy (IL)	14,293	0.4%
Kane (IL)	133,901	4.2%
Kendall (IL)	18,789	0.6%
Lake (IL)	216,297	6.7%
McHenry (IL)	89,403	2.8%
Will (IL)	167,542	5.2%
Lake (IN)	181,589	5.7%
Porter (IN)	41,086	1.3%
La Porte (IN)	54,721	1.7%
Total	3,217,403	100.0%

Source: Census 2000.

Sampling Frame

A dual frame sampling approach, combining the strengths of Random Digit Dialing (RDD) with the complete coverage of the Directory/Address-based samples, was employed in this study. This approach provided a more comprehensive coverage of the study area, more accuracy in locating the survey universe and higher efficiency in contacting the households in the survey universe.

Traditional RDD samples are biased towards upper income homeowners with a long tenure in the region and landline telephones. The dual-frame approach includes address-based sample to capture low-income, minority, renters, new residents, and cell-only households. An address-based sample is a random sample of all residential addresses that receive US Mail delivery. This sample may or may not have the resident's name or phone number. Its main advantage is its reach into population groups that typically participate at lower-then-average levels, largely due to RDD sample coverage bias. The main disadvantage is that the recruitment of households without traditional telephone service is passive – respondents must open the mailing and respond via mail, web, or telephone (calling in) in order to participate in the survey.

The RDD portion of the sampling frame included a random sample of all residential telephone numbers in the region and provided access to the majority of residents in the region. RDD sample includes both "listed" and "unlisted" sample. The "listed" sample includes all telephone numbers for which the name and address associated with that telephone number are known. The "unlisted" sample is comprised of telephone numbers for which there is no associated name or address. The advantage to RDD sample is its efficiency in conducting the survey effort – being able to directly reach households and secure their participation in the survey in a direct and active approach. The disadvantages of RDD sample are that it does not include households with non-traditional telephone service (i.e., cellular-only service) and, for the unlisted sample, the geographic location of the household is not known until after the household has been contacted and agrees to participate.

Sample Stratification

To support future model expansion into activity- or tour-based models, a census tract stratification variable was developed to reflect the environment in which travel took place (defined by population and job densities – with higher densities reflecting the more urbanized portions of the region) and the level of transit services (both bus and rail) available. These measures included:

- Population density – inhabitants per square mile
- Job density – jobs per square mile
- CTA train stations within tract
- METRA and South Shore (NICTD) stations within tract
- CTA bus miles of service in tract
- PACE bus miles of service in tract
- Bus miles of service in tract provided by local carriers in the three Indiana counties

Stratification that considers the environment in which travel takes place is highly relevant to the development of a valid model. Studies show that levels of non-motorized travel are higher in higher density areas, as there are more destinations within walking or biking distance, while travel in the lower density areas tends to be predominantly by auto and include higher

proportions of trip chaining. In addition, the types of households found in the different settings are related to differences in travel patterns as well. Households with children tend to settle in the lower density areas (suburbs) while those comprised only of workers might be found closer to the areas with high employment densities. To capture the environment of travel, two standardized measures reflecting population and job densities were developed for each census tract, ranging from 0 to 100 for each indicator. To minimize the skew associated with resulting low means and standard deviations, the measures were "capped" at the 95th percentile unstandardized value (thus all values of 95% or above were assigned a value of 100 and the remaining tracts were scaled accordingly from 0 to 100.

In a region with a full range of transportation options (from non-motorized travel to auto travel to viable transit options), model validity requires sufficient samples from travelers using each mode. Transit service in the region includes both bus (Pace and CTA in the CMAP region, local providers in the NIRPC region) and rail (CTA and Metra/South Shore Railroad), with significant overlap of services in the census tracts nearest to downtown Chicago and very little overlap in the outlying census tracts. To identify the availability of the different transit options, the transit bus routes and rail stations were imported into VISUM. For each census tract, two variables were created: a level of service variable and an access to transit variable. These were created as follows:

- Level of transit service variable was determined by calculating the length of the bus lines that were located within each census tract. This measure of length was divided by the size of the census tract to provide a level of service measure for each census tract reflective of the size of the census tract.
- Access to transit was determined by calculating the fraction of the area of the census tract intersected by buffers of size 0.5 miles around CTA rail stops and 1 mile around the METRA/South Shore Railroad stations.

Each census tract in the region received values of 0 to 100 in each of the four variables of interest. The following tables show the four variables standardized with the capping of the maximum value at the 95th percentile for both the Illinois and the Indiana County groups.

TABLE S-2: STRATIFICATION VARIABLES FOR THE ILLINOIS COUNTIES

Variable	Minimum	Maximum	Mean	St. Dev.
Population density	0	100	31.6	28.9
Job density	0	100	26.5	26.3
Level of service	0	100	21.0	19.4
Access to service	0	100	13.3	19.0

TABLE S-3: STRATIFICATION VARIABLES FOR THE INDIANA COUNTIES

Variable	Minimum	Maximum	Mean	St. Dev.
Population density	0.4	100	33.4	29.0
Job density	0.3	100	34.2	28.5
Access to bus service	0	100	21.1	30.6
Access to train service	0	100	16.2	25.4

Using the standardized scales, an overall density scale that combined population and job density with equal weights was created and standardized to the 0 to 100 scale. Similarly, an overall service scale to combine the level of transit service and the access to transit service scales was also created. Finally, a final stratification index was assigned to each census tract that reflected the combined influence of both the overall density scale and the overall service scale.

This final stratification index was then divided into five categories, which were then mapped (see Figures S-1 and S-2). The resulting index had five levels, reflecting the combined influence of densities and transit service availability and access, with level 1 having the lowest levels of densities and transit service and level 5 having the highest. As to be expected, the highest levels are concentrated primarily in the urban core with radials that follow the rail service lines out into the surrounding census tracts.

FIGURE S-1: STRATIFICATION OF ILLINOIS COUNTIES

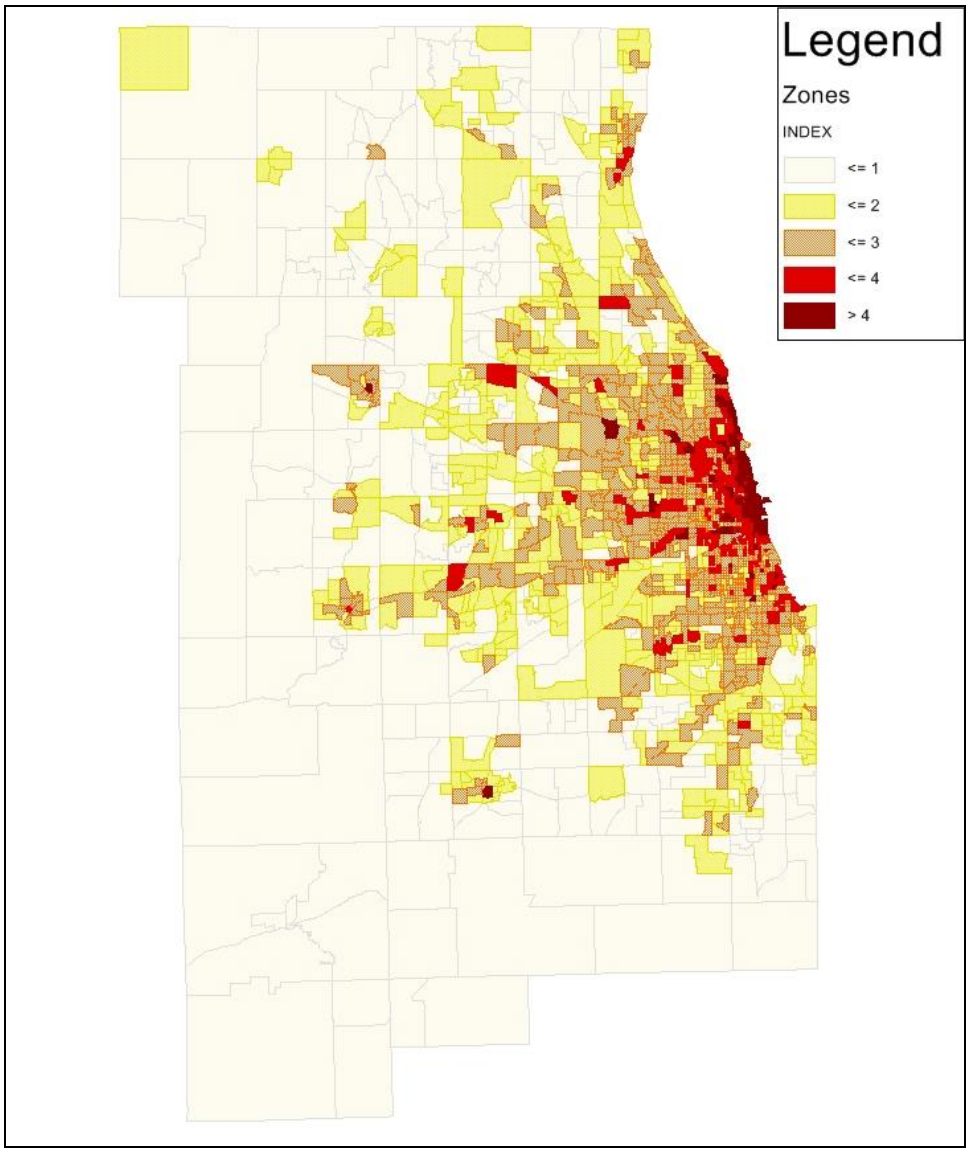
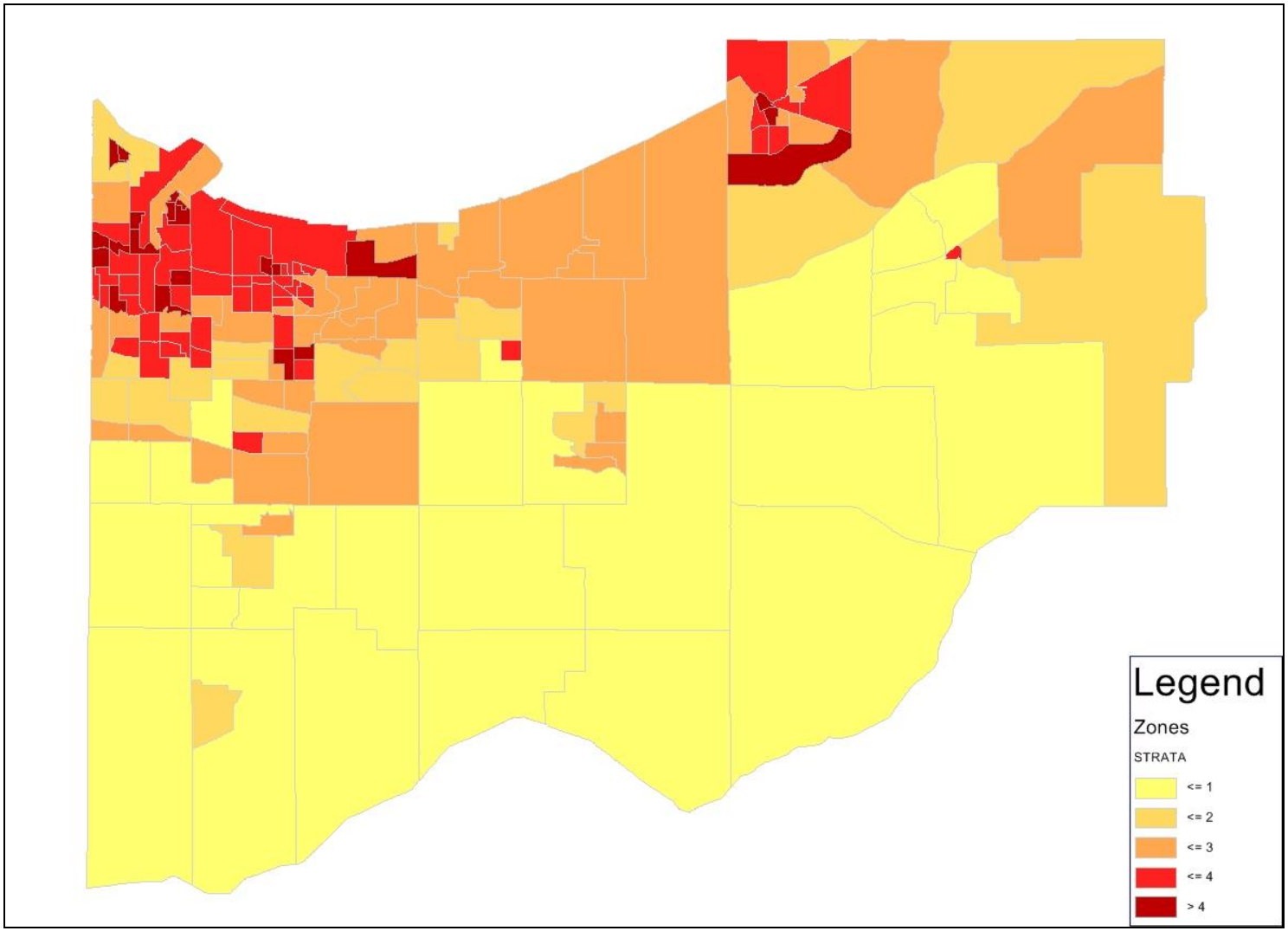


FIGURE S-2: STRATIFICATION OF INDIANA COUNTIES



Sample Size and Distribution

The anticipated distribution of the 10,600 surveys for the Illinois counties and the 3,750 surveys for the Indiana counties (14,350 surveys total) based on Strata and County are shown in Tables S-4 and S-5.

TABLE S-4: SURVEY GOALS BY STRATA

Strata	Total Households	% of Total Households	# of Surveys	% of Surveys
1	715,083	22.23%	3,054	21.28%
2	820,187	25.49%	3,430	23.90%
3	984,262	30.59%	4,378	30.51%
4	432,134	13.43%	2,198	15.32%
5	265,737	8.26%	1,290	8.99%
Total	3,217,403	100%	14,350	100%

TABLE S-5: SURVEY GOALS BY COUNTY

County	Total Households	% of Total Households	# of Surveys	% of Surveys
Cook (IL)	1,974,181	61.4%	7,364	51.31%
DuPage (IL)	325,601	10.1%	890	6.20%
Grundy (IL)	14,293	0.4%	63	0.44%
Kane (IL)	133,901	4.2%	416	2.90%
Kendall (IL)	18,789	0.6%	57	0.40%
Lake (IL)	216,297	6.7%	953	6.64%
McHenry (IL)	89,403	2.8%	316	2.20%
Will (IL)	167,542	5.2%	542	3.78%
Lake (IN)	181,589	5.7%	2,454	17.10%
Porter (IN)	41,086	1.3%	555	3.87%
La Porte (IN)	54,721	1.7%	740	5.16%
Total	3,217,403	100%	14,350	100%

FINAL SAMPLE COMPOSITION

The following tables show the unweighted distribution of the 14,390 completed interviews with respect to strata and county goals. The distribution of participating households across the region is shown in Figure S-3.

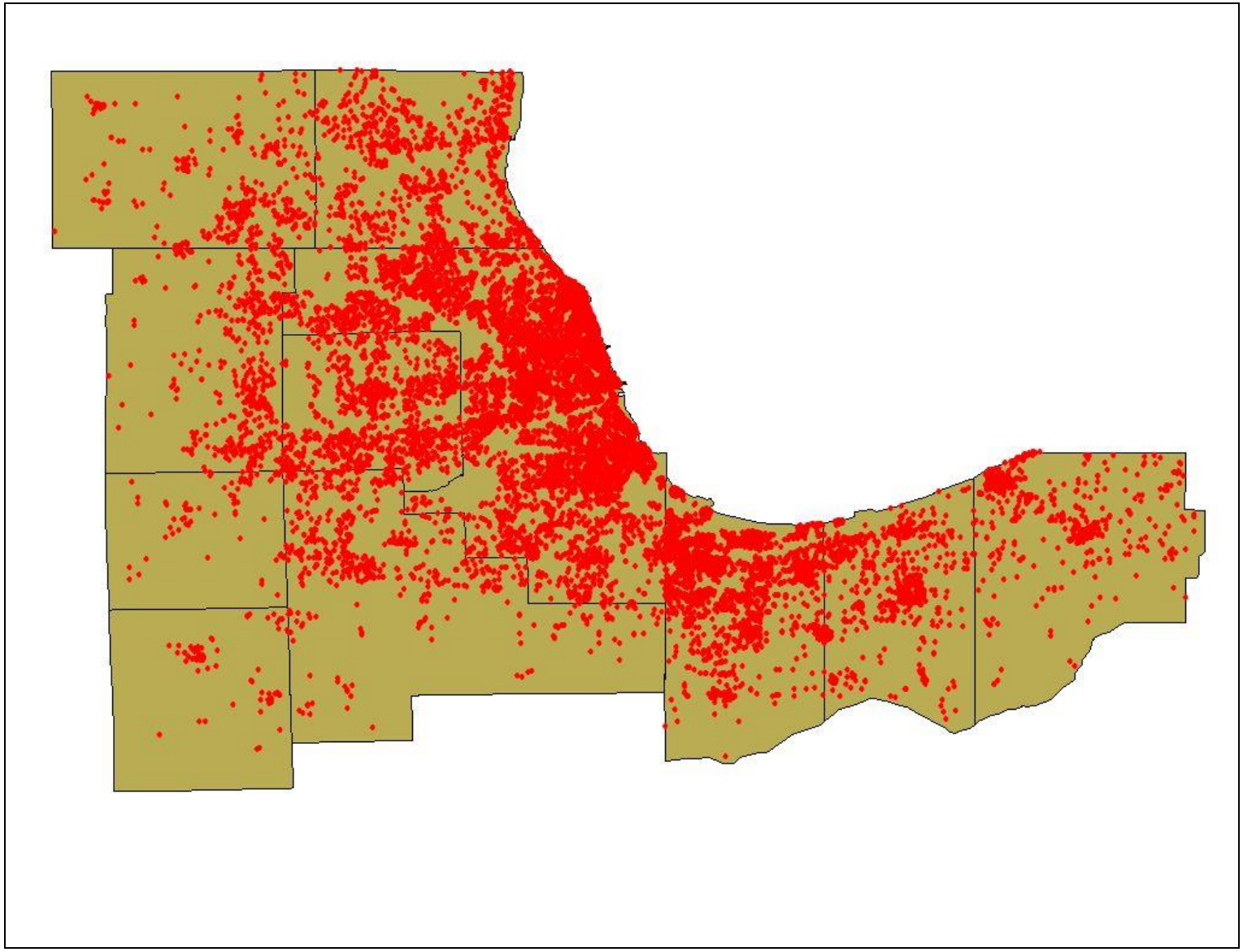
TABLE S-6: ACTUAL SURVEYS BY STRATA

Strata	Goal	% of Total	Actual	% of Total
1	3,054	21.28%	3,087	21.46%
2	3,430	23.90%	3,448	23.97%
3	4,378	30.51%	4,498	31.25%
4	2,198	15.32%	2,267	15.75%
5	1,290	8.99%	1,090	7.57%
Total	14,350	100%	14,390	100%

TABLE S-7: ACTUAL SURVEY BY COUNTY

County	Goal	% of Total	Actual	% of Total
Cook (IL)	7,364	51.31%	6,986	48.55%
DuPage (IL)	890	6.20%	994	6.91%
Grundy (IL)	63	0.44%	67	0.47%
Kane (IL)	416	2.90%	463	3.22%
Kendall (IL)	57	0.40%	73	0.51%
Lake (IL)	953	6.64%	988	6.87%
McHenry (IL)	316	2.20%	369	2.57%
Will (IL)	542	3.78%	612	4.26%
Lake (IN)	2,454	17.10%	2,484	17.27%
Porter (IN)	555	3.87%	549	3.82%
La Porte (IN)	740	5.16%	805	5.60%
Total	14,350	100%	14,390	100%

FIGURE S-3: DISTRIBUTION OF PARTICIPATING HOUSEHOLDS



WEIGHT CALCULATIONS

A household-level weight was developed for the CHRTI in order to account for the following:

- Sampling weight – to adjust for probabilities of selection of a phone number or an address from the sampling frame,
- Adjustment for unknown eligibility and nonresponse – to compensate for differing patterns of eligibility and response,
- Dual frame sampling weight – to adjust for bias associated with combining the RDD and address-based sampling frame,
- Raking adjustment – to align the weighted sample to known population distribution from 2000 Census data.

These factors adjust the relative importance of responses to reflect the different probabilities of selection of respondents, reduce bias in inventory estimates from differing patterns of eligibility and response, adjust for bias associated with combining two sampling frames, and align the sample distributions to population distributions thereby improving coverage and precision. Details about each are provided in this section.

Sampling Weight

The sampling weight reflects the probability of selection of a telephone number or an address from the sampling frame. Considering the dual sampling framework employed in this study, separate sampling weights were calculated for the RDD and the address-based sampling frame[1]. Specifically, the sampling weight for a sampling unit *j* in the sampling frame, selected from a stratum *i*, denoted as $W_{ij,SampFr}$, is simply the reciprocal of the selection probability of the sampling unit for the corresponding sampling stratum.

$$W_{ij,SampFr} = \frac{1}{\text{Prob}_{ij,SampFr}}$$

where,

Sampling unit *j* is a telephone number in the RDD sampling frame or an address in the address-based sampling frame,

Sampling frame $_{SampFr}$ is either the RDD sampling frame or the address-based sampling frame,

Stratum *i* is defined by cross-classifying the pre-defined strata and county of residence.

Sampling Weight for CMAP Study area

Table S-8 presents the sampling weights for the RDD sampling frame. A comparison of the percentage of phone numbers in the population and sample in Table S-8 indicates an over-sampling of telephone numbers in areas within Strata 3, 4 and 5.

Strata 3, 4 and 5 have higher levels of population and employment density, transit service availability and access. In addition, Strata 3 and 4 have higher densities of minorities including African-American households, Hispanic households, and low-income households with household

[1] It is important to note that the phone numbers were disproportionately drawn from the RDD and address-based sampling frame based on pre-defined strata. The pre-defined strata were based on a composite measure that captured the population and job densities.

income less than $25,000. Further, Strata 4 and 5 have the highest density of young households with age of the householder less than 25 years of age.

The sampling weights for the address-based sampling frame are presented in Table S-9, reflecting an oversampling of areas in Strata 3 and 4 that have higher densities of minorities as described above. In addition, these strata have the higher levels of population and employment density, transit service availability and access.

TABLE S-8: SAMPLING WEIGHTS FOR RDD SAMPLING FRAME - CMAP STUDY AREA[2]

Stratum	County	Telephone numbers in Population[3]		Telephone numbers in Sample		Sampling Weight
		Frequency	Percent	Frequency	Percent	
1	Cook	203,779	7%	1,658	6%	122.91
	DuPage	94,190	3%	845	3%	111.47
	Grundy	17,315	1%	109	<1%	158.85
	Kane	94,231	3%	940	3%	100.25
	Kendall	35,432	1%	150	1%	236.21
	Lake	126,428	4%	1,003	3%	126.05
	McHenry	87,433	3%	717	2%	121.94
	Will	168,892	6%	1,166	4%	144.85
2	Cook	441,036	15%	3,483	12%	126.63
	DuPage	167,292	6%	1,836	6%	91.12
	Kane	35,253	1%	366	1%	96.32
	Lake	84,298	3%	863	3%	97.68
	McHenry	20,914	1%	115	<1%	181.86
	Will	45,362	2%	315	1%	144.01
3	Cook	633,539	22%	7,133	24%	88.82
	DuPage	74,538	3%	641	2%	116.28
	Kane	31,979	1%	103	<1%	310.48
	Lake	32,491	1%	441	1%	73.68
	McHenry	1,632	<1%	0	0%	0
	Will	11,050	<1%	67	<1%	164.93
4	Cook	286,273	10%	4,000	13%	71.57
	DuPage	7,664	<1%	68	<1%	112.71
	Kane	357	<1%	0	0%	0
	Lake	1,903	<1%	25	<1%	76.12
5	Cook	237,263	8%	3,809	13%	62.29
	Kane	879	<1%	0	0%	0
	Will	800	<1%	0	0%	0
Total		2,942,223	100%	29,853	100%	

[2] It is important to note that the sample was drawn (proportional to the total number of households) by strata and not by a combination of strata and county. Hence, certain counties such as McHenry county in stratum 3, Kane county in stratum 4, and Kane and Lake counties in stratum 5, that have lower number of telephone numbers in the population compared to other areas do not have any sample drawn from the population.

[3] The population refers to the total working residential numbers in the RDD sampling frame in the Chicago study area.

The sampling weight adjusts for the bias associated with high probability of selection of phone numbers or addresses in over-sampled areas, and low probability of selection of phone numbers in under-sampled areas.

TABLE S-9: SAMPLING WEIGHTS FOR ADDRESS-BASED SAMPLING FRAME - CMAP STUDY AREA

Stratum	County	Addresses in Population[4]		Addresses in Sample		Sampling Weight
		Frequency	Percent	Frequency	Percent	
1	Cook	112,975	7%	18,988	6%	5.95
	DuPage	50,837	3%	5,026	1%	10.11
	Grundy	11,253	1%	1,895	1%	5.94
	Kane	53,446	3%	5,278	2%	10.13
	Kendall	19,270	1%	1,743	1%	11.06
	Lake	75,902	5%	9,922	3%	7.65
	McHenry	51,931	3%	5,887	2%	8.82
	Will	91,392	6%	11,548	3%	7.91
2	Cook	242,049	15%	55,702	16%	4.35
	DuPage	87,196	5%	11,522	3%	7.57
	Kane	17,970	1%	2,705	1%	6.64
	Lake	48,904	3%	8,460	2%	5.78
	McHenry	12,816	1%	1,987	1%	6.45
	Will	21,044	1%	4,690	1%	4.49
3	Cook	360,678	22%	121,521	35%	2.97
	DuPage	39,654	2%	6,309	2%	6.29
	Kane	16,310	1%	3,169	1%	5.15
	Lake	18,544	1%	3,905	1%	4.75
	McHenry	1,013	0%	188	0%	5.39
	Will	6,098	0%	1,314	0%	4.64
4	Cook	157,359	10%	46,768	14%	3.36
	DuPage	4,718	0%	742	0%	6.36
	Kane	97	0%	16	0%	6.06
	Lake	884	0%	385	0%	2.3
5	Cook	107,705	7%	14,566	4%	7.39
	Kane	298	0%	58	0%	5.14
	Will	424	0%	82	0%	5.17
Total		1,610,767	100%	344,376	100%	

[4] The population refers to the total residential addresses in the Address-based sampling frame in the Chicago study area.

Sampling Weight for NIRPC Study area

Table S-10 presents the sampling weights for the RDD sampling frame. A comparison of the percentage of phone numbers in the population and sample in Table S-10 indicates an over-sampling of telephone numbers in Strata 3, 4 and 5.

These strata have higher levels of population and employment density, transit service availability and access. In addition, Strata 3 and 4 have higher densities of African-American households and Hispanic households. Stratum 4 has the highest density of low-income households with household income less than $25,000, while Strata 3 and 5 have the highest density of young households with age of the householder less than 25 years of age.

TABLE S-10: SAMPLING WEIGHTS FOR RDD SAMPLING FRAME - NIRPC STUDY AREA

Stratum	County	Telephone Numbers in Population[5]		Telephone Numbers in Sample		Sampling Weight
		Frequency	Percent	Frequency	Percent	
1	Lake	27,804	10%	434	9%	64.06
	La Porte	13,070	4%	276	6%	47.36
	Porter	18,041	6%	240	5%	75.17
2	Lake	30,177	10%	695	14%	43.42
	La Porte	8,553	3%	16	0%	534.56
	Porter	14,019	5%	141	3%	99.43
3	Lake	52,126	18%	469	10%	111.14
	La Porte	10,055	3%	393	8%	25.59
	Porter	28,692	10%	691	14%	41.52
4	Lake	51,555	18%	984	20%	52.39
	La Porte	7,932	3%	0	0%	0
	Porter	1,763	1%	0	0%	0
5	Lake	24,921	9%	457	9%	54.53
	La Porte	3,585	1%	95	2%	37.74
Total		292,293	100%	4,891	100%	

The sampling weights for the address-based sampling frame are presented in Table S-11. The table indicates oversampling of areas in strata 4 and 5 that have higher densities of minorities described above. In addition, these strata have the higher levels of population and employment density, transit service availability and access.

[5] The population refers to the total working residential numbers in the RDD sampling frame in the NIRPC study area.

TABLE S-11: SAMPLING WEIGHTS FOR ADDRESS-BASED SAMPLING FRAME - NIRPC STUDY AREA

Stratum	County	Addresses in Population[6]		Addresses in Sample		Sampling Weight
		Frequency	Percent	Frequency	Percent	
1	Lake	18,956	11%	6,019	8%	3.15
	La Porte	8,472	5%	2,215	3%	3.82
	Porter	12,104	7%	2,914	4%	4.15
2	Lake	20,166	11%	6,955	9%	2.9
	La Porte	5,846	3%	2,081	3%	2.81
	Porter	8,472	5%	3,034	4%	2.79
3	Lake	30,068	17%	11,838	15%	2.54
	La Porte	6,645	4%	3,234	4%	2.05
	Porter	17,017	10%	6,501	8%	2.62
4	Lake	29,633	17%	19,001	24%	1.56
	La Porte	4,861	3%	2,552	3%	1.9
	Porter	1,054	1%	649	1%	1.62
5	Lake	13,791	8%	11,467	14%	1.2
	La Porte	2,018	1%	1,771	2%	1.14
Total		179,103	100%	80,231	100%	

Adjustment for Unknown Eligibility and Non-Response

Weight adjustments are necessary to minimize the potential bias due to unknown eligibility of telephone numbers/addresses and nonresponse. In order to apply the adjustments due to unknown eligibility and non-response, the sample was first divided into four categories based on the sample dispositions[7]. These categories for the RDD sampling frame were:

1. Eligible respondents – All telephone numbers known to be eligible households (i.e. residing within the study area) that participated in the survey.
2. Eligible non-respondents – All telephone numbers known to be eligible households that did not participate in the survey.
3. Ineligible – All ineligible telephone numbers (such as disconnected numbers, numbers belonging to government agencies, modem/fax numbers etc.)
4. Phone numbers with unknown eligibility – All telephone numbers with undetermined eligibility status (such as answering machine, no answer on repeated calls, etc)

Next, adjustments for unknown eligibility and nonresponse were calculated in two stages. In the first stage, the weighted telephone numbers with unknown eligibility status was distributed proportionately over the weighted telephone numbers with known eligibility status (including eligible respondents, eligible non-respondents and ineligible numbers). Thus, for each cell *h*, the adjustment for unknown eligibility, denoted as $NR1_h$ was calculated as ratio of the total sum of

[6] The population refers to the total residential addresses in the Address-based sampling frame in the NIRPC study area.
[7] These categories were based on the call dispositions for RDD sampling frame and mail and/or call dispositions for the Address-based sampling frame.

weighted cases (representing both eligible and ineligible cases) to the weighted sum of cases with known eligibility.

$$NR1_h = \frac{\sum_{ER} W_{jh} + \sum_{ENR} W_{jh} + \sum_{IE} W_{jh} + \sum_{UK} W_{jh}}{\sum_{ER} W_{jh} + \sum_{ENR} W_{jh} + \sum_{IE} W_{jh}}$$

Where,

h	Adjustment cell (*i.e.* Sampling frame in this case)
W_j	Sampling Weight for telephone number *j*
ER	Eligible Respondent
ENR	Eligible Non-Respondent
IE	Ineligible Telephone number
UK	Phone Number with Unknown Eligibility

Similarly, the sample drawn from the address-based frame was first divided into four categories based on mail and/or call dispositions, following which the adjustments for unknown eligibility and nonresponse were calculated. Table S-12 presents the adjustments for unknown eligibility by study area and sampling frame. The table shows that when the adjustments were applied, the weights of the telephone numbers/addresses with unknown eligibility status were distributed proportionally to the other three categories. This adjusts for the bias associated with failure to account for the cases with unknown eligibility status.

TABLE S-12: ADJUSTMENTS FOR UNKNOWN ELIGIBILITY

Study Area	Sampling Frame	Eligibility Status	Weighted Sample[8]	Adjustment for Unknown Eligibility	Adjusted Sample
CMAP	RDD	Eligible Respondents	28,485	2.24395	63,918
		Eligible Non-respondents	153,120	2.24395	343,593
		Ineligible	1,127,941	2.24395	2,531,044
		Unknown Eligibility Status	1,629,010	0	-
		Total	**2,938,556**		**2,938,555**
	Address-based	Eligible Respondents	52,488	3.96400	208,063
		Eligible Non-respondents	161,457	3.96400	640,017
		Ineligible	192,404	3.96400	762,688
		Unknown Eligibility Status	1,204,418	0	-
		Total	**1,610,767**		**1,610,768**
NIRPC	RDD	Eligible Respondents	4,955	1.91665	9,497
		Eligible Non-respondents	24,404	1.91665	46,775
		Ineligible	118,084	1.91665	226,327
		Unknown Eligibility Status	135,154	0	-
		Total	**282,597**		**282,599**
	Address-based	Eligible Respondents	9,141	3.16312	28,914
		Eligible Non-respondents	25,592	3.16312	80,952
		Ineligible	21,889	3.16312	69,238
		Unknown Eligibility Status	122,480	0	-
		Total	**179,102**		**179,104**

[8] The sample cases were weighted by the 'sampling weight'.

In the second stage, an adjustment for the bias associated with non-response was made by applying an adjustment factor, denoted as $NR2_h$ that is the ratio of sampled eligible cases (including responding and non-responding cases) to those that completed the survey, as shown in the formula below:

$$NR2_h = \frac{\sum_{ER}(W_{jh} * NR1_h) + \sum_{ENR}(W_{jh} * NR1_h)}{\sum_{ER}(W_{jh} * NR1_h)}$$

Where,

h	Adjustment cell (*i.e.* Sampling frame in this case)
W_j	Sampling Weight for telephone number/address *j*
$NR1_h$	Adjustment for unknown eligibility for adjustment cell, *h*
ER	Eligible Respondent
ENR	Eligible Non-Respondent

Table S-13 presents the adjustments for non-response by study area and sampling frame. The application of the adjustment factor increased the number of eligible respondents in the RDD and address-based sampling frames respectively.

TABLE S-13: ADJUSTMENTS FOR NONRESPONSE

Study Area	Sampling Frame	Eligibility Status	Weighted Sample[9]	Adjustment for Non-response	Adjusted Sample
CMAP	RDD	Eligible Respondents	63,918	6.37553	407,511
		Eligible Non-respondents	343,593	0	-
		Ineligible	2,531,044	1.00000	2,531,044
		Unknown Eligibility Status	-	-	-
		Total	**2,938,555**		**2,938,555**
	Address-based Sampling Frame	Eligible Respondents	208,063	4.07607	848,080
		Eligible Non-respondents	640,017	0	-
		Ineligible	762,688	1.00000	762,688
		Unknown Eligibility Status			
		Total	**1,610,768**		**1,610,768**
NIRPC	RDD	Eligible Respondents	9,497	5.92524	56,272
		Eligible Non-respondents	46,775	0	-
		Ineligible	226,327	1.00000	226,327
		Unknown Eligibility Status			
		Total	**282,599**		**282,599**
	Address-based Sampling Frame	Eligible Respondents	28,914	3.79975	109,866
		Eligible Non-respondents	80,952	0	-
		Ineligible	69,238	1.00000	69,238
		Unknown Eligibility Status			
		Total	**179,104**		**179,104**

Adjustment for Multiple Phone Numbers

The adjustment for multiple phone numbers accounted for the high probability of selection associated with households with more than one landline. This adjustment factor, applicable to the RDD sampling frame only, is the reciprocal of the number of landlines owned by the household.

Typically, a weighting factor of 1 is assigned to households reporting only one landline in the household, and an adjustment factor of ½ is assigned to households with more than one telephone number. However, considering the percentage of households that own three or more phone numbers (about 7%), adjustment factors were assigned depending upon the number of landlines owned by the household. In particular, an adjustment factor of 1 was assigned to household reporting one landline, ½ to households reporting two landlines, and 1/3 to household reporting three or more landlines.

The application of the adjustment factor decreased the number of eligible respondents in the RDD sampling frame to 352,085 and 48,048 for Chicago and NIRPC study area respectively.

[9] The sample cases were weighted by the 'sampling weight' and 'adjustment for unknown eligibility'.

Dual Sampling Frame Weight

The dual sampling frame weight was calculated to adjust for households that had a higher probability of being selected in both the RDD and address-based sampling frame. In particular, there was a higher probability that households meeting the following scenarios were present in both frames: (1) Households with more than one listed landline in address-based frame, (2) Household with one or more unlisted landlines in the address-based frame, and (3) Households with more than one landline in the RDD frame. To illustrate, suppose a household from an address-based frame when matched with a telephone directory showed that the household owned a listed landline, while the survey data indicated that they owned two landlines. Clearly, the other landline is unlisted and there is a high probability of this household being selected in the RDD sampling frame (that includes both listed and unlisted landlines). Thus, while we can check for duplicates between RDD and Address-based sampling frame based on listed landline numbers, we cannot account for the unlisted landlines (due to lack of information on the unlisted landline number). Following the weighting approach used by *Brick et. al.* (2006), a simple composite dual sampling weight of 0.5 was applied to the households that meet one of the aforementioned scenarios.

Raking Adjustment

Raking improves the reliability of the survey estimates. Hence, raking adjustments were used to align the weighted sample to the 2000 Census data using iterative proportionate fitting. In particular, the aforementioned dual sampling composite weights were adjusted so that the sums of the adjusted weights were equal to known population totals from Census for certain subgroups of the population defined by demographic characteristics and geographic variables. The variables used for raking were as follows:

- Household size (one, two, three, four, five, six or more)
- Household income (6 categories)
- Ethnicity (Hispanic, non-Hispanic)
- Race (White, African-American, Other)
- Age of the householder (less than 20 years, 20 – 24 years, 25 – 54 years, 55 – 64 years, 65 years or older)
- Strata (including the 5 pre-determined strata)
- County of residence

The above variables were chosen as the raking variables due to significant differences in the coverage by categories of these variables, and hence maximum bias reduction would be achieved using these variables. It is important to note that to calculate the raking adjustments, the missing values in the raking variables were imputed.[10]

The raking procedure was based on an iterative proportional fitting procedure and involved simultaneous ratio adjustments to two or more marginal distributions of the population counts. The raking procedure was carried out in a sequence of adjustments. First, the base weights were adjusted to one marginal distribution and then to the second marginal distribution, and so on. One sequence of adjustments to the marginal distributions is known as a cycle or iteration. The procedure was repeated until convergence was achieved. For this study, 30 complete iterations were conducted to produce the final combined weight.

[10] The missing values in the household income variable were imputed by taking the average of the income of households with similar demographic characteristics i.e. household size, household vehicle ownership, and home ownership status, and similar area of residence i.e. strata and county. Similarly, the missing values of age of the householder were imputed based on employment status, retirement status, presence of children in the household, and education status of similar households.

Following the raking procedure, the inordinately large weights, a by-product of raking, were trimmed. These very large weights tend to substantially increase sampling errors. Thus, by not allowing weights to get too large, sampling errors are reduced although there is some loss in the bias reduction due to nonresponse adjustment and raking. It is important to note that trimming is used to reduce very large weights only and does not edit the data in any way. In particular, the 'very large' weights were trimmed to equal a maximum of twelve times the mean weight. After trimming the large weights, the raking process was repeated to align the survey estimates to the control totals.

Tables S-14 and S-15 show the sample and population distribution by demographic and geographic raking variables for the CMAP and NIRPC study areas respectively. A comparison of the unweighted difference and weighted difference between the survey data and the census indicates that the raking procedure aligned the sample statistics to the population statistics.

TABLE S-14: RAKING VARIABLES FOR CMAP STUDY AREA

Post-Stratification Variables	Unweighted Data[11]	Weighted Data	Census	Unweighted Difference	Weighted Difference
Household Size					
1	32.23%	26.38%	26.39%	5.84%	-0.01%
2	36.83%	28.71%	28.72%	8.11%	-0.01%
3	13.29%	16.00%	16.01%	-2.72%	-0.01%
4	11.36%	14.86%	14.85%	-3.49%	0.01%
5	4.61%	7.97%	7.97%	-3.36%	-0.00%
6+	1.68%	6.08%	6.05%	-4.37%	0.03%
Total	100.0%	100.0%	100.0%		
Household Income					
$0-$19,999	32.23%	26.38%	26.39%	5.84%	-0.01%
$20-$34,999	36.83%	28.71%	28.72%	8.11%	-0.01%
$35-$49,999	13.29%	16.00%	16.01%	-2.72%	-0.01%
$50-$74,999	32.23%	26.38%	26.39%	5.84%	-0.01%
$75-$99,999	36.83%	28.71%	28.72%	8.11%	-0.01%
$100k +	13.29%	16.00%	16.01%	-2.72%	-0.01%
Total	100.0%	100.0%	100.0%		
Ethnicity					
White	78.24%	65.42%	65.50%	12.74%	-0.08%
African American/Black	14.49%	18.93%	18.90%	-4.41%	0.03%
Other	7.27%	15.66%	15.60%	-8.33%	0.06%
Total	100.0%	100.0%	100.0%		
Hispanic					
Yes	4.87%	17.63%	17.20%	-12.33%	0.43%
No	95.13%	82.37%	82.80%	12.33%	-0.43%
Total	100.0%	100.0%	100.0%		
Respondent Age					
<20	0.17%	29.88%	29.50%	-29.33%	0.38%
20 - 24	0.98%	6.69%	6.70%	-5.72%	-0.01%
25 - 54	49.30%	44.90%	45.10%	4.20%	-0.20%
55 – 64	22.84%	7.93%	8.00%	14.84%	-0.07%
65 +	26.71%	10.60%	10.70%	16.01%	-0.10%
Total	100.0%	100.0%	100.0%		

[11] This unweighted statistics include the imputed data.

Strata					
1	22.20%	22.68%	22.70%	-0.50%	-0.02%
2	25.81%	26.28%	26.30%	-0.49%	-0.02%
3	32.17%	30.64%	30.60%	1.57%	0.04%
4	13.30%	12.49%	12.50%	0.80%	-0.01%
5	6.53%	7.91%	7.90%	-1.37%	0.01%
Total	100.0%	100.00%	100.0%		
County					
Cook	66.20%	67.23%	67.15%	-0.95%	0.08%
DuPage	9.41%	11.05%	11.08%	-1.66%	-0.03%
Grundy	0.64%	0.48%	0.49%	0.15%	0.01%
Kane	4.38%	4.54%	4.55%	-0.17%	-0.01%
Kendall	0.69%	0.64%	0.64%	0.05%	0.00%
Lake	9.39%	7.35%	7.36%	2.03%	-0.01%
McHenry	3.50%	3.03%	3.04%	0.46%	-0.01%
Will	5.78%	5.68%	5.70%	0.08%	-0.02%
Total	100.0%	100.00%	100.0%		

TABLE S-15: RAKING VARIABLES FOR NIRPC STUDY AREA

Post-Stratification Variables	Raw Data	Weighted	Census	Raw Difference	Weighted Difference
Household Size					
1	28.22%	24.98%	24.99%	3.23%	-0.01%
2	43.98%	31.83%	31.83%	12.15%	0.00%
3	12.25%	17.40%	17.41%	-5.16%	-0.01%
4	9.98%	14.76%	14.75%	-4.77%	0.01%
5	4.01%	7.00%	7.00%	-2.99%	0.00%
6+	1.56%	4.03%	4.03%	-2.47%	0.00%
Total	100.0%	100.00%	100.0%		
Household Income					
$0-$19,999	11.46%	20.90%	20.90%	-9.44%	0.00%
$20-$34,999	12.87%	18.60%	18.60%	-5.73%	0.00%
$35-$49,999	15.95%	16.70%	16.70%	-0.75%	0.00%
$50-$74,999	26.32%	22.40%	22.40%	3.92%	0.00%
$75-$99,999	18.13%	11.70%	11.70%	6.43%	0.00%
$100k +	15.27%	9.70%	9.70%	5.57%	0.00%
Total	100.0%	100.00%	100.0%		
Ethnicity					
White	87.39%	75.30%	75.30%	12.09%	0.00%
African American/Black	7.58%	18.20%	18.20%	-10.62%	0.00%
Other	5.03%	6.50%	6.50%	-1.47%	0.00%
Total	100.0%	100.00%	100.0%		
Hispanic					
Yes	3.91%	9.40%	9.40%	-5.49%	0.00%
No	96.09%	90.60%	90.60%	5.49%	0.00%
Total	100.0%	100.00%	100.0%		
Respondent Age					
<20	0.16%	29.10%	29.10%	-28.94%	0.00%

20 - 24	0.47%	6.40%	6.40%	-5.93%	0.00%
25 - 54	40.80%	42.80%	42.80%	-2.00%	0.00%
55 – 64	26.68%	9.00%	9.00%	17.68%	0.00%
65 +	31.89%	12.70%	12.70%	19.19%	0.00%
Total	100.0%	100.00%	100.0%		
Strata					
1	19.62%	24.60%	24.60%	-4.98%	0.00%
2	18.92%	22.80%	22.80%	-3.88%	0.00%
3	28.69%	20.60%	20.60%	8.09%	0.00%
4	22.38%	19.40%	19.40%	2.98%	0.00%
5	10.40%	12.60%	12.60%	-2.20%	0.00%
Total	100.0%	100.00%	100.0%		
County					
Lake	64.72%	65.50%	65.50%	-0.78%	0.00%
La Porte	14.30%	19.70%	19.70%	-5.40%	0.00%
Porter	20.97%	14.80%	14.80%	6.17%	0.00%
Total	100.0%	100.00%	100.0%		

Final Household Weight

The final analytic weight was simply the product of sampling weight, adjustment for unknown eligibility, adjustment for non-response, adjustment for multiple phone numbers, dual sampling frame weight, and raking adjustment.

Expansion

The expansion process simply takes the weighted total (10,552 households for CMAP and 3,838 households for NIRPC) and multiplies each household by a factor that, when applied, will produce the household universe of 2,940,704 and 277,396 households for CMAP and NIRPC study area respectively. To derive the expansion factor, simple division was used: Expansion Factor=N (Universe) / N (Surveyed). The expansion factor was 278.69 for CMAP and 72.276 for NIRPC study area.

RESPONSE RATES

Over the course of the recruitment effort, 424,024 telephone numbers were called. Of these:

- 48,811 (12%) resulted in contact with eligible households.
- 91,461 (22%) were determined to be ineligible (non-working, non-household or non-voice lines), and
- 252,000 (59%) were unable to be classified as eligible or ineligible after 5 call attempts, since the CATI sample management program suppressed sample from being dialed as geographic goals were reached.
- A replacement method was used in this sample. Essentially, all eligibility unknown numbers dialed at least 8 times (and which didn't result in a final eligible or ineligible disposition) were replaced with fresh sample. In total 31,752 (7%) were replaced.

Of the eligible households reached, 25,845 of the 48,811 agreed to participate in the study (53%).

Data was collected from all household members for the 14,390 households that completed the study. This is a retrieval rate of 56% (14,390 retrieved / 25,845 recruited). The overall response rate for the study is determined by multiplying the recruitment rate (19% CASRO/53% eligible sample only) by the retrieval rate (56%). For this study, the response rate lies somewhere between 10% and 30%. This means that between 10% and 30% of all households that were initially attempted and/or actually contacted about participation in the Travel Tracker Survey completed all activities associated with the project. Table S-16 shows the relevant statistics for each MPO region and Table S-17 shows the same for each survey type (1-day and 2-day).

TABLE S-16: RESPONSE RATE STATISTICS BY MPO REGION

Statistic	CMAP	NIRPC	Total
Eligible Sample	36,920	11,891	48,811
Ineligible Sample	78,840	12,621	91,461
Unknown Eligibility	198,831	53,169	252,000
Replaced	28,235	3,517	31,752
Total Sample	342,826	81,198	424,024
# Recruits	18,705	7,140	25,845
CASRO Rate	18.6%	18.9%	18.9%
Recr/Elig Rate	50.7%	60.0%	52.9%
# Retrieved	10,522	3,838	14,390
Retrieval Rate	56.3%	53.8%	55.7%
Minimum Resp Rate	10.5%	10.2%	10.5%
Maximum Resp Rate	28.5%	32.3%	29.5%

TABLE S-17: RESPONSE RATE STATISTICS BY SURVEY TYPE

	1-day	2-day	Total
Eligible Sample	25,903	22,908	48,811
Ineligible Sample	46,646	44,815	91,461
Unknown Eligibility	134,204	117,796	252,000
Replaced	16,702	15,050	31,752
Total Sample	223,455	200,569	424,024
# Recruits	13,779	12,066	25,845
CASRO Rate	18.7%	19.2%	18.9%
Recr/Elig Rate	53.2%	52.7%	52.9%
# Retrieved	8,100	6,290	14,390
Retrieval Rate	58.8%	52.1%	55.7%
Minimum Resp Rate	11.0%	10.0%	10.5%
Maximum Resp Rate	31.2%	27.5%	29.4%

SURVEY PROMOTIONS

The promotions program for the CMAP portion of the Travel Tracker Survey was implemented in September 2007. The purpose was to increase the completion rates of respondent groups that had lower response rates than would be consistent with the Chicago population composition per the 2000 Census data. While most promotions projects are cash-based, in this effort, $10 Chicago Transit Authority (CTA) transit cards were offered (one per household member). In order to receive the promotion, qualifying households must have provided travel information for every person in the household. Once it was determined that every household member had complete travel data, CTA Transit cards were mailed to each of those household members.

Respondent households qualified for a promotion if they fit into one of the following categories:

1. Hispanic Origin (either survey type)
2. African-American Household (either survey type)
3. Household with 4 or more members (either survey type)
4. Any Two-Day Household (introduced in the last month of the effort)
5. Any One-Day Household with 3+ members – introduced in last month of the effort)

A total of 1,651 households received survey promotions under this effort, at a cost of $53,920.

SURVEY METHODS

DATA COLLECTION OVERVIEW

The purpose of this section of the report is to review the methods used to conduct the Travel Tracker Survey in support of the Chicago Regional Household Travel Inventory (CHRTI). This includes an overview of the pilot objectives and findings as well as summaries of the white papers developed to guide the final inventory design and vetted at a peer review panel held prior to the start of the full study. This section also includes the final methods and approaches used to compile the inventory.

Pilot Test

The pilot study was conducted in September and October 2006. It served two functions: (1) to objectively assess the effectiveness, efficiency, and appropriateness of all data collection instruments, materials, and procedures, and (2) to provide details that informed the development of the white papers. For this particular study, this included evaluating the advance mailing, recruitment interview, travel logs, mailing procedures, reminder call, data retrieval interview, geocoding, and data processing procedures for three specific population subgroups in the greater Chicago area. The pilot also served to estimate the anticipated response rates (both at the unit and item levels) and sample performance for the full study. In all, the pilot included three specific activities: public outreach, passive recruitment, and data collection.

Public Outreach

The diversity of the greater Chicago area, combined with known extremes in terms of participation rates in prior surveys and the 2000 census, suggested that focused attention on the elements of the public outreach planned for this effort was warranted during the design phase of the study. This effort was guided by the Social Exchange Theory, which states that respondents weigh the costs (time, release of personal information) against the benefits when considering whether to participate in a survey. The costs can be calculated to some extent using survey length and level of detail requested by the survey questions. But given that the purpose of this data is to develop an inventory to be used in travel demand models that forecast travel 20 years into the future, what is the benefit to the respondent? What details are critical to convey in order to balance the survey costs? The public outreach effort during the pilot was used to identify these benefits or "hooks" which were then used to elicit participation across the various respondent groups in the region during the full study.

The public outreach component of the pilot test consisted of the following activities:

1. CMAP External Affairs staff worked with local partners to identify key leaders in the region for the African American, Latinos, and youth communities.
2. Partner agencies contacted these community leaders by phone and invited them (or their designees) to participate in community meetings about the survey effort. NuStats prepared a public information packet for the partner agencies to distribute to these leaders as they discussed participation at the community group meetings.
3. On August 23 and 24, 2006, a series of four community meetings were conducted in Chicago and surrounding areas in order to identify the benefits, "hooks" and design features that would maximize participation among constituents. Each meeting targeted a unique demographic group known to have under-participated in similar studies conducted in other regions. Those demographic groups included African Americans, predominantly Spanish speaking Latinos, predominantly English speaking Latinos and youth ages 18-24.

At these meetings, the project team (NuStats, MKC Consulting and staff from the Chicago Metropolitan Agency for Planning along with the appropriate community group partner) provided a brief introduction to the study, and distributed sample packets of respondent materials (including the advance letters, brochures and travel logs). Participants were asked to read and examine the documents and comment on them, specifically replying to a series of targeted questions designed to elicit details necessary for the planned public outreach effort and the meeting goals. The participants were also asked to complete the travel logs as if the previous day was their assigned travel day (to help them understand the task that would be requested from their constituents). They were then queried on their perceived ease/difficulty in completing this task. Finally, the participants were asked for their input in how to market the survey, what the benefits are, and how to convey this to their friends and families. Findings from the meetings are discussed in more detail in the white paper on Maximizing Participation, where specific design recommendations were also made. A summary of the findings from these community group meetings include:

- ***Latinos***. Regardless of dominant language, the Latino groups exhibited the strongest sense of community among the three groups. From the onset of the meeting, where the Latinos were asked to identify what motivated them in their daily lives, to the discussion of the materials, to the conclusion of the meeting, references to the importance of community and family were ever present. In terms of design, issues of confidentiality and anonymity were at the forefront of the discussion. Participants clearly felt that all the materials should clearly and immediately bring these key points to light. Another important issue for this constituent group was making the connection between survey participation and increased community well being (market the survey as a means by which the individual can contribute to the whole).

- ***African Americans.*** The African American community can be characterized by strong ties to family, and, simultaneously, being very independent and civic-minded. Meeting participants indicated that a key factor in determining the success of the inventory would be survey endorsement by civic organizations and civic leaders in the African American community. Of all groups with whom meetings were held, African Americans had the greatest understanding of what was being requested of them in terms of the survey task and how to properly complete the travel logs. Meeting participants stated that it was vitally important to highlight (in the survey materials) that the last time that the survey was conducted, African Americans were under-represented, and state, "this is your chance to make sure this does not happen again."

- ***Youth.*** Although non-response among youth (ages 18 to 24) is typically noted in travel surveys, little research has been conducted to identify the factors that might increase participation among this population subgroup. The youth meeting conducted to inform this study revealed a sub-section of the general population that is very eager to participate and genuinely concerned that their voices are not being heard. They perceive that the impact they have (as youth) on the transportation system is overlooked. This highly mobile group comprehended all survey materials and accurately assessed what was being requested of them. The meeting discussion revealed that many of the core transportation issues faced by the youth are the same core issues faced by others. However, in many instances, lack of or limited access to a personal vehicle exaggerates the affect of these issues on youth. The discussions at this community group meeting suggest that the key to maximizing youth participation would be the explanation of how the planning process works, and how the data we are requesting today would lead to improved transportation infrastructure tomorrow, with an emphasis on the importance of youth participation.

Passive Recruitment Testing

Most recent U.S. household travel surveys have employed random telephone samples, resulting in samples with too few renters, new residents, minorities, low income or cell-only households. While a random telephone sample has never been used for any of the Chicago Regional Travel Surveys, it was assumed that similar problems would exist. Thus, this pilot tested the use of an address-based sample, where the location of the household was known, but there was not always a telephone number associated with each piece of sample. In order to determine whether it was possible to (1) reach and secure participation from households where there were addresses but no telephone number, and (2) ascertain whether there were differences in travel between these two respondent groups to warrant a passive recruitment effort in the full study, a small scale test was conducted as part of the pilot.

Specifically, 1,000 pieces of address-based sample were obtained. To each, a recruitment packet was mailed, which contained a cover letter outlining the survey, a study brochure, a household questionnaire (to obtain demographic details), and a postage-paid envelope to return the household questionnaire. In addition, in order to test whether a pre-paid incentive increased participation levels among this otherwise passive group, a $2 bill was included in one-half of these mailings. Respondents were provided the options of returning the survey by mail, fax, or Internet. A short survey of non-participants was also conducted, to glean insight into why so few households responded to the passive mailing.

The general finding of the passive recruitment effort was that returns were marginal (5%) compared to the costs ($1.55 per survey). Incentives did help, but given the volume of non-response, it is not possible to determine whether the envelopes were opened (and incentive used) or whether the mailing was thrown away without opening to see the incentive.

Those who did enter the survey through the passive recruitment effort were mainly households that were newer to the area and used Privacy Manager, meaning they would not likely be included via a traditional RDD sample. In reviewing the actual travel reported by households that participated in the pilot, the difference in trip rates based on tenure in the region showed that those living in the region less than 2 years reported fewer trips. However, this was not statistically different from the level of trip-making reported by those living in the region for more than 2 years. Thus, the capture of newcomers to the region through this approach does not provide travel details different from what is captured through the active telephone recruitment.

Pilot Data Collection

For the actual pilot data collection effort, the data collection team attempted to recruit 300 households by telephone (active recruitment of RDD sample) to participate. Due to higher-then-expected refusal rates, recruitment ended with 275 households agreeing to participate in the pilot. These households represented three different geographies, each with access to different aspects of the regional transportation infrastructure:

(1) Households living in Chicago's urban core, an area with high levels of transit access as well as dense living environments. **This was targeted to households in zip codes 60613 and 60640,** which were selected after reviewing the demographic characteristics for all zip codes in the urban core. These particular zip codes share census tracts that exhibit a good mix of incomes, dwelling type, and ethnicities, as well as a strong proportion of commuters who take transit to work. This group was important in confirming that the household travel survey materials capture sufficient transit segment details. In addition, response rates in areas with high population density tend to be lower (respondents know there are other households that could participate).

(2) Households in the Chicago suburbs with good access to the central city via CTA, Metra, and Pace trains, but also good local transit service and destination options. **This was targeted to households in Downer's Grove.** Downer's Grove was selected again because it provided a strong mix of incomes, household types, and ethnicities in a region where transit service into the central city was strong, but alternative destinations are also viable. It was anticipated that this geographic group would exhibit transit usage (particularly commuter travel into downtown Chicago), but also automobile usage to destinations outside the central city. This group was important in order to determine participation levels by other suburban households in the region, and differences in respondent reaction to the materials by those who commute into the city vs. those that do not. It also allowed for evaluation of the collection of address detail in a suburban environment, the reaction of households to the questions regarding children's travel, and other geographic differences that might impact data collection.

(3) Households in an outlying county. **This was targeted to households in Woodstock (McHenry County).** Given the size of the study area, it was critical that the material design convey the importance of the study for all households in the region, not just those with strong linkages to the downtown and inner core Chicago. The selection of Woodstock for this group was done in order to focus on a city in the outlying area where alternative destinations for jobs, shopping, and other errands might exist (although we recognized that the Metra service availability might result in some rail commuters in our pilot sample). What was most important for this group of households was that the materials "speak" to them in the same way that they did to households in the inner core area.

In order to capture the data required to support the development of the white papers, different questionnaire versions were employed in this effort.

- Recruitment: the budget assumed an average interview length of 20 minutes. However, the white paper authors were interested in obtaining detailed information about each respondent's job. To accommodate this, two recruitment versions were drafted, one with the detailed employment questions and one without. Combined, the overall recruitment length was 19 minutes, but one survey version averaged 16 minutes and the other 21 minutes. Households were randomly assigned to one survey or the other.

- Travel Details: Three approaches to obtaining travel details were employed, in order to understand the effect of more detailed questioning on response rates. Specifically, the pilot tested a one-day place based log (the base), a two-day place-based log, and a one-day activity-based log. Households were randomly assigned to a survey type, with the goal being an equal distribution of households across the three survey options.

- Retrieval: The retrieval interview was budgeted at an average interview length of 29 minutes and the actual survey averaged 28 minutes. There were two survey versions:

  i. Base: the base survey with no other questions. This was the foundation or control for testing the effects of obtaining the other details. It averaged 24 minutes.

  ii. The more detailed activity-based and tour-based models could be enriched with more details regarding the activity choices that underlie the reported travel, and details from the respondent in terms of how the travel differs from "typical" travel. These questions were asked, in addition to the base questions. The longer version averaged 33 minutes.

Pilot response and participation rates are shown in Table M-1. As indicated therein, participation was highest in the Downer's Grove suburban location, and lowest in the more rural area of Woodstock. As anticipated, those participating in the shorter interview were more likely to complete

the survey effort, as were those in the 1-day survey program. Participation was lowest for those in the activity survey component.

TABLE M-1: RESPONSE AND PARTICIPATION RATES

	RECRUITMENT RATE	RETRIEVAL RATE	OVERALL RESPONSE RATE	RECRUIT RATE (PARTICIPATION)	RETRIEVAL RATE	OVERALL PARTICIPATION RATE
Overall	17.1%	54.5%	9.3%	52.7%	54.5%	28.7%
Chicago	24.1%	44.4%	10.7%	64.3%	44.4%	28.5%
Downer's Grove	14.7%	58.2%	25.3%	51.9%	58.2%	30.2%
Woodstock	13.7%	61.3%	8.4%	44.0%	61.3%	27.0%
Short Recruit and Retrieve	17.9%	52.7%	9.4%	55.0%	52.7%	29.0%
Long Recruit and Retrieve	16.3%	48.1%	7.8%	50.2%	48.1%	24.1%
1-day Place		56.4%			56.4%	
2-day Place		51.2%			51.2%	
1-day Activity		49.4%			49.4%	

Overall, the pilot test was successful in terms of the procedures and collection of necessary data. These conclusions focus on five main areas: sampling, outreach, approach, data, and budget.

- **Sampling.** The pilot results raised several issues to be addressed in the white paper on sampling. These included (1) how or should the data from community meetings (non-probability samples) be incorporated into the largely probability-based inventory, (2) how the participation and response rates resulting from the pilot might impact sample size and sample orders, and (3) whether there was a need for the non-telephone imputation questions.
- **Outreach.** The insights from the community group meetings provided important details for the design of the inventory, particularly the outreach effort but also the materials themselves. Specifics on how outreach should be carried out on the project and what material design features should be considered based on participant input were important questions addressed in the white paper.
- **Data.** A large focus of this pilot was to test the respondent reactions to the different approaches for obtaining travel data. Participation rates varied greatly by survey type, and in addition, respondent reaction to some of the probes was not positive. A key question was how to prioritize the optional data elements tested in the long survey versions such that respondent burden could be balanced with inventory content.
- **Survey Modes.** The pilot findings addressed perhaps most clearly the identification of survey modes. In particular, the passive mailing yielded very little returns, and those that did participate from this mode didn't exhibit statistically different travel patterns from the data obtained from the RDD sample. In addition, the lower participation rates in Woodstock suggest the need to tailor the materials for the outlying counties to improve participation. The pilot debrief provided good insight into respondent usage of the survey materials, to help inform the design recommendations regarding survey mode(s).

- **Budget.** The survey length was approximately what was originally budgeted but the response rates were much lower than anticipated. In addition, the pilot provided solid statistics that can be used to incorporate the final survey approach. What are the corresponding budget implications?

White Papers

The purpose of the white papers prepared under this phase was to address specific issues pertaining to the design of the data inventory and supporting data collection effort. Because the inventory needed to both update the current regional travel demand model as well as to develop new models, the actual elements contained in the inventory needed to meet the needs of both efforts. These white papers served to delineate those elements that were critical to both efforts. Ultimately, the cost trade-offs, respondent reactions, white paper recommendations, and input from the expert and local peer review panels were used by CMAP staff to finalize the actual inventory contents.

Each white paper had a primary author team and a secondary author. The primary author team was responsible for ensuring that the document addressed the necessary elements and provided actionable recommendations for the data collection phase. To facilitate this, the primary authors provided the project manager with a list of key questions or design elements for the pilot test. The secondary author's role was as reviewer, with the specific intent being to balance the paper, to ensure that it was well-rounded and practical in approach and recommendations.

The white papers combined secondary research with primary data collection (through the study pilot) in order to make recommendations on key issues that impact inventory design. These issues were identified at the project kick-off meeting[12], held Tuesday, May 23, 2006 in Austin, Texas and included: (1) inventory content, (2) sampling considerations, (3) maximizing participation, and (4) efficient data collection. The white papers are available at www.nustats.com/chicago under "Survey Design."

Efficient Data Collection

This white paper focused on the survey modes necessary for efficient data collection, addressing the following issues:

- Data collection modes: telephone, web, GPS, in-person, mail
- Structure and length of survey instruments
- GPS – vehicle, on-person – who?
- Timing of special population surveys
- Household surveys, visitor surveys, employer surveys, commercial travel?

Design recommendations included:

- Telephone should be the primary interviewing method
- The inventory will realize the widest population coverage with a dual-frame sample
- There should be creativity in advance mailing packaging
- The advance mailing should include a household questionnaire.
- GPS should be deployed for information value

[12] This kick-off meeting included the project team members as well as members of the project's expert and peer review panels.

Inventory Contents

This white paper focused on identifying the inventory contents. The inventory needed to contain accurate depictions of the demographic and travel behavior characteristics of regional residents. Achieving this straightforward objective required consideration of several issues related to the inventory design. These included:

- Data Contents – What type of behavioral documentation is needed to support the study objectives?
  - Weekday and weekend travel?
  - Continuous data or stop for summer/holidays?
  - Survey period – 24 hours? 48 hours? Weeklong? Mix? (if mix, how?)
  - Complete travel/activity records for all HH members?
  - 100% geocoding?
- Data Elements – What data should be in the inventory?
  - In-home activities and substitution effects (internet connectivity, usage)
  - Decisions/decision making
  - Do they consider transit an option?
  - Cost of parking, where parked, perception of parking if didn't drive
  - Effect of transit fares, Transit routes used (How did they route themselves through the transit system?) Impact of service reliability
  - Route choice (toll vs. non-tolled facilities) – which chose and why?
  - Stated preference – sensitivity to time of day strategies
  - Pre and post surveys
  - Residential and workplace changes
  - Value of time for individuals and if vary by trip purpose
  - Attitudes/market segmentation
- Modeling Requirements
  - Represent sub-modes in model? (transit = buses, rail, commuter rail, etc.)
  - Expansion?
  - Activity-based?
  - Links to current model?
  - Land-use elements?
  - Availability and quality of GIS coverage files (comprehensive files of highway system and routes by type, precise distance to stops)
  - What level of geocoding is necessary to support the modeling effort?
- What considerations should be given to the needs of other potential users of the data – FTA new starts, public health – built environment/physical activities, etc.?

The paper included an extensive variable list, with annotations regarding the usefulness of each variable in achieving modeling goals on a spectrum from a simple model update to an advanced activity and land-use model. In addition, the team presented the pros and cons regarding key design elements such as a 1-day vs. 2-day sample, activity- vs. place-based data, and how much detail to elicit from survey participants vs. response rate and participation rate trade-offs.

Sampling

This white paper, focusing on sampling issues, addressed the following issues:

- Frame/frames
- Bias associated with cellular-only households

- Population coverage
- Differences in politics and respondents, and other related issues resulting from the size of the Chicago metro region
- Definition of household, including treatment of unrelated, student, and multi-family HH
- Newcomers to the region – immigrants
- Stratification (transit riders? Income?)
- Continuous sample/seasonality effects
- Choice-based sample or fully random sample?
- Language needs
- Panel hooks

Recommendations included the following:

- **Population**. The population should represent all the households residing in the CMAP and NIRPC modeling area.
- **Sampling Frame**. A dual frame sampling should be used for this study.
- **Sampling Method**. In this study, the approach should be to select a stratified probability sample of households, primarily because a probability sample ensures high levels of coverage, accuracy, and efficiency compared to non-probability samples. In particular, it should use a stratified sampling method as opposed to the traditional random sampling method because the latter under-represents certain market segments of particular interest in this study such as transit users. The stratified sampling method can over-sample some strata to ensure that the diversity of the population according to specific geographic and behavioral factors affecting travel activity in the CMAP study area is captured.
- **Sample Size**. The team identified a total sample size of 11,700 for the CMAP study area. The sample size should vary by county in order to adequately represent travel mode, transit access and area type variables by county. For example, some counties, like Cook County, will contain many sub-areas of interest with different transit and walk accessibility measures, requiring much larger sample sizes. Other counties, such as Grundy County, will contain very few of these categories and thus, require fewer samples.

Maximizing Participation

This paper addressed the following issues:

- Current Survey Environment – Survey research is battling increasing resistance to the dominant telephone-based survey process. Details that are needed to support modeling are considered intrusive, and privacy concerns abound, particularly those relating to the travel patterns of children. What are the specific concerns of Chicago area residents and how can we maximize participation within this environment?
- Representative Results – what type of outreach efforts are necessary to ensure results contribute to the development of a valid model? Outreach partners, gatekeeper interviews, non-random samples through community group meetings, etc.
- Special groups: transit, tollway users, minorities, extremes in wealth, social equity, residents of groups quarters/university dorms/assisted living
- Immigrants, many working multiple jobs – how to best reach?
- Instrument design

Recommendations included material design issues such as the following:

Envelope

- The envelope should not be addressed to "Resident".
- The envelope must look professional from a credible source, and not appear as a sales pitch.

Brochure

- The pictures should show a diverse population.
- Use better paper and more color.
- Expand the section "Why is my participation so important?" Based on the pilot results that refer to the respondents' general concern for transportation, highlight their contribution to the "public good" by participating in the survey.

Letter

- Shorten the cover letter. The letter should include confidentiality statements, the reasons why this effort is important, and how the results will benefit the participant.
- Strengthen the confidentiality statement.
- The letter should refer readers to the brochure for more information.
- In advance mailings ask participants when would be the best time to call.

Travel Log

- An explanation for the 3 a.m. start time was requested.
- Several participants did not know how to answer the question, "Did you get out of your vehicle?" Many stated, "I'm driving, why would I get out of the car before I get to where I'm going?"
- The List 1 and List 2 codes were not seen by participants and a variety of suggestions were offered to improve the effectiveness of the lists. These suggestions included the use of color or including the lists as options/checkboxes in the column.
- The example pages should be better identified as examples and should look more like the travel log.

Peer Review

The pilot results and white paper findings were vetted before a peer review panel, held at CMAP offices in Chicago in November 2006. The meetings lasted two days. The first portion of the meeting included a series of presentations of the pilot results and white paper findings. Next, expert review panelists shared their concerns and recommendations for the inventory design. Finally, peer review panelists were invited to voice concerns and recommendations. The second day of the meeting focused on specific design elements, with participation by the expert review panel and the consultant team. The following recommendations resulted from these meetings:

Data Inventory

1. In order to finalize the data inventory contents, a final list of specific variables and associated choice categories is needed. These variables must support CMAP's ability to perform an enhanced update of the current model structure.
2. The inventory will also support the development of a new model. The data inventory white paper presents details regarding options for the shape of this new model. When data collection is 50% completed, the NuStats team should review the interim data and prepare a technical memorandum that delineates a prototype example of what CMAP's new model might look like.
3. The data collection should take place over the entire calendar year of 2007. There should be no blackout dates for holidays. Households should be evenly distributed across these travel days.

4. The mechanism for obtaining travel behavior details should be a modified place-based travel log. The typical place-based approach should obtain secondary activities (asking for all secondary activities lasting at least 10 minutes) and include questions to understand the decision-making process underlying the decision to travel. The main question should focus on places visited, but probing should allow us to obtain the activities inducing that travel.
5. The sample should be equally divided between 24-hour and 48-hour travel periods. The 24-hour travel periods should be equally distributed across all weekdays (Monday through Friday). The 48-hour travel periods should begin with Sunday/Monday pairs and end with Friday/Saturday pairs, with more sample allocated to Sunday/Monday and Friday/Saturday pairs then weekday pairs.
6. A stated preference (SP) follow-up survey should be pursued, provided that its administration does not compromise the respondent burden associated with the documentation of travel behavior details.

Sampling

1. The study area geography should be considered in four groupings: (1) the old urban core of the City of Chicago and Cook County, except for the northwest panhandle, (2) the NW panhandle of Cook County, all of DuPage County, and all of Lake County, (3) All of McHenry, Kane, Kendall, and Grundy Counties, and (4) all of Will County.
2. Minimum sample sizes are also desired by AREA (urban core, suburban, and rural).

Survey Mode

1. The project should utilize telephone, mail, internet, GPS, and in-person interviewing techniques as appropriate. The core data collection effort should focus on telephone with mail and internet options. GPS and in-person interviewing modes should be employed as detailed below.
2. The project should include GPS data collection technology for up to 500 households. The initial production plan should call for the 500 households to be equipped with in-vehicle units for a 7-day period each (with travel to be recorded at the start of the GPS collection period). Incentives should be provided to these households, and the target respondent group should be high mileage households.
3. There is an interest in employing wearable GPS for youth and those who walk a lot or bike in lieu of driving. However, the technology limits associated with urban canyons in the Chicago CBD are recognized.

Maximizing Participation

1. The survey materials should be "branded" and include aerial photos of the region and other photos as appropriate to document a sense of place.
2. All surveys should be conducted in English and Spanish, and all materials prepared accordingly. The data collection team should monitor contacts with Polish-speaking residents and should sufficient incidence be identified, provide CMAP with a plan to include Polish language options in the survey.
3. NuStats should develop a survey promotions plan.

SURVEY PROCESS AND PROCEDURES

The full study was fielded from January 2007 through March 2008. During this time, contact was made with 48,811 households, of which 25,845 agreed to participate in the study. Ultimately, travel survey details were obtained from 14,390 regional households for inclusion in the Chicago Regional Household Travel Inventory. The purpose of this section is to document the process by which the study was fielded.

Advance Notification Mailing

The advance notification mailing was used to notify households that they had been randomly sampled for inclusion in the study. The mailing consisted of a letter that introduced the study, co-signed by the Executive Director and the Chair of CMAP; a brochure that addressed the reasons behind the study, details of what participation entailed, and benefits of participating; and a short household questionnaire which served to recruit households into the study. See Appendix A for sample materials.

The mailing was targeted to two types of households. First, "unmatched" households – those whose addresses were randomly sampled but for whom a telephone number was not identified during the matching process. For these households, the advance notification mailing was the only means of contact. Second, "matched" households – a random sample of those for whom the address and telephone number were known (believed to increase participation rates). These households were also contacted by telephone.

A total of 72,347 letters were mailed over the course of the study (52,345 to CMAP households and 20,000 to NIRPC households). Of the households to which letters were mailed, 5,379 were recruited (7% of all mailings) and 3,169 (4% of all mailings) completed all aspects of the Travel Tracker Survey.

- Of these 3,169 households, 2,232 were recruited by telephone, 112 completed the household questionnaire on the internet, and 825 mailed in the completed household questionnaire.
- A total of 304 households recruited through this method were "unmatched" sample (i.e., only an address was available for that household). Of these, 172 completed all aspects of the Travel Tracker Survey and are included in the Chicago Regional Household Travel Inventory.
- A total of 29 households reporting only cellular telephone service (no landline telephone service) were included in the inventory through the use of advance letters.

Recruitment Interview

The recruitment interview was administered using a computer-assisted telephone-interviewing (CATI) program. During recruitment, each household was contacted to secure participation in the study. If the household agreed, household-level demographic information was collected including income, household size, vehicle ownership, and other household characteristics. In addition, demographic characteristics were obtained for each member of the household such as age, gender, employment and school status (see Appendix B for the recruitment questionnaire).

The recruitment calls began on January 11th and continued through March 17th, recruiting a total of 25,845 households. All households within the study area that provided the necessary address and demographic details were eligible for the study.

The average length of the recruitment call was 19 minutes. It took an average of 3.11 call attempts to reach a household for recruitment. Table M-2 shows the average interview length and the average

number of call attempts it took to reach each household based on household size. As indicated in that table, the larger the household, the longer the interview length.

TABLE M-2: RECRUITMENT INTERVIEW LENGTH AND CONTACTS

Household Size	N	Interview Length	# Attempts
1 person	6941	13.33 min	2.95
2 persons	9217	17.52 min	2.93
3 persons	3872	22.14 min	3.25
4+ persons	5815	26.70 min	3.63
Total	25845	19.15 min	3.11

Placement of Materials

The day following recruitment, demographic information was processed into the master data set and packets were assembled for each recruited household. These packets included a cover letter, travel log, example of a completed travel log, and a postage-paid envelope to return the completed logs after the retrieval interview (see Appendix C). Travel days were scheduled 7 to 10 days after recruitment to allow for sufficient time for packets to reach the households using first class mail.

Reminder Calls

The night prior to the start of the assigned travel period, reminder calls were made to the households. This reminder call served three key purposes:

1. Confirm that the household received the packet and answer any questions respondents might have about using the log to track their travel.
2. Schedule an appointment to conduct the retrieval interview.
3. Increase the likelihood that the household will follow-through with recording their travel by re-iterating the importance of the study and the household's commitment to participate.

For those instances where an answering machine was reached, the interviewers left brief messages that referenced a toll-free number for respondents to call if they had questions.

Retrieval Interviews

The day after the assigned travel period or at the appointed time, telephone calls were made to retrieve the travel data recorded by each eligible household member in his/ her travel log. The interviews were guided using CATI programs of the retrieval instrument (see Appendix D). The average interview length was 28 minutes and it took 8 call attempts to complete each household, on average.

TABLE M-3: RETRIEVAL INTERVIEW LENGTH AND CONTACTS

Household Size	N	Interview Length	# Attempts
1 person	4460	20.38 min	7.3
2 persons	5547	28.06 min	7.45
3 persons	1862	33.94 min	9.77
4+ persons	2446	39.00 min	11.44
Total	14,390	27.52 min	8.13

Travel days began Monday, January 22, 2007 and continued through Monday, March 31, 2008. Retrieval interviews began on Tuesday, January 23, 2007 (for the 1-day sample) and Wednesday, January 24, 2007 (for the 2-day sample) and continued through Friday, April 4, 2008 for both samples. Data were collected from all household members for the 14,390 households that completed the study (except for three households, which each were missing one person). For a complete list of travel days, see Appendix F.

Processing

Data processing took place throughout the study, beginning with the creation of the advance notification mailout, continuing with the release of sample for recruitment, processing recruitment data for the respondent mailout, appending the retrieval data to the master tables, and performing quality control on the data. A master control file tracked the progress of each household through the various survey stages, with codes to allow immediate identification of problem cases that were not progressing according to schedule as well as confirmation that cleared cases moved along as appropriate. Routine data checks totaled more than 75 and are listed in Appendix E.

Geocoding

Three methods were used to geocode the home, work, school, and trip ends reported as part of this effort. These included: manual (traditional) geocoding, pre-geocoded look-up lists which were then referenced during the CATI interview, and real-time on-line geocoding using the PTV e-CATI function. Each of these is described in more detail below. All three methods relied on Navteq based coverage files.

Traditional Geocoding

The traditional geocoding process consisted of four steps:

(1) On a daily basis, addresses obtained from recruitment (work, school, and updated home location) and retrieval (trip ends) were pulled from the master data tables. As the data were pulled, a field containing concatenated address data was created. This table was sorted by the technician during the session to best perform the geocoding procedure.

(2) Interactive (manual) geocoding was performed on all addresses in the files using ArcView software. Addresses for which latitude/longitude coordinates could be identified received a status (AV_STATUS) of “M” for matched. If the location was outside the study area, it received a status of “O” for out of area. If the technician was unable to code the location, it received a status of “U” for unmatched.

(3) After addresses were geocoded, ArcView calculated and assigned longitude and latitude coordinates for the matched cases in decimal degrees to five decimal places. Additional geography variables (city, county, state, and tract) were added at this time.

(4) Unmatched cases were researched further in an attempt to match them to a geographic location through manual address research efforts (using the internet and other resources available to the technician).

Pre-Geocoded Lists

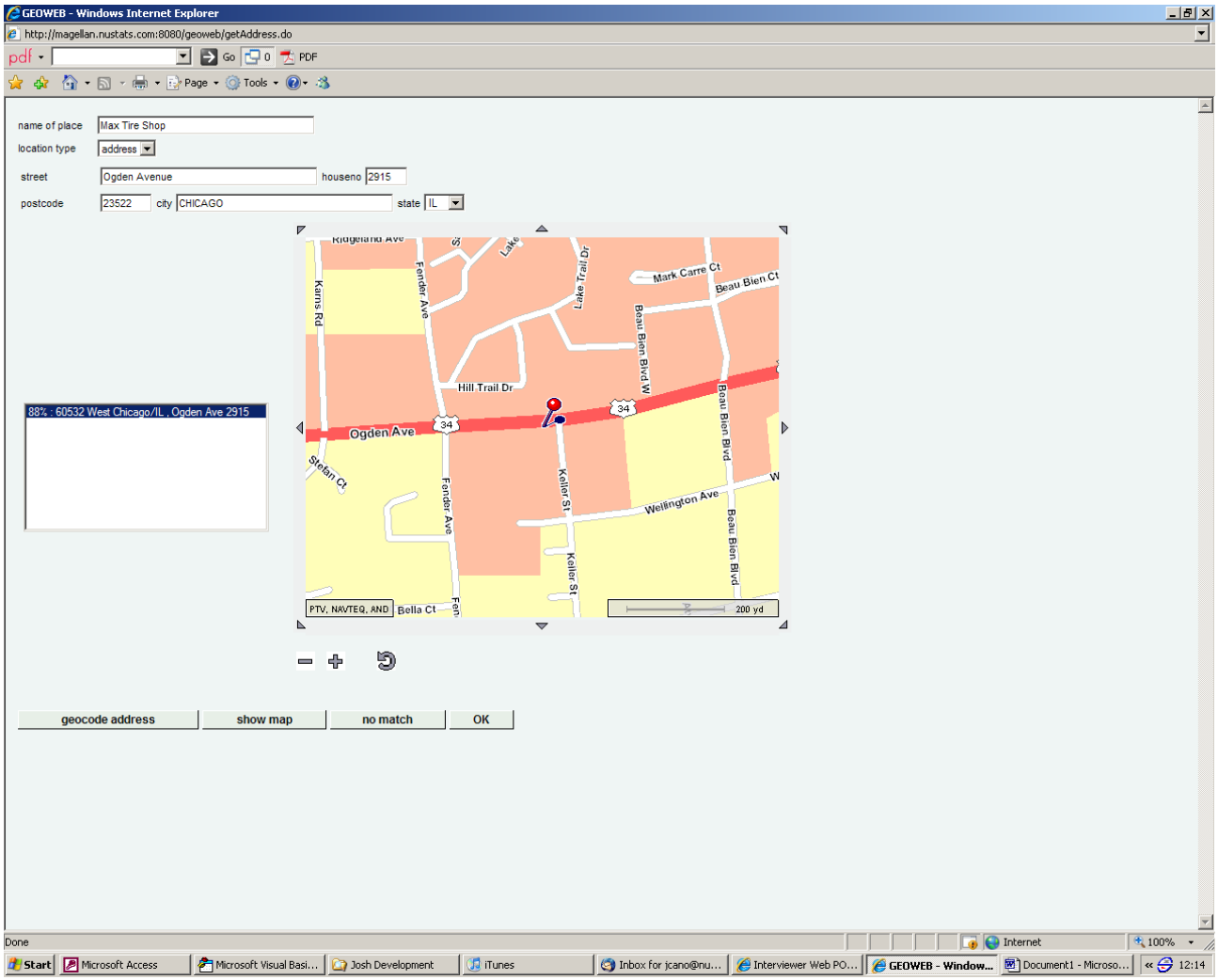
To simplify the address collection process, the geocoding team created pre-geocoded lists of points of interest in the region. These lists included the Navteq Points of Interest table as well as bus stops and other prominent points of interest in the study area. These lists were loaded into the CATI, where the interviewer could reference them as needed during address collection (either work/school

locations during recruitment or trip ends during retrieval). As the study progressed, the list of geocoded trip ends was also loaded into the CATI as an additional point of interest file.

PTV e-CATI

A third option for geocoding was for the interviewer to geocode a specific address as the respondent reported it. Figure M-1 shows the interviewer screen, displaying a map of the location. In this geocoding approach, the interviewer entered the location details (name of place, address, city, state, and zip) and submitted the address to the e-CATI server. The interviewer then verified that the location was correct by reporting back to the respondent the cross streets and other landmarks. The lists of locations or addresses included a percent probability of a correct match to assist the interviewer in selecting the most accurate address. For addresses that could not be matched, or were matched at anything less than a 90% probability, the interviewer obtained cross-streets, landmarks, and any other details about the location, and sent the address to the technician for traditional geocoding.

FIGURE M-1: E-CATI ADDRESS SCREEN



Geocoding Results

A total of 96,999 locations were recorded as part of the Travel Tracker Survey. Of these, 1,218 (1%) were coded using the Pre-Geocoded Lists, 12,788 were coded through PTV e-CATI (13%), and the remaining 82,993 (86%) were coded using traditional geocoding methods.

Of all locations reported (regardless of whether they were used on the travel day), 95% were successfully matched to latitude/longitude coordinates. The distribution of addresses by type and geocoding status is shown in Table M-4.

TABLE M-4: GEOCODING OUTCOMES BY ADDRESS TYPE FOR ALL ADDRESSES COLLECTED

LOCATION	Count	Match	Out of Area	Unmatched	Total
Home	14,390	100.0%	0.0%	0.0%	100.0%
School	6,969	96.7%	1.9%	1.4%	100.0%
Work	17,415	95.8%	1.2%	3.0%	100.0%
Other	58,225	94.1%	2.9%	3.0%	100.0%
Total	96,999	95.4%	2.1%	2.5%	100.0%

QUALITY STANDARDS

The following standards guided the quality control process:

1. A completed household was one in which the household provided demographic information and all household members provided travel behavior data for the assigned travel period.
2. A valid partially completed household was one in which (a) household size was at least 4 members, (b) demographic information was obtained for all household members, and (c) all but one household member provided travel behavior data for the assigned travel period. This definition was introduced to help mitigate non-response bias among larger households. However, only three households included in the data set meet these criteria (the remainder had more than one household member not provide travel data).
3. The data conform to the recruitment and retrieval questionnaires (present where it should be, missing where appropriate).
4. The data successfully pass the quality control edit check criteria as listed in Appendix E.
5. 100% of all home locations are geocoded to x/y coordinates.
6. 90% of all non-home locations are geocoded to x/y coordinates.

NON-RESPONSE ASSESSMENT

The purpose of this section is to review the characteristics of households included in the CHRTI against census data to identify levels of unit non-response. In addition, a review of the responses provided by participating households indicates the level of item non-response.

Unit Non-Response

Unit non-response analysis identifying differences in participating households as compared to census data took place on a weekly basis during collection. Adjustments in sampling and data collection were made as needed in response to the lagging populations identified in the weekly reports. Of particular concern was minority participation, since that group was under-represented in the 1990 household travel survey. When participation rates among the African American population in the region lagged and did not respond to targeted sampling, NuStats contracted with minority-owned/Chicago-based Blackstone Group to specifically focus on that group to supplement efforts by PTV DataSource. As a result of the efforts of both data collection firms, the African American

population is fully represented in this inventory. Participation by Hispanic households lagged as compared to 2000 census proportions by approximately 10%. The weighting procedure to account for non-response addressed this, and thus the final weighted data are fully representative of both groups.

TABLE M-5: CHRTI UNIT NON-RESPONSE ASSESSMENT

	CMAP Region	CMAP Region Census Data	NIRPC Region	NIRPC Region Census Data
Household Size				
1	26.3%	26.4%	25.0%	25.0%
2	28.7%	28.7%	31.8%	31.8%
3	16.0%	16.2%	17.4%	17.4%
4+	28.9%	28.9%	25.8%	25.8%
Household Vehicles				
0	13.8%	14.3%	5.3%	8.9%
1	31.3%	36.3%	30.7%	34.4%
2	34.9%	36.1%	36.9%	38.9%
3+	20.0%	13.3%	27.0%	17.9%
Household Income				
< $20k	17.9%	16.9%	22.1%	20.9%
$20k - < $35k	16.6%	15.7%	19.7%	18.6%
$35k- < $50k	15.9%	15.3%	16.4%	16.7%
$50k - < $75k	20.4%	20.9%	20.7%	22.4%
$75k - < $100K	10.0%	12.9%	11.2%	11.7%
$100k +	19.1%	18.3%	10.0%	9.7%
Income refusals	6.8%	--	5.2%	--
Residence Type				
Single family	49.6%	55.6%	85.9%	70.4%
All other types	50.4%	44.4%	14.1%	29.6%
Ethnicity				
White	66.6%	65.5%	76.9%	75.3%
Black/African American	19.3%	18.9%	18.6%	18.2%
Other	14.1%	15.6%	4.5%	6.5%
Hispanic				
Yes	17.7%	17.2%	9.5%	9.4%
No	82.3%	82.8%	90.5%	90.6%
Respondent Age				
<20	39.6%	29.5%	29.6%	29.1%
20 - 24	5.0%	6.7%	9.1%	6.4%
25 - 54	41.4%	45.1%	46.1%	42.8%
55 - 64	5.6%	8.0%	6.9%	9.0%
65+	8.4%	10.7%	8.2%	12.7%
Age refusals	2.o%	--	5.1%	--

Base: CHRTI Households, weighted.

Item Non-Response

In evaluating item non-response, the focus is on the completeness of the inventory. Item non-response can be expressed as a refusal to answer a question or a respondent not knowing the answer to a question (mostly during a proxy interview). What follows is a list of variables with item non-response and the unweighted magnitude of that non-response.

Recruitment Instrument:

- Number of persons depending on you for transportation (0.9%)
- Number of bicycles (0.6%)
- Residence type (0.3%)
- Home ownership status (1.3%)
- Tenure at current residence (0.1%)
- # Cell phone lines (1.3%)
- # Landlines (0.8%)
- Household income (10.4%)
- Vehicle year (2.1%)
- Vehicle make (0.5%)
- Vehicle body type (1.1%)
- Where vehicle is parked at home (3.7%)
- Gender (<0.01%)
- Age (1.8%)
- Hispanic origin (0.7%)
- Race (1.6%)
- Disability status (0.8%)
- Licensed driver status (0.2%)
- Employment status (0.1%)
- Volunteer status (0.1%)
- Work status if not employed (0.7%)
- Typical mode to work (0.3%)
- Type of work schedule (1.2%)
- Educational attainment (0.7%)

Retrieval Instrument

- Parking details (if auto trip) (10.7%)
- If trip was made on expressway or tollway (if auto trip) (18.8%)
- Car available (if transit trip) (<0.01%)

RESULTS

A total of 14,390 regional households fully participated in the Travel Tracker Survey, conducted in support of the Chicago Regional Household Travel Inventory (CHRTI). In doing so, these households provided data about their household composition, vehicles owned, and travel throughout the region for a randomly assigned 24- or 48-hour travel period. When properly weighted to account for probability of selection, non-response, etc., the data from the 14,390 households provides details about 38,745 household members, 25,746 vehicles, and 184,194 unlinked trips (133,549 reported on Day 1 and 50,645 reported on Day 2). When expanded to the survey universe, the travel data represents 3,218,100 households, 8,727,717 persons, 5,588,431 vehicles, and 39,956,631 trips. In all, the households reported an average of 9.28 daily household trips and 3.45 daily person trips on Day 1, with a subset of households reporting 7.59 average daily household trips and 2.90 average daily person trips on Day 2.

TABLE R-1: INVENTORY SUMMARY

SURVEY INDICATORS	WEIGHTED DATA	EXPANDED DATA
Total Households Surveyed	14,390	3,218,100
Total Members Surveyed	38,745	8,726,717
Total Household Vehicles	25,746	5,588,431
Total Trips (unlinked) – Day 1	133,549	29,278,426
Total Trips (unlinked) – Day 2	50,645	10,678,205
Average HH Trip Rate – Day 1	9.28 trips*	--
Average Person Trip Rate – Day 1	3.45 trips *	--
Average HH Trip Rate – Day 2	7.59 trips*	--
Average Person Trip Rate – Day 2	2.90 trips *	--

Source: CHRTI, weighted. *Unlinked Trips

The purpose of this chapter is to summarize the demographic and travel behavior characteristics of the participating households and to provide details highlighting how demographic variations in the households across the study area are reflected in the travel behavior data. The presentation has two sections: Demographic Characteristics and Travel Behavior Characteristics. The study area geography is summarized at the MPO level, as well as whether the household is in an urban, suburban, or rural county, along with a region-wide total. All results are weighted, unless otherwise noted.

The counties comprising the CMAP and NIRPC regions are shown in Figure R-1. The categorization of counties into urban, suburban, and rural designations is shown in Figure R-2.

FIGURE R-1: MPO REGIONS

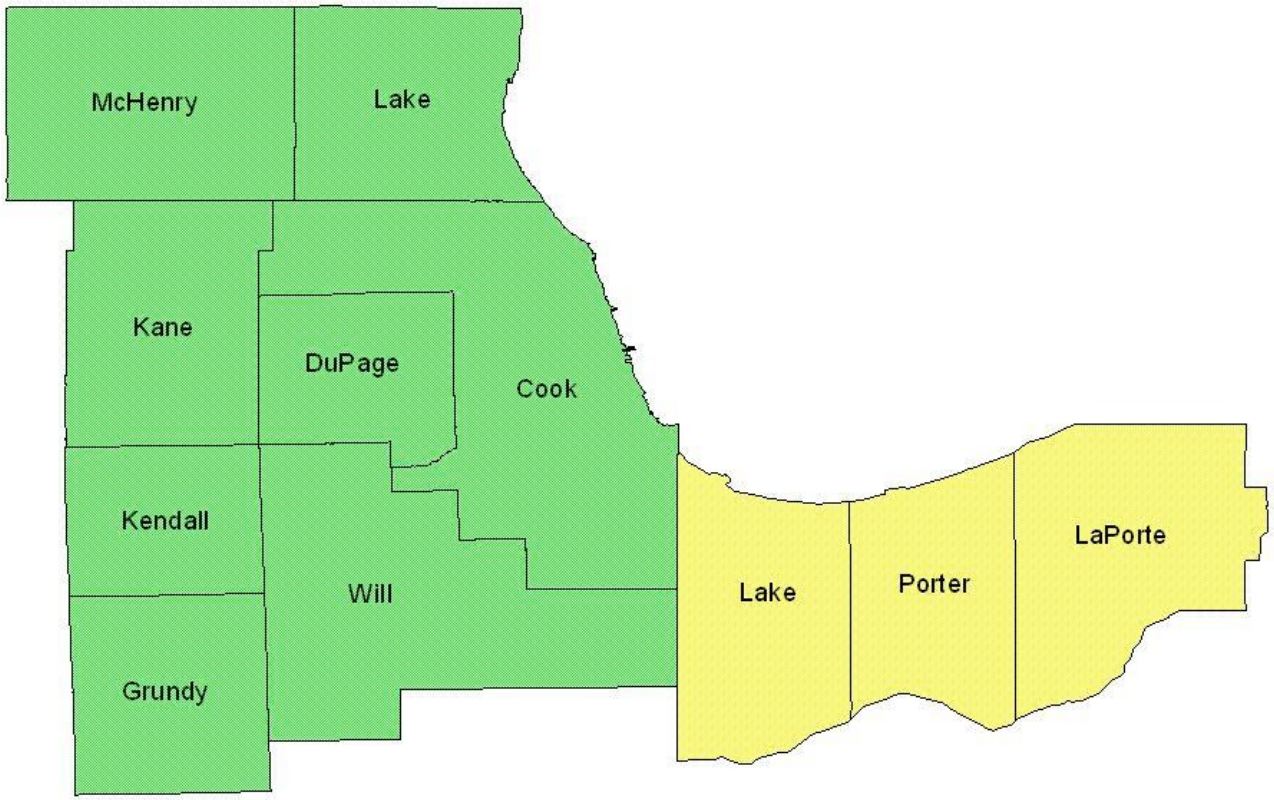
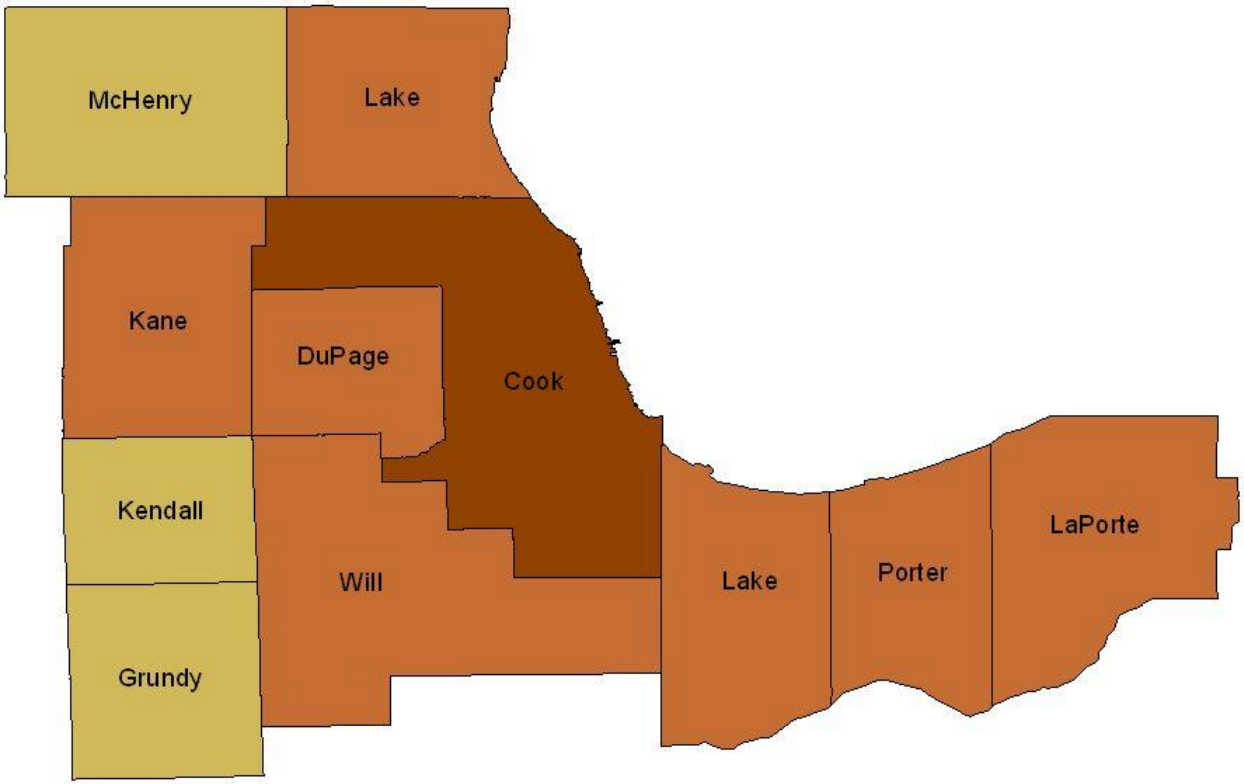


FIGURE R-2: COUNTY DISTRIBUTIONS



DEMOGRAPHIC CHARACTERISTICS

In this section, the demographic characteristics of the travelers included in the inventory are presented. This includes characteristics about the participating households, their vehicles, and the travelers themselves.

Household Characteristics

The 14,390 participating households reported an average household size of 2.71 persons. The distribution of households by size is shown in Table D-1. Households in the CMAP region had 2.72 members, on average, while those in the NIRPC region reported an average size of 2.61 persons. Households in the urban and rural counties were smaller, on average, than those in the suburban counties.

TABLE D-1: HOUSEHOLD SIZE

	N	HH Size					Mean	SE Mean
		1	2	3	4+	Total		
CMAP	10552	26.4%	28.7%	16.0%	28.9%	100.0%	2.72	.00
NIRPC	3838	25.0%	31.8%	17.4%	25.8%	100.0%	2.61	.00
Urban	6986	31.2%	25.5%	18.0%	25.3%	100.0%	2.65	.00
Suburban	6895	18.6%	34.3%	12.1%	35.1%	100.0%	2.83	.00
Rural	509	17.2%	36.1%	22.7%	24.0%	100.0%	2.64	.00
Total	14390	26.3%	29.0%	16.1%	28.6%	100.0%	2.71	.00

Source: Chicago Regional Household Travel Inventory, weighted. Base – all households.

With regard to household vehicle ownership, the regional average was 1.74 vehicles per household. Households in the CMAP region reported owning 1.71 vehicles on average, while those in the NIRPC region reported 2.00 vehicles owned, on average. Consistent with expectations, households in the urban county owned significantly fewer vehicles (1.49 vehicles) as compared to 2.15 vehicles owned by suburban county households and 2.02 vehicles owned by rural county households.

TABLE D-2: HOUSEHOLD VEHICLES

	N	HH Vehicles					Mean	SE Mean
		0	1	2	3+	Total		
CMAP	10552	13.7%	31.2%	34.3%	20.8%	100.0%	1.71	.00
NIRPC	3838	5.3%	30.7%	36.9%	27.0%	100.0%	2.00	.00
Urban	6986	19.4%	34.1%	29.2%	17.4%	100.0%	1.49	.00
Suburban	6895	2.9%	27.0%	42.0%	28.1%	100.0%	2.15	.00
Rural	509	3.2%*	22.0%	51.4%	23.4%	100.0%	2.02	.00
Total	14390	13.0%	31.2%	34.5%	21.3%	100.0%	1.74	.00

Source: Chicago Regional Household Travel Inventory, weighted. Base – all households.
*less than 20 observations.

According to the detailed information provided for each household vehicle, households in the CMAP region own newer vehicles as compared to those in the NIRPC region. In addition, those living in the rural counties were more likely to own newer vehicles.

TABLE D-3: FLEET AGE

	Year of Manufacture				Total
	Pre 1996	1996-1999	2000-2004	2005+	
CMAP	18.6%	27.3%	34.9%	19.3%	100.0%
NIRPC	27.5%	23.4%	32.2%	17.0%	100.0%
Urban	16.5%	28.5%	35.7%	19.3%	100.0%
Suburban	23.7%	25.3%	32.4%	18.6%	100.0%
Rural	14.6%	22.4%	41.6%	21.4%	100.0%
Total	19.5%	26.9%	34.6%	19.1%	100.0%

Source: Chicago Regional Household Travel Inventory, weighted. Base – all household vehicles for which manufacture year was reported.

On average, households reported owning 1.06 bikes. Bicycle ownership was statistically higher for households in the CMAP region as compared to those in the NIRPC region. Households in the rural and suburban counties reported owning more bikes, on average (1.16 per HH) than those in the urban county (1.00 per HH).

TABLE D-4: BICYCLES OWNED

	N	HH Bicycles				Mean	SE Mean
		0	1	2+	Total		
CMAP	10552	46.2%	22.2%	31.6%	100.0%	1.07	.00
NIRPC	3838	43.1%	30.7%	26.2%	100.0%	1.00	.00
Urban	6986	49.1%	20.7%	30.2%	100.0%	1.00	.00
Suburban	6895	39.9%	28.0%	32.1%	100.0%	1.16	.00
Rural	509	49.5%	12.1%	38.4%	100.0%	1.16	.00
Total	14390	45.9%	22.9%	31.1%	100.0%	1.06	.00

Source: Chicago Regional Household Travel Inventory, weighted. Base – all households.

Region-wide, households indicated having 1.45 workers, on average. This was the same for both regions. Households in the suburban counties had the highest average worker count (1.74 workers) while those in the urban county had the lowest (1.29 workers).

TABLE D-5: HOUSEHOLD WORKERS

	N	HH Workers				Mean	SE Mean
		0	1	2+	Total		
CMAP	10552	17.0%	36.3%	46.7%	100.0%	1.45	.00
NIRPC	3838	20.6%	33.8%	45.6%	100.0%	1.44	.00
Urban	6986	21.1%	40.2%	38.7%	100.0%	1.29	.00
Suburban	6895	11.5%	28.2%	60.3%	100.0%	1.74	.00
Rural	509	9.9%	42.2%	47.9%	100.0%	1.45	.00
Total	14390	17.3%	36.1%	46.6%	100.0%	1.45	.00

Source: Chicago Regional Household Travel Inventory, weighted. Base – all households.

Households in the NIRPC region were more likely to report lower incomes as compared to those in the CMAP region, with 58% of NIRPC households reporting an income less than $50,000 as compared to 50% of CMAP households. In addition, 31% in the rural county reported incomes of less than $50,000 as compared to 53% in the urban county and 50% of suburban county households.

TABLE D-6: HOUSEHOLD INCOME

	Household Income							Total
	<$20k	$20-<$35k	$35-<$50k	$50-<$60k	$60-<$75k	$75-<$100k	$100k+	
CMAP	17.9%	16.5%	15.9%	6.3%	14.1%	10.3%	19.0%	100.0%
NIRPC	22.1%	19.7%	16.4%	8.4%	12.3%	11.2%	10.0%	100.0%
Urban	21.7%	15.1%	16.2%	6.2%	10.3%	10.5%	20.0%	100.0%
Suburban	14.1%	19.9%	15.7%	6.8%	19.0%	9.9%	14.6%	100.0%
Rural	3.1%*	13.7%	13.7%	8.9%	24.4%	13.0%	23.2%	100.0%
Total	18.3%	16.8%	15.9%	6.5%	13.9%	10.4%	18.2%	100.0%

Source: Chicago Regional Household Travel Inventory, weighted. Base – all households reporting income.
*less than 20 observations.

Most participating households reported owning their own home (73%), with households in the NIRPC area more likely to own than those in the CMAP region. Households in the rural counties had the highest ownership rates (89%) while those in the urban county had the lowest (65%).

TABLE D-7: HOME OWNERSHIP STATUS

	Owner/Renter Status		
	Own	Rent	Total
CMAP	72.2%	27.8%	100.0%
NIRPC	80.3%	19.7%	100.0%
Urban	65.4%	34.6%	100.0%
Suburban	84.8%	15.2%	100.0%
Rural	88.7%	11.3%	100.0%
Total	72.9%	27.1%	100.0%

Source: Chicago Regional Household Travel Inventory, weighted.
Base – all households

Corresponding to the high home ownership rates are long tenures in the region. As shown in Table D-8, 38% of participating households have lived in the region for ten years or more. However, 9% of households have lived in the study area for less than a year, and 10% have lived here for about a year. Newcomers to the region were more likely to be found in the CMAP region, which includes the urban area. "Old timers" were more likely to be found in the suburban counties.

TABLE D-8: REGIONAL TENURE

	Length of Stay					
	<1 yr	1 to <2 yrs	2 to <5 yrs	5 to <10 yrs	10+ yrs	Total
CMAP	9.6%	10.6%	24.2%	18.7%	36.8%	100.0%
NIRPC	3.8%	3.1%	16.0%	24.2%	52.8%	100.0%
Urban	9.6%	12.9%	22.4%	17.3%	37.8%	100.0%
Suburban	8.3%	5.0%	25.4%	21.7%	39.6%	100.0%
Rural	8.5%	6.2%	25.3%	28.0%	32.0%	100.0%
Total	9.1%	10.0%	23.5%	19.2%	38.2%	100.0%

Source: Chicago Regional Household Travel Inventory, weighted. Base – all households reporting tenure.

Because the sample was largely proportionate to the population, almost two-thirds of the surveys come from households residing in Cook County, and 91% from the CMAP region.

TABLE D-9: COUNTY OF RESIDENCE

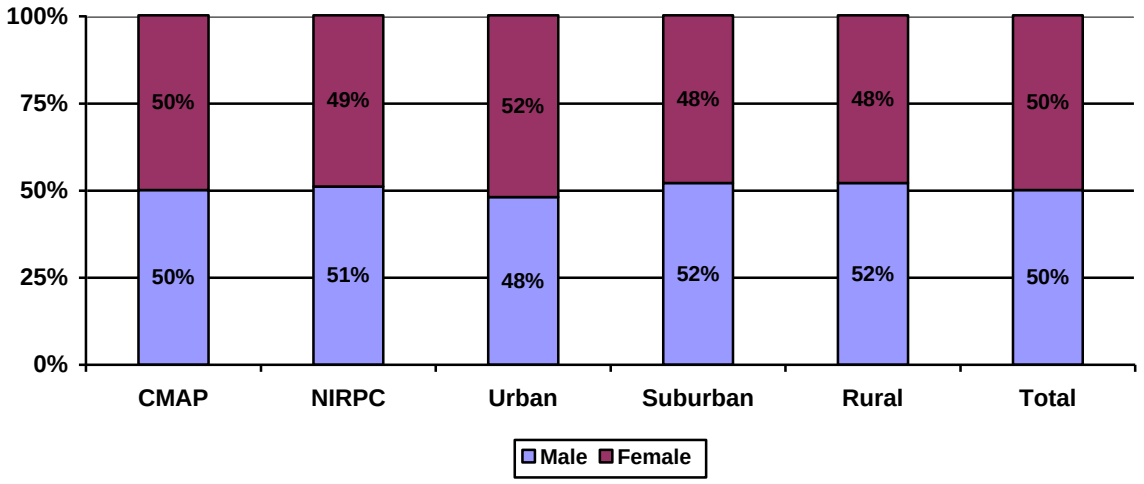
	Travel Period		
	1 Day	2 Day	Total
Cook County, IL	64.2%	57.9%	61.4%
DuPage County, IL	6.8%	14.2%	10.1%
Grundy County, IL	0.7%	0.1%	0.4%
Kane County, IL	2.1%	6.8%	4.2%
Kendall County, IL	.5%	.7%	.6%
Lake County, IL	9.6%	3.2%	6.7%
McHenry County, IL	2.5%	3.2%	2.8%
Will County, IL	6.6%	3.5%	5.2%
Lake County, IN	4.7%	6.9%	5.6%
LaPorte County, IN	1.1%	2.4%	1.7%
Porter County, IN	1.4%	1.1%	1.3%
CMAP	92.8%	89.6%	91.4%
NIRPC	7.2%	10.4%	8.6%
Urban	64.2%	57.9%	61.4%
Suburban	32.2%	38.1%	34.8%
Rural	3.6%	4.0%	3.8%
Total	100.0%	100.0%	100.0%

Source: Chicago Regional Household Travel Inventory, weighted.
Base – all households.

Person Characteristics

A total of 38,745 persons across the 14,390 participating households provided travel behavior details. The distribution of respondents by gender was fairly consistent across the region. As shown in Figure D-1, respondents were equally divided between male and female.

FIGURE D-1: RESPONDENT GENDER



Household members in the CMAP region tended to be slightly younger than those in the NIRPC region. Those living in the rural counties reported the highest proportions of members under age 18. Respondents living in suburban counties reported the highest proportion of members age 65 or older.

TABLE D-10: AGE

	Respondent Age						Mean
	Under 18	18 to 24	25 to 44	45 to 64	65+	Total	
CMAP	25.2%	19.4%	22.8%	24.2%	8.4%	100.0%	32.96
NIRPC	25.4%	16.9%	24.3%	25.8%	7.7%	100.0%	33.71
Urban	26.2%	20.8%	22.5%	22.8%	7.8%	100.0%	32.00
Suburban	23.6%	17.8%	23.1%	26.3%	9.3%	100.0%	34.51
Rural	26.8%	8.1%	28.1%	30.5%	6.6%	100.0%	34.68
Total	25.3%	19.2%	22.9%	24.3%	8.3%	100.0%	33.02

Source: Chicago Regional Household Travel Inventory, weighted. Base – all household members reporting age.

In terms of educational attainment, one-third of all residents reported less than a high school education. This includes adults, as well as school-aged children. Respondents in the CMAP region and urban and rural counties were more likely to have graduate-level education.

TABLE D-11: EDUCATIONAL ATTAINMENT

	Educational Attainment							
	Less than High School Grad	High School Grad	Some College	Associate & Technical	Bachelor	Graduate Level	Other	Total
CMAP	34.5%	21.0%	13.6%	6.2%	14.6%	10.1%	0.0%*	100.0%
NIRPC	32.5%	28.1%	14.9%	6.6%	11.7%	6.2%	0.0%*	100.0%
Urban	37.7%	16.6%	14.2%	6.0%	14.8%	10.7%	0.0%*	100.0%
Suburban	29.1%	30.1%	13.2%	6.3%	13.2%	8.2%	0.0%*	100.0%
Rural	28.5%	23.6%	11.6%	7.5%	18.3%	10.4%	0.0%*	100.0%
Total	34.3%	21.6%	13.7%	6.2%	14.4%	9.8%	0.0%*	100.0%

Source: Chicago Regional Household Travel Inventory, weighted. Base – all household members.
*less than 20 observations.

Almost one in every six households (16%) reported being of Hispanic origin. The proportions were two times higher in the CMAP region as compared to the NIRPC region, and stronger in the urban and suburban counties as compared to the rural counties.

TABLE D-12: HISPANIC ORIGIN

	Hispanic/Latino Origin		
	Yes	No	Total
CMAP	17.1%	82.9%	100.0%
NIRPC	9.5%	90.5%	100.0%
Urban	16.5%	83.5%	100.0%
Suburban	17.6%	82.4%	100.0%
Rural	4.8%	95.2%	100.0%
Total	16.4%	83.6%	100.0%

Source: Chicago Regional Household Travel Inventory, weighted. Base – main household respondents.

The distribution of respondents by race is shown in Table D-13. As indicated therein, about two-thirds of the respondents were white and 19% African American. The respondents in the CMAP region were more diverse than their NIRPC counterparts, as were the urban county dwellers particularly as compared to those living in the rural counties.

TABLE D-13: ETHNICITY

	Race/Ethnicity					
	White	Black/ African American	American Indian, Alaskan Native	Asian	Other	Total
CMAP	66.6%	19.2%	.0%	.3%	13.8%	100.0%
NIRPC	76.9%	18.6%	.1%*	.1%*	4.3%	100.0%
Urban	60.1%	26.9%	.0%	.3%	12.7%	100.0%
Suburban	77.5%	7.1%	.1%	.2%	15.1%	100.0%
Rural	99.4%	.3%*	.0%*	.0%*	.2%*	100.0%
Total	67.5%	19.2%	.0%	.3%	13.0%	100.0%

Source: Chicago Regional Household Travel Inventory, weighted. Base – main household respondents. *less than 20 observations.

The majority of respondents reported having no disabilities. Of those that did report a disability, they were less likely to live in the rural counties.

TABLE D-14: DISABILITY STATUS

	Disability Status		
	Yes	No	Total
CMAP	8.9%	91.1%	100.0%
NIRPC	7.1%	92.9%	100.0%
Urban	9.4%	90.6%	100.0%
Suburban	8.4%	91.6%	100.0%
Rural	3.1%	96.9%	100.0%
Total	8.8%	91.2%	100.0%

Source: Chicago Regional Household Travel Inventory, weighted.
Base – all household members.

Of the respondents age 16 or older, most (79%) reported having a driver's license. Licensure rates were lower in the CMAP region, and in the urban county.

TABLE D-15: LICENSE STATUS

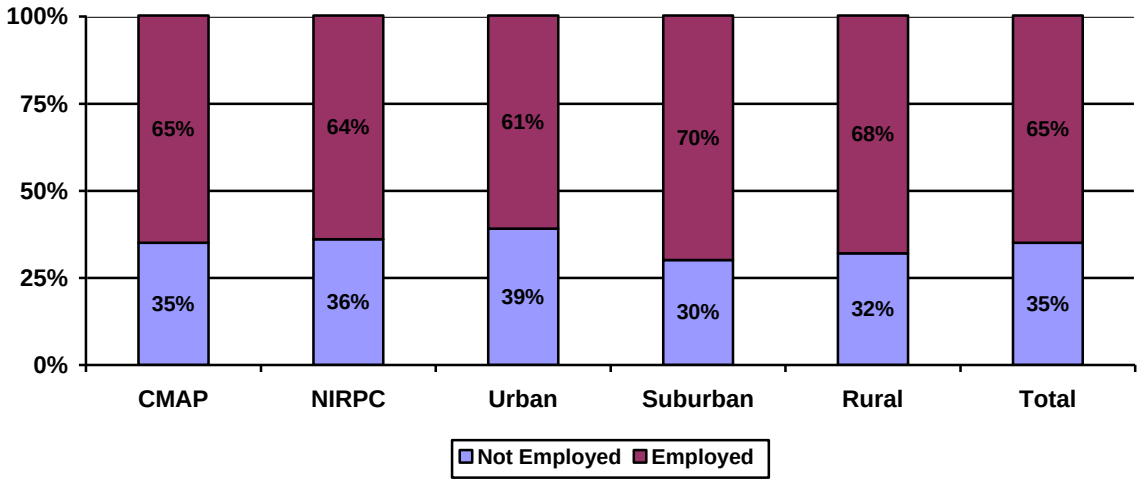
	Licensed Driver		
	Yes	No	Total
CMAP	78.3%	21.7%	100.0%
NIRPC	89.2%	10.8%	100.0%
Urban	72.6%	27.4%	100.0%
Suburban	87.8%	12.2%	100.0%
Rural	93.8%	6.2%	100.0%
Total	79.2%	20.8%	100.0%

Source: Chicago Regional Household Travel Inventory, weighted.
Base – all household members age 16+

Worker Characteristics

Employment status was obtained for those respondents age 16 or older. As shown in Figure D-2, region-wide, 65% of respondents age 16+ were employed. Employment rates were similar across the two MPO regions, and higher in the suburban counties.

FIGURE D-2: WORKER STATUS



For those respondents age 16 or older who reported being employed, their occupational industry was obtained. As indicated in Table D-16, more than half of all respondents reported working in the service industry (56%), followed by 16% in the retail industry. For the NIRPC region, the level of workers in the service industry was higher than the overall regional average (60% as compared to 55%). In terms of home location, those living in the urban county had high levels of service and retail industry positions. In addition, those in suburban counties reported higher than average proportions of workers in the transportation/utilities/warehousing industry (12% vs. 8%) and service industry (59% vs. 56%). Workers from the rural counties reported lower than average proportions of workers in the service industry (49% vs. 56%), but higher than average levels of workers in the manufacturing (13% vs. 9%) and government (9% vs. 5%) industries.

TABLE D-16: WORKER INDUSTRY

	Worker Industry							
	Manufac-turing	Transportation, utilities or warehousing	Communi-cations	Retail	Service	Govern-ment	Other	Total
CMAP	8.4%	8.2%	4.1%	16.8%	55.3%	5.4%	1.8%	100.0%
NIRPC	14.7%	9.3%	3.9%	6.0%	60.0%	4.7%	1.5%	100.0%
Urban	8.4%	5.7%	5.2%	20.2%	53.7%	5.3%	1.5%	100.0%
Suburban	9.4%	11.8%	2.7%	10.5%	58.9%	4.9%	1.8%	100.0%
Rural	12.6%	8.0%	3.1%	12.8%	49.4%	9.3%	4.8%	100.0%
Total	9.0%	8.3%	4.0%	15.9%	55.7%	5.3%	1.8%	100.0%

Source: Chicago Regional Household Travel Inventory, weighted. Base – all employed household members.
*less than 20 observations.

Most workers who work outside the home travel to work by automobile (78%). This proportion increased to 96% of all NIRPC commuters, 92% of commuters in suburban counties, and 94% of commuters in rural counties. Bus riders were highest in the CMAP region and the urban county, as were rail commuters.

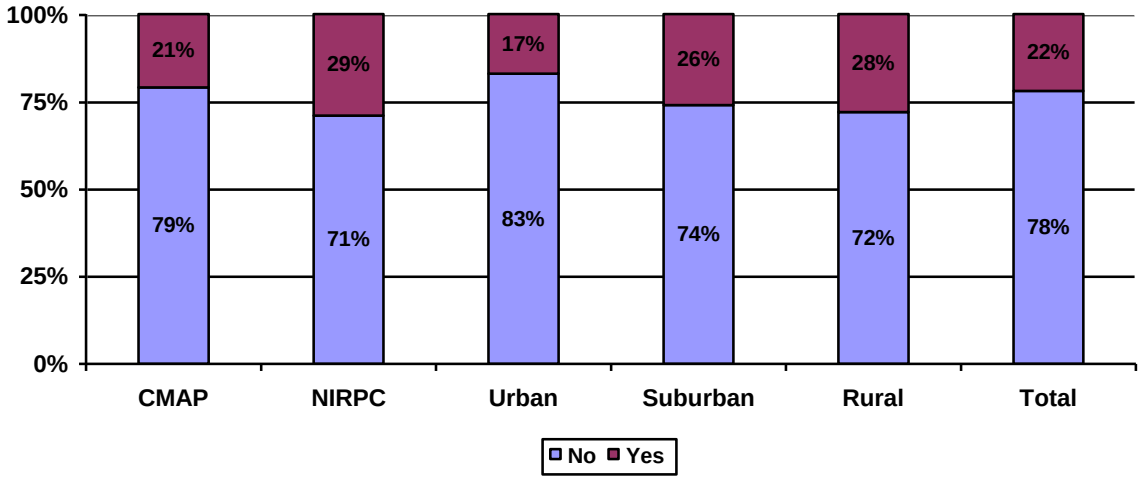
TABLE D-17: TYPICAL MODE TO WORK

	Typical Mode of Transportation to Work					
	Auto	Bus	Rail	Shared Ride-Taxi	Other	Total
CMAP	76.7%	9.7%	7.8%	0.2%	5.7%	100.0%
NIRPC	95.8%	0.1%*	2.4%	0.1%*	1.6%	100.0%
Urban	66.2%	14.2%	11.4%	0.3%	7.9%	100.0%
Suburban	92.4%	2.8%	2.5%	0.0%*	2.2%	100.0%
Rural	94.1%	0.1%*	2.7%	0.0%*	3.2%*	100.0%
Total	78.3%	8.9%	7.3%	0.2%	5.3%	100.0%

Source: Chicago Regional Household Travel Inventory, weighted. Base – all workers that work at a non-home location. *less than 20 observations.
Auto = auto-van-truck driver or passenger; Bus=CTA, Pace, and NIRPC regional providers; Rail=CTA and Metra (South Shore Railroad in IN); and Shared Ride=Private Shuttle Bus, Dial-a-ride, Paratransit, and Taxi

Almost one-fourth of commuters indicated that their vehicle was required at work. This included 21% of CMAP regional commuters and 29% of NIRPC regional commuters. Commuters from the rural counties were more likely to report needing a vehicle at work (28%) as compared to commuters from the suburban counties (26%) or urban-based commuters (17%).

FIGURE D-3: VEHICLE REQUIRED AT WORK



Only 13% of workers reported being able to telecommute. Telecommuters were more likely to live in the CMAP region as compared to the NIRPC region (13% as compared to 8%). There was little difference in the proportion of telecommuters based on county of residence.

TABLE D-18: TELECOMMUTE STATUS

	Telecommute for Work		
	Yes	No	Total
CMAP	13.2%	86.8%	100.0%
NIRPC	7.5%	92.5%	100.0%
Urban	11.9%	88.1%	100.0%
Suburban	13.9%	86.1%	100.0%
Rural	10.9%	89.1%	100.0%
Total	12.7%	87.3%	100.0%

Source: Chicago Regional Household Travel Inventory, weighted.
Base – all workers.

Of those workers who do telecommute, half telecommute almost every day (26%) or at least once a week (25%). An additional 30% indicated they telecommute at least once a month. Only 18% indicated they telecommute a few times per year or less. Although a smaller proportion of NIRPC workers telecommute, those who do telecommute do so at a higher frequency than their CMAP counterparts, with 27% telecommuting almost every day and 47% telecommuting once a week or more. Suburban county dwellers were most likely to report telecommuting only once a year (19% as compared to 10% overall).

TABLE D-19: TELECOMMUTE STATUS

	Frequency Telecommute					
	Almost every day	Once a week or more	Once a month or more	A few times a year	Once a year	Total
CMAP	26.2%	24.6%	30.5%	8.5%	10.1%	100.0%
NIRPC	27.3%	46.6%	15.7%	8.9%	1.6%*	100.0%
Urban	28.4%	30.4%	27.9%	11.5%	1.8%	100.0%
Suburban	24.9%	18.8%*	32.2%	4.8%*	19.3%*	100.0%
Rural	11.9%*	39.3%	31.3%	15.1%*	2.5%*	100.0%
Total	26.3%	25.4%	30.0%	8.5%	9.8%	100.0%

Source: Chicago Regional Household Travel Inventory, weighted. Base – all workers who telecommute. *less than 20 observations.

Almost half of all workers reported some work schedule flexibility (47%). However, one-third (33%) reported no flexibility. One-fourth of urban-county based workers reported complete flexibility with their work schedules, as compared to only 15% of workers living in the suburban counties and 18% of workers living in rural counties.

TABLE D-20: SCHEDULE FLEXIBILITY

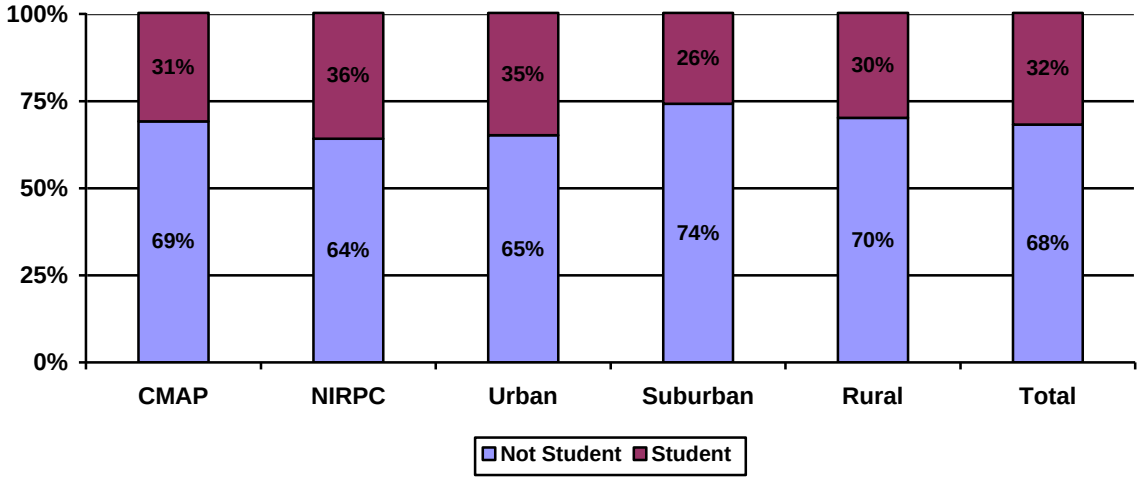
	Work Schedule Flexibility			
	No Flexibility	Some Flexibility	Complete Flexibility	Total
CMAP	33.2%	47.1%	19.6%	100.0%
NIRPC	32.8%	48.3%	18.9%	100.0%
Urban	31.0%	45.7%	23.3%	100.0%
Suburban	35.8%	49.3%	14.9%	100.0%
Rural	35.8%	46.1%	18.1%	100.0%
Total	33.2%	47.2%	19.6%	100.0%

Source: Chicago Regional Household Travel Inventory, weighted. Base – all workers.

Student Characteristics

Student levels were fairly consistent across the region, with slightly more in the NIRPC region as compared to the CMAP region. More students were reported in the urban county, likely reflecting the higher levels of university students.

FIGURE D-3: STUDENT STATUS



Most students in the data set were primary students, in grades K through 12 (62%). An additional 25% of students attended 2-year or 4-year colleges and universities. The NIRPC region has a higher level of 4-year university students than average (30% compared to 13% overall), as do students living in the suburban counties (24% compared to 13% overall). Almost half of all students in the rural counties (42%) were in grades K through 8, as compared to 38% overall.

TABLE D-21: STUDENT GRADE LEVEL

	Grade Level								
	Daycare Nursery & Pre-K	K - 8	9 - 12	Technical & Vocational	2-yr College	4-yr University	Grad School & Professional	Other	Total
CMAP	5.3%	39.0%	23.6%	1.2%	12.3%	11.7%	4.8%	2.0%	100.0%
NIRPC	3.2%	29.6%	25.7%	0.4%	9.0%	30.1%	2.0%	0.1%*	100.0%
Urban	4.6%	39.7%	24.6%	1.1%	12.4%	9.3%	5.5%	2.7%	100.0%
Suburban	5.8%	34.2%	22.0%	0.7%	10.9%	23.5%	2.6%	0.3%*	100.0%
Rural	8.4%	42.0%	23.9%	4.4%*	13.9%	5.4%*	1.9%*	0.0%*	100.0%
Total	5.1%	38.1%	23.8%	1.1%	12.0%	13.4%	4.5%	1.9%	100.0%

Source: Chicago Regional Household Travel Inventory, weighted. Base – all students.
*less than 20 observations.

Students who were not home-schooled were most likely to travel to school by auto (driver or passenger – 48%), followed by walking or biking (25%) and school bus (14%). Students in the NIRPC region were more likely to travel by auto (59% as compared to 48% overall) and school bus (20% as compared to 14% overall). Students in rural counties were most likely to travel to school by school bus (39% compared to 14% overall) and least likely to travel by walk or bike (9% compared to 25% overall).

TABLE D-22 TYPICAL MODE TO SCHOOL

	Typical Mode of Transportation to School							
	Walk or Bike	Auto	Other Bus	Rail	Shared Ride-Taxi	School Bus	Other	Total
Chicago	26.5%	47.3%	8.6%	3.6%	.4%	13.6%	.1%*	100.0%
NIRPC	5.5%	58.6%	.5%*	1.1%*	14.5%	19.6%	.2%*	100.0%
Urban	30.3%	46.9%	8.7%	4.5%	.4%	9.1%	.1%*	100.0%
Suburban	13.4%	51.3%	6.6%	1.0%	4.9%	22.7%	.1%*	100.0%
Rural	9.3%	50.6%	.4%*	.7%*	.3%*	38.6%	.0%*	100.0%
Total	24.5%	48.3%	7.8%	3.3%	1.7%	14.2%	.1%	100.0%

Source: Chicago Regional Household Travel Inventory, weighted. Base – all students not homeschooled.
*less than 20 observations.
Auto = auto-van-truck driver or passenger; Bus=CTA, Pace, and NIRPC regional providers; Rail=CTA and Metra (South Shore Railroad in IN); and Shared Ride=Private Shuttle Bus, Dial-a-ride, Paratransit, and Taxi

TRAVEL BEHAVIOR CHARACTERISTICS

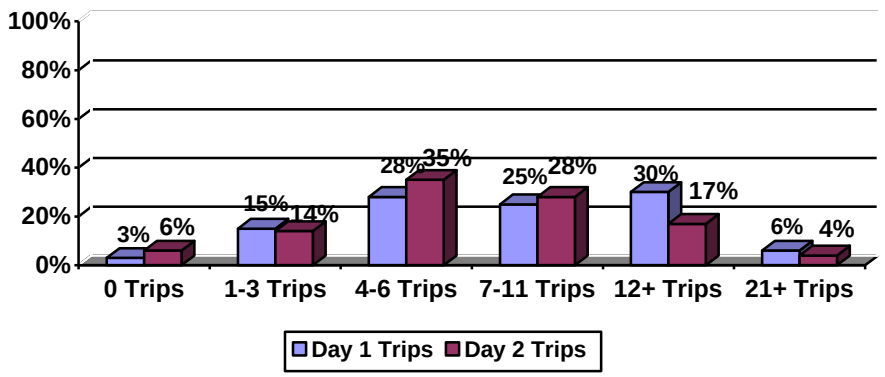
The previous section provided a summary of demographic characteristics for the participating households, with differences noted based on the MPO region and the density levels (urban, suburban, and rural). In this section, details of the reported trips are reviewed in order to document the extent to which travel behavior varies across the region. This includes summaries of trip rates, trip characteristics, travel times, and mode choice by the different household and person characteristics across the region as well as the entire study area.

When reporting trip rates, separate tables have been prepared to illustrate the differences in trip rates for Day 1 and Day 2 of travel. All 14,390 households have Day 1 data. Only those participating in the 2-Day survey type have Day 2 data.

Household Trip Rates

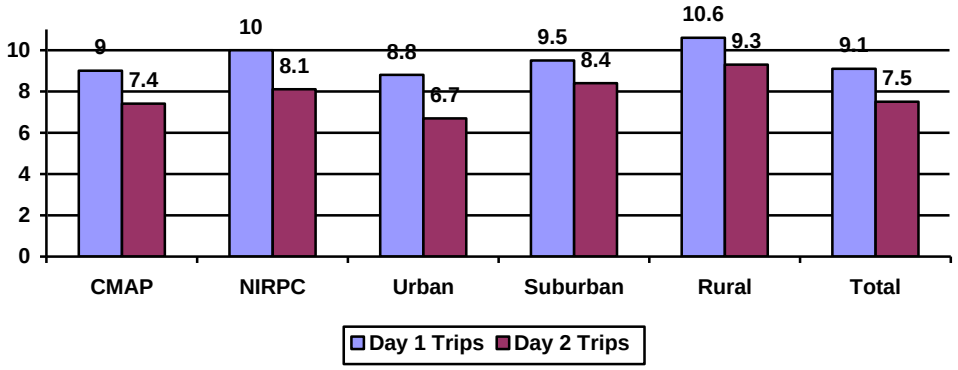
The average daily household trip rate was 9.28 trips on Day 1 and 7.45 trips on Day 2. Of the 14,390 participating households, 2% overall reported having no household trips on either travel day. This rate is well within the standard range of immobility in household travel surveys (8%).

FIGURE T-1: HOUSEHOLD TRIP VOLUME



Household trip rates varied across the region, as shown in Figure T-2. Households in the NIRPC region reported more trips than those in the CMAP region. Those from the rural counties also reported higher average daily trip rates as compared to those from the urban and suburban counties.

FIGURE T-2: HOUSEHOLD TRIP RATES BY GEOGRAPHY



The average number of reported daily household trips increased as household size increased, which was an expected trend. The average number of trips for a 1-person household was 4.09, which is half that of 2-person households (7.93 trips). Households with three persons reported 9.13 trips, while those with four or more reported 14.85 trips.

TABLE T-1: HOUSEHOLD TRIP RATES BY HOUSEHOLD SIZE – DAY 1

	HH size								Total	
	1		2		3		4+			
	Mean	SE Mean	Mean	SE Mean	Mean	SE Mean	Mean	SE Mean	Mean	SE Mean
CMAP	4.12	.00	7.76	.00	8.96	.01	14.74	.01	9.01	.00
NIRPC	3.68	.01	9.60	.02	10.79	.02	16.18	.03	10.02	.01
Urban	4.15	.00	8.07	.01	8.14	.01	15.63	.01	8.77	.00
Suburban	3.97	.01	7.65	.01	10.93	.01	13.76	.01	9.51	.01
Rural	3.33	.02	8.84	.02	13.06	.04	16.24	.05	10.62	.02
Total	4.09	.00	7.93	.00	9.13	.01	14.85	.01	9.10	.00

Source: Chicago Regional Household Travel Inventory, weighted. Base – all trips reported for Day 1.

A similar trend is observed in the Day 2 data, as indicated in Table T-2.

TABLE T-2: HOUSEHOLD TRIP RATES BY HOUSEHOLD SIZE – DAY 2

	HH size								Total	
	1		2		3		4+			
	Mean	SE Mean	Mean	SE Mean	Mean	SE Mean	Mean	SE Mean	Mean	SE Mean
CMAP	3.77	.00	7.15	.01	8.50	.01	10.45	.01	7.37	.00
NIRPC	2.95	.01	6.45	.01	10.24	.04	15.52	.04	8.07	.02
Urban	3.78	.00	6.89	.01	7.56	.01	10.24	.02	6.70	.01
Suburban	3.59	.01	7.08	.01	10.29	.02	11.34	.02	8.38	.01
Rural	2.62	.02	7.83	.03	14.15	.05	12.63	.08	9.31	.03
Total	3.70	.00	7.04	.01	8.67	.01	10.83	.01	7.45	.00

Source: Chicago Regional Household Travel Inventory, weighted. Base – all trips reported for Day 2.

Overall, average daily household trip rates increased as vehicle ownership levels increased. However, within regions, trip rates for 0-vehicle households differed significantly. In the CMAP region, and the urban county, 0-vehicle households reported higher levels of travels while those in the NIRPC region and non-urban counties reported considerably less travel.

TABLE T-3: HOUSEHOLD TRIP RATES BY VEHICLES – DAY 1

	HH Vehicles								Total	
	0		1		2		3+			
	Mean	SE Mean	Mean	SE Mean	Mean	SE Mean	Mean	SE Mean	Mean	SE Mean
CMAP	5.41	.01	7.41	.01	11.33	.01	9.97	.01	9.01	.00
NIRPC	2.90	.02	8.74	.02	10.25	.02	12.57	.02	10.02	.01
Urban	5.46	.01	7.42	.01	12.66	.01	8.58	.01	8.77	.00
Suburban	4.19	.02	7.83	.01	9.44	.01	11.78	.01	9.51	.01
Rural	1.65	.01	6.67	.03	11.58	.03	13.48	.04	10.62	.02
Total	5.33	.01	7.53	.01	11.23	.01	10.25	.01	9.10	.00

Source: Chicago Regional Household Travel Inventory, weighted. Base – all trips reported for Day 1.

A similar trend is observed in the Day 2 data, as indicated in Table T-4.

TABLE T-4: HOUSEHOLD TRIP RATES BY VEHICLES – DAY 2

	HH Vehicles								Group Total	
	0		1		2		3+			
	Mean	SE Mean	Mean	SE Mean	Mean	SE Mean	Mean	SE Mean	Mean	SE Mean
CMAP	4.59	.01	6.02	.01	9.24	.01	9.10	.01	7.37	.00
NIRPC	1.53	.03	6.27	.02	7.65	.03	12.61	.04	8.07	.02
Urban	4.64	.01	6.41	.01	8.57	.01	7.77	.01	6.70	.01
Suburban	1.70	.02	5.67	.01	9.13	.01	11.41	.02	8.38	.01
Rural	1.46	.10	3.52	.03	11.41	.04	9.17	.05	9.31	.03
Total	4.52	.01	6.05	.01	9.04	.01	9.53	.01	7.45	.00

Source: Chicago Regional Household Travel Inventory, weighted. Base – all trips reported for Day 2.

A common method for reviewing trip rates is to consider both household size and household vehicles owned. This is contained in Tables T-5 and T-6 for the Day 1 and Day 2 data respectively.

TABLE T-5: HOUSEHOLD TRIP RATES BY HOUSEHOLD SIZE AND HOUSEHOLD VEHICLES - DAY 1

	0-VEHICLES	1-VEHICLE	2-VEHICLES	3+ VEHICLES	TOTAL
1-person	3.87 +/- .01	4.26 +/- .00	4.40 +/- .01	3.21 +/- .00	4.09 +/- .00
2-persons	5.76 +/- .02	9.09 +/- .01	7.41 +/- .01	8.11 +/- .02	7.93 +/- .00
3-persons	4.52 +/- .01	10.5 +/- .02	11.33 +/- .02	8.54 +/- .01	9.13 +/- .01
4+ persons	10.91 +/- .01	14.56 +/- .02	16.76 +/- .01	13.35 +/- .01	14.85 +/- .01
Total	5.33 +/- .01	7.53 +/- .01	11.23 +/- .01	10.25 +/- .01	9.10 +/- .00

Source: Chicago Regional Household Travel Inventory, weighted. Base – all trips reported for Day 1.

TABLE T-6: HOUSEHOLD TRIP RATES BY HOUSEHOLD SIZE AND HOUSEHOLD VEHICLES - DAY 2

	0-VEHICLES	1-VEHICLE	2-VEHICLES	3+ VEHICLES	TOTAL
1-person	3.23 +/- .01	3.96 +/- .01	4.43 +/- .02	3.8 +/- .04	3.7 +/- .00
2-persons	5.18 +/- .03	7.11 +/- .01	7.26 +/- .01	6.37 +/- .02	7.04 +/- .01
3-persons	4.1 +/- .04	9.92 +/- .03	10.6 +/- .02	7.7 +/- .01	8.67 +/- .01
4+ persons	7.82 +/- .01	7.98 +/- .03	11.98 +/- .02	13.3 +/- .02	10.83 +/- .01
Total	4.52 +/- .01	6.05 +/- .01	9.04 +/- .01	9.53 +/- .01	7.45 +/- .00

Source: Chicago Regional Household Travel Inventory, weighted. Base – all trips reported for Day 2.

Households with 2 or more workers reported almost twice the number of trips as those without workers.

TABLE T-7: HOUSEHOLD TRIP RATES BY WORKERS – DAY 1

	HH Workers						Group Total	
	0		1		2+			
	Mean	SE Mean	Mean	SE Mean	Mean	SE Mean	Mean	SE Mean
CMAP	6.36	.01	7.93	.01	10.82	.01	9.01	.00
NIRPC	7.30	.03	9.39	.02	11.72	.02	10.02	.01
Urban	6.51	.01	7.83	.01	10.99	.01	8.77	.00
Suburban	6.33	.02	8.25	.01	10.70	.01	9.51	.01
Rural	6.20	.04	10.22	.04	11.89	.03	10.62	.02
Total	6.46	.01	8.05	.01	10.89	.01	9.10	.00

Source: Chicago Regional Household Travel Inventory, weighted. Base – all trips reported for Day 1.

TABLE T-8: HOUSEHOLD TRIP RATES BY WORKERS – DAY 2

	HH Workers						Group Total	
	0		1		2+			
	Mean	SE Mean	Mean	SE Mean	Mean	SE Mean	Mean	SE Mean
CMAP	4.90	.01	6.30	.01	9.18	.01	7.37	.00
NIRPC	2.88	.02	7.44	.02	10.09	.03	8.07	.02
Urban	4.88	.01	5.56	.01	9.23	.01	6.70	.01
Suburban	4.03	.02	7.72	.02	9.34	.01	8.38	.01
Rural	5.97	.07	10.14	.04	9.10	.04	9.31	.03
Total	4.72	.01	6.42	.01	9.28	.01	7.45	.00

Source: Chicago Regional Household Travel Inventory, weighted. Base – all trips reported for Day 2.

In general, household trip rates increased as income increased. NIRPC households reported higher trip rates for the low to mid-income levels, while those in the CMAP region had higher trip rates for the higher income categories.

TABLE T-9: HOUSEHOLD TRIP RATES BY HOUSEHOLD INCOME - DAY 1

	Household Income							
	<$20k	$20-<$35k	$35-<$50k	$50-<$60k	$60-<$75k	$75-<$100k	$100k+	Total
	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean
CMAP	8.19	8.10	7.83	7.96	11.12	10.15	10.06	9.01
NIRPC	8.88	13.36	9.95	8.61	9.38	9.16	10.99	10.02
Urban	7.95	9.57	8.15	7.58	9.94	9.42	9.35	8.77
Suburban	9.15	7.26	7.51	8.01	12.30	11.06	11.56	9.51
Rural	5.91	10.54	10.69	13.08	8.62	11.18	12.02	10.62
Total	8.26	8.64	8.02	8.03	10.99	10.05	10.10	9.10

Source: Chicago Regional Household Travel Inventory, weighted. Base – all trips reported for Day 1.

For households reporting a 2nd day of data, the trend is reversed: CMAP households report higher trip rates for the low to mid-income groups, while the NIRPC households had higher trip rates for the upper income categories.

TABLE T-10: HOUSEHOLD TRIP RATES BY HOUSEHOLD INCOME - DAY 2

	Household Income							
	<$20k	$20-<$35k	$35-<$50k	$50-<$60k	$60-<$75k	$75-<$100k	$100k+	Total
	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean
CMAP	5.23	6.09	7.14	7.66	7.82	9.52	9.89	7.37
NIRPC	3.85	6.95	6.93	8.44	9.39	13.70	10.90	8.07
Urban	5.21	5.23	6.44	7.04	7.46	8.64	9.23	6.70
Suburban	4.67	6.96	8.03	8.49	7.90	11.96	11.37	8.38
Rural	3.22	8.39	9.25	11.73	10.35	8.75	9.58	9.31
Total	5.12	6.25	7.12	7.77	7.92	10.18	9.95	7.45

Source: Chicago Regional Household Travel Inventory, weighted. Base – all trips reported for Day 2.

Finally, average daily household trip rates by home ownership type were examined. As indicated in Table T-11, trip rates were higher for owners vs. renters across all portions of the study area.

TABLE T-11: HOUSEHOLD TRIP RATES BY HOME OWNERSHIP STATUS – DAY 1

	Owned/mortgaged		Rented		Total	
	Mean	SE Mean	Mean	SE Mean	Mean	SE Mean
CMAP	9.88	.01	6.96	.01	9.01	.00
NIRPC	10.16	.01	9.48	.04	10.02	.01
Urban	9.72	.01	7.01	.01	8.77	.00
Suburban	10.01	.01	7.74	.02	9.51	.01
Rural	11.28	.02	5.39	.04	10.62	.02
Total	9.91	.00	7.12	.01	9.10	.00

Source: Chicago Regional Household Travel Inventory, weighted. Base – all trips reported for Day 1.

TABLE T-12: HOUSEHOLD TRIP RATES BY HOME OWNERSHIP STATUS – DAY 2

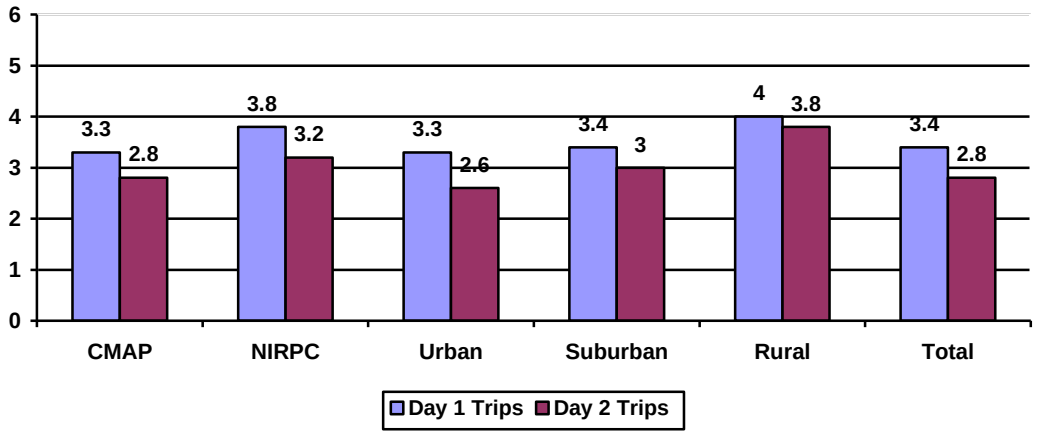
	Owned/mortgaged		Rented		Total	
	Mean	SE Mean	Mean	SE Mean	Mean	SE Mean
CMAP	8.07	.01	5.90	.01	7.37	.00
NIRPC	8.73	.02	4.39	.03	8.07	.02
Urban	7.43	.01	5.65	.01	6.70	.01
Suburban	8.81	.01	6.63	.02	8.38	.01
Rural	9.71	.03	6.59	.04	9.31	.03
Total	8.16	.01	5.83	.01	7.45	.00

Source: Chicago Regional Household Travel Inventory, weighted. Base – all trips reported for Day 2.

Person Trip Rates

The average daily person trip rate for participating household members was 3.36 for Day 1 and 2.81 for Day 2. The following tables and figures in this section summarize the average daily person trip rates for household members based on specific person-level characteristics. Person trip rates at the modeling area and regional levels are shown in Figure T-3.

FIGURE T-3: PERSON TRIP RATES BY GEOGRAPHY



Throughout the region, average daily person trip rates did not vary much based on gender. The one exception to this is in the rural counties, where females tended to report a statistically higher trip rate as compared to males.

FIGURE T-4 PERSON TRIP RATES BY GENDER AND GEOGRAPHY – DAY 1

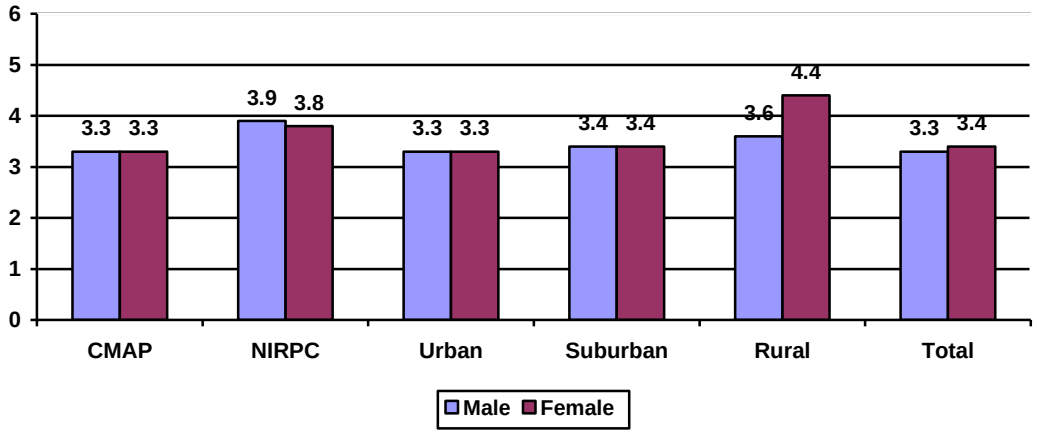
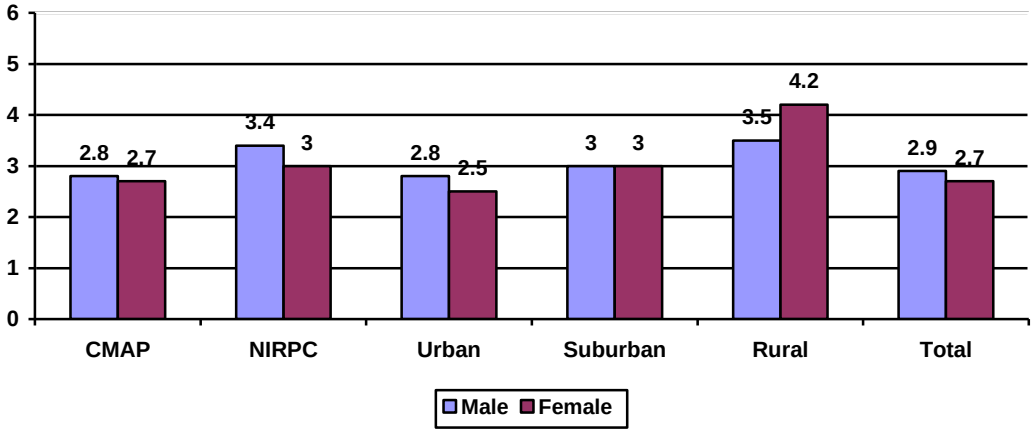


FIGURE T-5 PERSON TRIP RATES BY GENDER AND GEOGRAPHY – DAY 2



Person trip rates increased from children until middle age, peaking for respondents between the ages of 25 to 54. After this, the average daily trip rate declines for each age cohort. Person trip rates tended to be higher for respondents in the rural counties, regardless of age cohort.

TABLE T-13: PERSON TRIP RATES BY AGE – DAY 1

	<20	20-24	25-54	55-64	65+	Total
	Mean	Mean	Mean	Mean	Mean	Mean
CMAP	2.85	3.34	3.57	3.55	3.23	3.31
NIRPC	2.61	2.79	5.69	4.02	3.28	3.83
Urban	2.79	3.38	3.64	3.38	3.76	3.31
Suburban	2.86	3.08	3.88	3.82	2.48	3.36
Rural	3.20	4.85	4.21	4.24	3.78	4.02
Total	2.83	3.30	3.75	3.59	3.24	3.36

Source: Chicago Regional Household Travel Inventory, weighted. Base – all trips reported for Day 1.

TABLE T-14: PERSON TRIP RATES BY AGE – DAY 2

	<20	20-24	25-54	55-64	65+	Total
	Mean	Mean	Mean	Mean	Mean	Mean
CMAP	2.25	2.59	3.33	3.16	2.09	2.77
NIRPC	1.85	3.14	4.81	3.70	2.59	3.21
Urban	2.16	2.48	3.00	2.84	2.74	2.62
Suburban	2.19	2.79	4.19	3.56	1.56	2.98
Rural	3.39	5.12	3.78	3.93	3.32	3.83
Total	2.20	2.65	3.47	3.20	2.12	2.81

Source: Chicago Regional Household Travel Inventory, weighted. Base – all trips reported for Day 2.

Ethnicity was asked only of the main reference person and is assumed to represent the ethnicity of all household members. Overall, white households report higher overall trip rates than African American households. Within MPO region, whites report higher trip rates in the CMAP region, and African Americans report higher trip rates in the NIRPC region.

TABLE T-15: PERSON TRIP RATES BY RACE – DAY 1

	White		Afr Am		Other		Total	
	Mean	SE Mean	Mean	SE Mean	Mean	SE Mean	Mean	SE Mean
CMAP	4.38	.00	3.88	.00	3.71	.00	3.31	.00
NIRPC	3.53	.01	4.42	.01	3.84	.03	3.83	.00
Urban	4.35	.00	3.89	.00	3.94	.00	3.31	.00
Suburban	4.17	.00	4.14	.01	3.36	.00	3.36	.00
Rural	4.64	.01	7.94	.24	3.66	.10	4.02	.00
Total	4.30	.00	3.93	.00	3.71	.00	3.36	.00

Source: Chicago Regional Household Travel Inventory, weighted. Base – all trips reported for Day 1 by main household respondents.

TABLE T-16: PERSON TRIP RATES BY RACE – DAY 2

	White		Afr Am		Other		Total	
	Mean	SE Mean	Mean	SE Mean	Mean	SE Mean	Mean	SE Mean
CMAP	4.09	.00	2.48	.00	2.63	.01	2.77	.00
NIRPC	3.28	.01	2.84	.02	2.82	.02	3.21	.00
Urban	3.96	.00	2.39	.00	4.59	.01	2.62	.00
Suburban	3.95	.00	3.44	.01	.71	.01	2.98	.00
Rural	4.48	.02	--	--	2.00	.00	3.83	.01
Total	3.99	.00	2.50	.00	2.64	.01	2.81	.00

Source: Chicago Regional Household Travel Inventory, weighted. Base – all trips reported for Day 2 by main household respondents.

Respondents age 16 or older that held a driver's license reported at least one trip more than those without driver's licenses. In the NIRPC region and in the rural counties, the difference is closer to two trips.

TABLE T-17: PERSON TRIP RATES BY LICENSE STATUS – DAY 1

	Yes		No		Total	
	Mean	SE Mean	Mean	SE Mean	Mean	SE Mean
CMAP	3.70	.00	2.60	.00	3.31	.00
NIRPC	4.27	.01	2.31	.01	3.83	.00
Urban	3.78	.00	2.65	.00	3.31	.00
Suburban	3.66	.00	2.32	.00	3.36	.00
Rural	4.37	.01	2.90	.02	4.02	.00
Total	3.75	.00	2.58	.00	3.36	.00

Source: Chicago Regional Household Travel Inventory, weighted. Base – all trips reported for Day 1 by members age 16+.

TABLE T-18: PERSON TRIP RATES BY LICENSE STATUS – DAY 2

	Yes		No		Total	
	Mean	SE Mean	Mean	SE Mean	Mean	SE Mean
CMAP	3.27	.00	1.59	.00	2.77	.00
NIRPC	3.87	.01	.76	.01	3.21	.00
Urban	3.10	.00	1.79	.00	2.62	.00
Suburban	3.54	.00	1.08	.00	2.98	.00
Rural	3.96	.01	2.62	.04	3.83	.01
Total	3.34	.00	1.54	.00	2.81	.00

Source: Chicago Regional Household Travel Inventory, weighted. Base – all trips reported for Day 2 by members age 16+.

Respondents age 16 and older who work reported almost one full trip more than those who do not work. The difference in trip rates between workers and non-workers is smaller for those in the CMAP region and larger for those in the NIRPC region.

TABLE T-19: PERSON TRIP RATES BY WORKER STATUS – DAY 1

	Yes		No		Total	
	Mean	SE Mean	Mean	SE Mean	Mean	SE Mean
CMAP	3.69	.00	2.97	.00	3.31	.00
NIRPC	4.46	.01	3.19	.01	3.83	.00
Urban	3.66	.00	3.14	.00	3.31	.00
Suburban	3.84	.00	2.54	.00	3.36	.00
Rural	4.34	.01	4.14	.01	4.02	.00
Total	3.76	.00	2.99	.00	3.36	.00

Source: Chicago Regional Household Travel Inventory, weighted. Base – all trips reported for Day 1.

Workers in households that reported a second day of travel reported higher trip making levels than non-workers. The only exception to this was in the rural counties, where non-workers reported more travel than workers.

TABLE T-20: PERSON TRIP RATES BY WORKER STATUS – DAY 2

	Yes		No		Total	
	Mean	SE Mean	Mean	SE Mean	Mean	SE Mean
CMAP	3.37	.00	1.98	.00	2.77	.00
NIRPC	4.11	.01	1.62	.01	3.21	.00
Urban	3.33	.00	1.92	.00	2.62	.00
Suburban	3.57	.00	1.72	.00	2.98	.00
Rural	3.60	.01	4.69	.02	3.83	.01
Total	3.45	.00	1.95	.00	2.81	.00

Source: Chicago Regional Household Travel Inventory, weighted. Base – all trips reported for Day 2.

Trip Characteristics

The Chicago Regional Household Travel Inventory contains details regarding 184,194 unlinked trips (133,549 reported on Day 1 and 50,645 reported on Day 2). While the previous section focused on the characteristics of the travelers, the purpose of this section is to present the characteristics of the trips themselves. The method used to collect this data was a "place-based" approach. This means that each trip segment is recorded separately in the data file as a "trip." So a person traveling from home to work by auto has one trip segment (assuming the car was parked at the same address as the work location). However, a worker who made a stop on the way to work would show two trip segments: home to stop and stop to work. For purposes of this report, the word "trip" is used to refer to a particular trip segment between two addresses.

For each trip, a purpose was obtained. As shown in Table T-21, one-third of all trips involved returning home to perform in-home activities. Over 16% of all trips were to perform errands, while 14% were for work purposes.

TABLE T-21: PRIMARY TRIP PURPOSE

	In-home activities	Work	School	Transport Activities	Errands	Other	Total
CMAP	35.4%	13.4%	5.8%	10.4%	16.2%	18.8%	100.0%
NIRPC	32.0%	22.2%	4.6%	8.9%	17.4%	14.9%	100.0%
Urban	35.1%	12.2%	6.9%	11.1%	16.7%	18.0%	100.0%
Suburban	35.2%	17.3%	3.9%	9.2%	15.7%	18.8%	100.0%
Rural	33.5%	15.9%	4.8%	8.2%	17.5%	20.2%	100.0%
Total	35.1%	14.2%	5.7%	10.3%	16.4%	18.4%	100.0%

Source: Chicago Regional Household Travel Inventory, weighted. Base: all unlinked trips

The majority of trips (79%) were made by auto, with an additional 13% by walking or biking. Transit usage was higher in the CMAP region, and in the urban county.

TABLE T-22: TRAVEL MODE

	Auto	Bus	Rail	Walk/Bike	Other	Total
CMAP	76.9%	6.3%	1.7%	14.1%	1.0%	100.0%
NIRPC	94.2%	2.0%	.5%	3.0%	.3%	100.0%
Urban	70.6%	7.8%	2.1%	18.1%	1.4%	100.0%
Suburban	89.8%	3.1%	.8%	6.0%	.3%	100.0%
Rural	91.1%	3.9%	.7%	4.0%	.3%	100.0%
Total	78.5%	5.9%	1.6%	13.1%	1.0%	100.0%

Source: Chicago Regional Household Travel Inventory, weighted. Base: all unlinked trips

Overall, travel parties averaged 1.73 persons, regardless of travel mode. Those by auto averaged 1.8 persons, while those by bus and rail averaged 1.4 persons. Those traveling by walk and bike tended to do so with the company of others, averaging 1.5 persons. Travel party sizes were larger in the CMAP region as compared to the NIRPC region, and for rural dwellers as compared to those in suburban and urban counties.

TABLE T-23: TRAVEL PARTY SIZE BY TRAVEL MODE

	Auto	Bus	Rail	Walk/Bike	Other	Total
	Mean	Mean	Mean	Mean	Mean	Mean
CMAP	1.82	1.40	1.41	1.51	1.23	1.74
NIRPC	1.65	2.76	1.06	1.62	1.15	1.67
Urban	1.83	1.41	1.47	1.52	1.21	1.72
Suburban	1.76	1.55	1.13	1.52	1.36	1.73
Rural	1.85	1.55	1.13	1.23	1.04	1.81
Total	1.80	1.44	1.40	1.52	1.23	1.73

Source: Chicago Regional Household Travel Inventory, weighted. Base: all unlinked trips

The average reported trip distance was 4.9 miles. Trips for work purposes were the longest (7.3 miles) while those associated with meeting transportation needs (dropping off, picking up, etc.) and errands were the shortest (4.5 miles and 3.9 miles, respectively).

TABLE T-24: TRIP DISTANCE BY TRIP PURPOSE

	In-home activities	Work	School	Transport Activities	Errands	Other	Total
	Mean	Mean	Mean	Mean	Mean	Mean	Mean
CMAP	5.42	7.17	5.35	4.29	3.97	4.82	4.84
NIRPC	5.11	8.14	4.95	6.30	3.43	4.83	5.58
Urban	4.52	6.58	5.38	3.45	3.67	3.67	4.13
Suburban	6.34	7.65	5.06	5.95	4.18	6.18	5.87
Rural	8.24	11.05	6.41	6.68	5.25	7.54	7.18
Total	5.39	7.31	5.33	4.45	3.92	4.82	4.91

Source: Chicago Regional Household Travel Inventory, weighted. Base: all unlinked trips, straightline distance in miles

Rail trips were the longest (13 miles), while non-motorized travel had the shortest trip distances (2 miles).

TABLE T-25: TRIP DISTANCE BY TRAVEL MODE

	Auto	Bus	Rail	Walk/Bike	Other	Total
	Mean	Mean	Mean	Mean	Mean	Mean
CMAP	5.22	3.86	12.79	1.97	8.24	4.84
NIRPC	5.64	3.73	28.10	1.16	5.64	5.58
Urban	4.49	3.63	8.83	2.15	7.46	4.13
Suburban	5.99	4.71	28.91	1.09	13.14	5.87
Rural	7.27	4.21	48.19	1.04	9.42	7.18
Total	5.27	3.86	13.26	1.95	8.16	4.91

Source: Chicago Regional Household Travel Inventory, weighted. Base: all unlinked trips, straightline distance in miles

Work trips had the longest reported lengths (29 minutes), followed closely by school trips (25 minutes).

TABLE T-26: TRIP DURATION BY TRIP PURPOSE

	In-home activities	Work	School	Transport Activities	Errands	Other	Total
	Mean	Mean	Mean	Mean	Mean	Mean	Mean
CMAP	24.50	29.45	24.67	17.80	17.91	23.43	22.53
NIRPC	19.83	23.59	25.25	17.47	14.26	19.67	18.41
Urban	24.40	30.49	21.37	15.66	17.81	22.57	22.05
Suburban	23.81	26.66	33.38	21.34	17.23	23.96	22.39
Rural	22.16	28.20	22.79	16.65	16.59	22.69	21.29
Total	24.07	28.56	24.72	17.77	17.55	23.09	22.14

Source: Chicago Regional Household Travel Inventory, weighted. Base: all unlinked trips, trip duration in minutes.

Given that rail trips were the longest in terms of distance traveled, it is not surprising that they are also the longest in terms of duration (60 minutes). Non-motorized trips were the shortest durations (16 minutes).

TABLE T-27: TRIP DURATION BY TRAVEL MODE

	Auto	Bus	Rail	Walk/Bike	Other	Total
	Mean	Mean	Mean	Mean	Mean	Mean
CMAP	22.22	35.52	57.29	16.49	63.37	22.53
NIRPC	18.98	31.72	121.55	13.09	37.79	18.41
Urban	20.94	37.36	53.61	15.72	61.49	22.05
Suburban	23.03	27.97	79.54	19.52	61.40	22.39
Rural	20.59	28.64	122.95	20.61	111.33	21.29
Total	21.84	35.37	59.59	16.42	62.56	22.14

Source: Chicago Regional Household Travel Inventory, weighted. Base: all unlinked trips, trip duration in minutes.

Almost half of all reported trips were made during the mid-day period (10 am to 4 pm). Trip levels were almost equal with regard to the AM and PM peak periods (25% from 6 to 10 am, and 24% from 4 to 8 pm).

TABLE T-28: TRAVEL TIME

	AM Peak	Midday	PM Peak	Evening	Owl	Total
CMAP	25.0%	42.2%	23.2%	7.2%	2.4%	100.0%
NIRPC	20.0%	42.9%	27.8%	6.7%	2.5%	100.0%
Urban	24.8%	42.1%	22.7%	7.9%	2.6%	100.0%
Suburban	24.6%	42.9%	24.6%	5.6%	2.2%	100.0%
Rural	20.7%	39.6%	27.7%	10.0%	2.0%	100.0%
Total	24.5%	42.3%	23.6%	7.1%	2.4%	100.0%

Source: Chicago Regional Household Travel Inventory, weighted. Base: all unlinked trips.

Table T-29 shows the flow of trips at the county level. In this table, the counties of origin are shown in the left-most column, and the counties of destination are reflected in the remaining columns. Each row shows the distribution of trips that began in a specific county. For example, of all trips that begin in Cook County, 89% are to a destination in Cook County, 3% are to a destination in DuPage County, and 1% are to a destination in Kane County.

TABLE T-29: ORIGINS AND DESTINATIONS OF TRAVEL

Origin	Destination												Total
	IL-Cook	IL-DuPage	IL-Grundy	IL-Kane	IL-Kendall	IL-Lake	IL-McHenry	IL-Will	IN-Lake	IN-LaPorte	IN-Porter	Not Coded	
IL-Cook	89.2%	2.8%	.0%	1.1%	.0%	1.2%	.4%	1.8%	1.2%	.0%	.3%	2.1%	100.0%
IL-DuPage	15.9%	73.2%	.0%	2.9%	.5%	.4%	.2%	5.1%	.5%			1.4%	100.0%
IL-Grundy	.8%	.2%	84.0%	.2%	2.2%			8.3%				4.3%	100.0%
IL-Kane	9.0%	4.1%	.0%	76.9%	4.5%	.2%	3.7%	.6%	.0%			1.0%	100.0%
IL-Kendall	.9%	8.3%	1.3%	43.3%	37.1%		.1%	6.8%				2.2%	100.0%
IL-Lake	11.7%	.8%		.2%		83.0%	2.9%	.0%	.0%			1.4%	100.0%
IL-McHenry	8.1%	.6%		7.7%	.0%	4.9%	76.2%	.0%				2.6%	100.0%
IL-Will	16.3%	11.1%	.8%	.5%	1.0%	.1%		67.9%	.8%	.1%	.0%	1.5%	100.0%
IN-Lake	2.4%	.2%		.0%		.0%		.2%	92.2%	.4%	2.3%	2.4%	100.0%
IN-LaPorte	.3%			.0%				.1%	2.4%	69.3%	4.2%	23.6%	100.0%
IN-Porter	3.2%	.0%						.0%	13.6%	4.2%	76.7%	2.2%	100.0%
Not Coded	26.8%	3.3%	.5%	1.7%	.4%	1.5%	2.2%	1.7%	12.6%	24.7%	3.6%	21.1%	100.0%
Total	44.0%	7.9%	.4%	5.4%	.6%	4.4%	2.5%	4.0%	20.5%	3.4%	3.6%	3.4%	100.0%

Source: Chicago Regional Household Travel Inventory, weighted. Base: all unlinked trips

Table T-30 shows the flow of trips based on density (urban, suburban, rural). As with the prior table, the counties of origin are shown in the left-most column, and the counties of destination are reflected in the remaining columns. As indicated in this table, 89% of all trips that originate in an urban county end in a destination within an urban county, while 8% end in a suburban county and less than one percent end in a rural-county destination.

TABLE T-30: TRAVEL FLOWS BASED ON DENSITY – ORIGIN BASED

	Urban	Suburban	Rural	Not Coded	Total
Urban	89.2%	8.3%	.4%	2.1%	100.00%
Suburban	7.1%	88.1%	1.4%	3.4%	100.00%
Rural	6.2%	20.0%	71.1%	2.7%	100.00%
Not Coded	26.8%	49.1%	3.0%	21.1%	100.00%
Total	44.0%	49.2%	3.4%	3.4%	100.00%

Source: Chicago Regional Household Travel Inventory, weighted. Base: all unlinked trips

Table T-31 shows the travel flows in a slight different format. Here, the percentages within each cell reflect the total proportion of all trips made from one density setting to another. So, for example, 39% of all reported trips were within the urban county, while 43% were from one suburban county to another, and 3% of all trips were from one rural county to another.

TABLE T-31: TRAVEL FLOWS BASED ON DENSITY - % OF TOTAL TRIPS

	Urban	Suburban	Rural	Not Coded	Total
Urban	39.4%	3.7%	.2%	.9%	44.2%
Suburban	3.5%	43.2%	.7%	1.7%	49.0%
Rural	.2%	.7%	2.5%	.1%	3.5%
Not Coded	.9%	1.6%	.1%	.7%	3.3%
Total	44.0%	49.2%	3.4%	3.4%	100.0%

Source: Chicago Regional Household Travel Inventory, weighted. Base: all unlinked trips