H+T^{sm} INDEX METHODOLOGY

TRANSPORTATION MODEL

The household transportation model is based on a multidimensional regression analysis, in which a formula describes the relationship between three dependent variables (auto ownership, auto use, and transit use) and eight main independent household and local environment variables. Neighborhood level (Census block group) data on household income (both average and median), household size, commuters per household, journey to work time (for all commuters, transit commuters, and non-transit commuters), household density (both residential and gross), block size, transit access, and job access were utilized as the independent, or predictor variables. To construct the regression equations, each predictor variable was tested separately; first to determine the distribution of the sample and second to test the strength of the relationship to the criterion variables. For this research, the regression analysis was conducted in a comprehensive way, thus ignoring the distinction between the local environment variables and the household variables in order to obtain the best fit possible from all of the independent variables. The three models were summed to derive the total household costs for auto ownership (AO), auto use (AU), and transit (TU). The predicted result from each model was multiplied by the appropriate price for each unit – autos, miles, and transit trips – to obtain the cost of that aspect of transportation. This is summarized as follows:

Household T Costs = $[C_{AO}*F_{AO}(X)] + [C_{AU}*F_{AU}(X)] + [C_{TU}*F_{TU}(X)]$

Where
C = cost factor (i.e. dollars per mile)
F = function of the independent variables (F_{AO} is auto ownership + F_{AU} is auto use and F_{TU} is transit use)

Independent Variables: Neighborhood Characteristics

Residential Density

Residential Density represents household density of residential areas, in contrast to population density on land area. Using the 2000 U.S. Census Summary File 1, total households (P15) are obtained at the block level. US Census TIGER/Line files are used to define blocks. Blocks are selected on the criteria that gross density (households per land acre) must be greater than one. From these selected blocks, both households and land acres are aggregated to the block group level, at which level residential density is calculated.

Gross Density

Gross Density is calculated as the total households (P15 from 2000 U. S. Census Summary File 1) divided by total land acres.

Average Block Size

The Average Block Size in an area is used to represent street connectivity and pedestrian friendliness, which influences travel mode and distance traveled. Greater connectivity, from more streets and intersections, creates smaller blocks, and tends to lead to more frequent walking and biking trips, as well as shorter average trips. Census TIGER/Line files are utilized to calculate average block size (acres) as the total block group area divided by the number of Census blocks with the block group.

Transit Connectivity Index / Transit Access Index

Transit levels were defined using two measures. When necessary data were available, the Transit Connectivity Index (TCI) was calculated and utilized. In this index, transit service levels are calculated as the number of bus routes and train stations within walking distance (¼ mile and ½ mile respectively) for households in a given block group scaled by the frequency of service. The index value therefore represents the Average Rides per Week available to households in a given block group. While TCI is a preferable measure of transit access, data on the frequency of service were not often available. In these instances, the Transit Access Index (TAI) was calculated and utilized. As with the TCI, the TAI calculates the number of bus routes and train stations within walking distance (again, ¼ mile and ½ mile respectively) for households in a given block group. However, with the TAI, values are not scaled by frequency of service. Therefore, the TAI value represents overall transit opportunities available to households in a given block group, but does not reflect the frequency or service levels of these opportunities.

Employment Access Index

Proximity to regional employment was determined using a gravity model, which considered both the quantity of and distance to all such destinations, relative to any given block group. Using an inverse-square law, an employment index was calculated by summing the total number of jobs divided by the square of the distance to those jobs. This quantity allows us to examine both the existence of jobs and the accessibility of these jobs for a given census block group. Because a gravity model enables consideration of jobs both directly and not directly in a given block group, the employment access index gives a better measure of job opportunity, and thus a better understanding of job access than a simple employment density measure.

To calculate the employment access index, data pertaining to the locations of all jobs in a region were obtained from the 2000 Census Transportation Planning Products (CTPP). The index was calculated as:

$$E \equiv \sum_{i=1}^{n} \frac{p_i}{r_i^2}$$

Equation 1: Employment Proximity Definition

Where E is the Employment Proximity for a given census block group, n is the total number of census tracts in the region, p_i is the number of jobs in the ith census tract, r_i is the distance (in miles) from the center of the given census block group to the center or the ith census tract. Note that this is in units of jobs per square mile.

Average Journey to Work Time

Average Journey to Work Time was calculated using Aggregate Travel Time to Work (in minutes) by Travel Time to Work by Means of Transportation to Work (P33 from 2000 U. S. Census Summary File 3), and Means of Transportation to Work (P30 from 2000 U. S. Census Summary File 3) to define the universe of Workers 16 Years and Over Who Did Not Work at Home. Average journey to work time was calculated at the block group level in minutes.

Average Journey to Work Time – Transit Commuters

Average Journey to Work Time for Transit Commuters was calculated using Aggregate Travel Time to Work (in minutes) by Travel Time to Work by Means of Transportation to Work (P33 from 2000 U. S. Census Summary File 3), and Means of Transportation to Work (P30 from 2000 U. S. Census Summary File 3) to define the universe of Workers 16 Years and Over utilizing transit. Average journey to work time was calculated at the block group level in minutes.

Average Journey to Work Time – Non-Transit Commuters

Average Journey to Work Time for Non-Transit Commuters was calculated using Aggregate Travel Time to Work (in minutes) by Travel Time to Work by Means of Transportation to Work (P33 from 2000 U. S. Census Summary File 3), and Means of Transportation to Work (P30 from 2000 U. S. Census Summary File 3) to define the universe of Workers 16 Years and Over commuting by means other than transit. Average journey to work time was calculated at the block group level in minutes.

Independent Variables: Household Characteristics

All independent variables pertaining to household characteristics utilized data obtained from the US Census 2000 Summary File 3.

Average Income

Average Income was calculated using Aggregate Household Income in 1999 (P54), and Household Income in 1999 (P52) to define the universe of Households. Average income was calculated at the block group level.

Median Income

Median Income refers to Median Household Income in 1999 (P53) obtained at the block group level as well as at the regional level (MSA or PMSA) to define the Area Median Income (AMI).

Average Household Size

Average Household Size was calculated using Total Population in Occupied Housing Units by Tenure (H15), and Tenure (H7) to define the universe of Occupied Housing Units. Average household size was calculated at both the block group and regional level.

Average Commuters per Household

Average Commuters per Household was calculated using the total workers 16 years and over who do not work at home from Means of Transportation to Work (P30), and Tenure (H7) to define Occupied Housing Units. Because Means of Transportation to Work (P30) includes workers not living in occupied housing units (i.e. those living in group quarters), the ratio of Total Population in Occupied Housing Units (H15) to Total Population (P1) was used to scale the count of commuters to better represent those living in households. Average commuters per household was calculated at both the block group and regional level.

Dependent Variables: Measured Data

Auto Ownership

For the dependent variable of auto ownership, the regression analysis was fit using measured data on auto ownership obtained from the 2000 US Census. From the Summary File 3, Aggregate Number of Vehicles Available by Tenure (H46) defined the total number of vehicles, and Tenure (H7) defined the universe of Occupied Housing Units. Average vehicles per occupied housing unit were calculated at the block group level.

Auto Use

For the dependent variable of auto use, the regression analysis was fit using measured data representing the total amount that households drive their autos, or vehicle miles traveled (VMT) per automobile. In order to determine the amount that households drive their autos, odometer readings are utilized. Data are obtained for one region of the country, the optimum formula is determined using the independent variables in that region, and these formula are then applied to the study area. Odometer readings for the time period of 2005-2007 were obtained from the Massachusetts Department of Transportation for the entire state at a 250 meter grid cell level. A similar dataset for the greater Chicago area was analyzed at the zip code level and compared with the Massachusetts dataset resulting in similar relationships with the independent variables. Due to the geographic scale of the Massachusetts dataset, the regression analysis is fit using these data.

However, it should be noted that the years of VMT data collection differ by a few years from that of the independent variables. The table below, from the Bureau of Transportation Statistics, shows VMT per capita for Massachusetts and the nation overall from 1998 to 2007 (note that 2001 is missing).

State	1997	1998	1999	2000	2002	2003	2004	2005	2006	2007
Massachusetts	8,106	8,264	8,392	8,298	8,282	8,348	8,536	8,667	8,565	8,538
United States	9,361	9,527	9,866	9,733	9,920	9,941	10,088	10,087	10,067	10,045

For Massachusetts, the per capita VMT in 2000 was 8,298 and in 2006-2007 was 8,667 8,565 8,538 or a change of approximately 4% (the national variation was about 3%). For overall transportation costs, auto ownership dominates. As an example, the transportation costs for a household owning 2 cars, driving a total of 25,000 a year and taking no transit would be approximately $12,386 ($5,068*2 + $0.09*25,000). A 4% decrease in VMT changes these overall costs to $12,296 ($5,068*2 + $0.09*24,000), or a reduction by $90, or 0.7%. Therefore, because the overall difference is so small, we chose to preserve the spatial variation, and use the 2005 – 2007 VMT data.

Transit Use

Because no direct measure of transit use was available at the block group level, a proxy was utilized for the measured data representing the dependent variable of transit use. From the US Census Summary File 3, Means of Transportation to Work (P30) was used to calculate a percent of commuters utilizing public transit.

TRANSPORTATION COST CALCULATION

The transportation model was used to estimate auto ownership (vehicles per household), auto use (annual vehicle miles traveled), and transit use for each block group. To calculate total transportation costs, values for the per unit cost of each component were determined and then aggregated for the specific transportation components in each block group.

Auto Ownership Costs

Auto ownership costs, for the purposes of this research, have been defined as depreciation; finance charges; insurance; and license, registration and taxes (state fees). These costs were chosen as ownership costs as they have been deemed largely fixed, less determined by use, and therefore, a result of simply owning an automobile.

The Federal Highway Administration (FHWA), citing Intellichoice's *The Complete Car Cost Guide* and *Complete Small Truck Guide*, reports figures on the cost of owning and operating automobiles, vans and light trucks. These estimates are based on the annual average costs over five years, assuming 70,000 miles driven, and include depreciation, insurance, financing, fuel cost, maintenance, state fees, and repairs. Here, costs are broken out for different types of vehicles (e.g. subcompact) and reported as average per mile costs.

Because the FHWA auto ownership cost estimates break out costs for many different vehicle types, these data were used as the primary source. The U.S. Department of Energy's Transportation Energy Data Book (2002) was utilized to obtain an approximate fleet mix using the Vehicle Stock and New Sales in the US data. Once the fleet mix was determined, these values were applied to the vehicle types as presented by the FHWA. Costs per mile by auto type were calculated for each cost component using the total cost per mile as well as the percent breakdown between cost components. These per mile costs were then multiplied by the FHWA assumed 14,000 miles annually to obtain a total average fixed cost. This method was used to determine the cost of depreciation, insurance, finance charges, license, registration and taxes (see Table 1).

Total average auto ownership costs were calculated to be $5,068 per auto; this value is applied to the modeled results of average automobiles per household.

This method provides a consistent estimate of car ownership costs that reflects widely used industry sources. While it may not fully reflect the costs of used cars older than the modeled vehicles in the analysis, or the tradeoff between lower depreciation and higher maintenance costs as cars become older, such comparative information is not readily available. Further research which quantifies the total costs of ownership of both newer and older cars could provide more refined estimates of ownership costs.

Table 1: Fixed Auto Ownership Cost Calculations

	Fleet Mix	Total Cost per Mile (given)	Depreciation per Mile	Total Depreciation	Insurance per Mile	Total Insurance	Financing per Mile	Total Financing	State Fees per Mile	Total State Fees	Ownership Costs per Mile	**Total Ownership Costs** (assumes 14,000 miles per year)
Percent (given)		100.00%	**35.00%**		**27.00%**		**15.00%**		**3.00%**		**80.00%**	
Full Size Van	2.43%	$0.520	$0.182	$2,548	$0.140	$1,966	$0.078	$1,092	$0.016	$218	$0.416	**$5,824**
Mini Van	6.19%	$0.507	$0.177	$2,484	$0.137	$1,916	$0.076	$1,065	$0.015	$213	$0.406	**$5,678**
Full Size Utility	7.44%	$0.529	$0.185	$2,592	$0.143	$2,000	$0.079	$1,111	$0.016	$222	$0.423	**$5,925**
Intermediate Utility	5.99%	$0.514	$0.180	$2,519	$0.139	$1,943	$0.077	$1,079	$0.015	$216	$0.411	**$5,757**
Compact Utility	2.97%	$0.456	$0.160	$2,234	$0.123	$1,724	$0.068	$958	$0.014	$192	$0.365	**$5,107**
Full Size Pick Up	9.98%	$0.477	$0.167	$2,337	$0.129	$1,803	$0.072	$1,002	$0.014	$200	$0.382	**$5,342**
Compact Pick Up	6.01%	$0.402	$0.141	$1,970	$0.109	$1,520	$0.060	$844	$0.012	$169	$0.322	**$4,502**
Full Size Vehicle	8.75%	$0.511	$0.179	$2,504	$0.138	$1,932	$0.077	$1,073	$0.015	$215	$0.409	**$5,723**
Intermediate	18.31%	$0.468	$0.164	$2,293	$0.127	$1,778	$0.070	$983	$0.014	$197	$0.375	**$5,250**
Compact	19.50%	$0.423	$0.148	$2,073	$0.114	$1,599	$0.063	$888	$0.013	$178	$0.338	**$4,738**
SubCompact	12.42%	$0.322	$0.113	$1,578	$0.087	$1,217	$0.048	$676	$0.010	$135	$0.258	**$3,606**
Weighted Average (weighted by calculated fleet mix)		$0.452	$0.158	**$2,217**	$0.122	**$1,712**	$0.068	**$950**	$0.014	**$190**	$0.362	**$5,068**

Sources: Calculated from the Federal Highway Administration at http://www.fhwa.dot.gov/ohim/onh00/onh2p3.htm and the U.S. Department of Energy's Transportation Energy Data Book, Table 3.4: Vehicle Stock and New Sales in the US 2002 Calendar Year

Auto Use Costs

Auto use costs, for the purposes of this research, have been defined as gas, maintenance and repairs. These costs were chosen as use costs as they have been deemed largely variable and therefore determined primarily based on the level of use of the automobile.

Again, FHWA figures were utilized as a primary data source as to enable averages to be calculated based on a fleet mix obtained from the Transportation Energy Data Book. However, for the auto use costs, average values were calculated as a per mile cost. This method was used to determine the cost of maintenance and repairs (see Table 2).

While the FHWA estimates are broken out by type of vehicle, it was concluded that the variation in gasoline costs by geography were necessary to capture. Therefore, average gasoline prices for 2000 were obtained for each region from the Energy Information Administration. Transportation costs were also estimated for 2008 considering an increase in gasoline costs; for this calculation, maximum prices in 2008 were utilized (see Table 3). These gasoline costs, as well as an average fuel efficiency of 20.3 miles per gallon were used to calculate gasoline cost per mile by region.

Total auto use costs were calculated (per mile by region) and then applied to the modeled results of average vehicle miles traveled per household.

Table 2: Variable Auto Use Cost Calculation

	Fleet Mix	Total Cost per Mile (given)	Maintenance per mile	Repairs per mile
Percent (given)		100.00%	**5.00%**	**2.00%**
Full Size Van	2.43%	$0.520	$0.026	$0.010
Mini Van	6.19%	$0.507	$0.025	$0.010
Full Size Utility	7.44%	$0.529	$0.026	$0.011
Intermediate Utility	5.99%	$0.514	$0.026	$0.010
Compact Utility	2.97%	$0.456	$0.023	$0.009
Full Size Pick Up	9.98%	$0.477	$0.024	$0.010
Compact Pick Up	6.01%	$0.402	$0.020	$0.008
Full Size Vehicle	8.75%	$0.511	$0.026	$0.010
Intermediate	18.31%	$0.468	$0.023	$0.009
Compact	19.50%	$0.423	$0.021	$0.008
SubCompact	12.42%	$0.322	$0.016	$0.006
Weighted Average (weighted by calculated fleet mix)		$0.452	**$0.023**	**$0.009**

Source: Calculated from the Federal Highway Administration at http://www.fhwa.dot.gov/ohim/onh00/onh2p3.htm and the U.S. Department of Energy's Transportation Energy Data Book, Table 3.4: Vehicle Stock and New Sales in the US 2002 Calendar Year

Table 3: Gasoline Prices by Region

NAME	EIA Region	Average Gasoline Price 2000 ($)	Maximum Gasoline Price 2008 ($)	NAME	EIA Region	Average Gasoline Price 2000 ($)	Maximum Gasoline Price 2008 ($)
Alabama	MG_RT_P3	1.413	3.971	Missouri	MG_RT_P2	1.474	4.066
Alaska	MG_RT_P5	1.630	4.460	Montana	MG_RT_P4	1.512	4.105
Arizona	MG_RT_P5	1.630	4.460	Nebraska	MG_RT_P2	1.474	4.066
Arkansas	MG_RT_P3	1.413	3.971	Nevada	MG_RT_P5	1.630	4.460
Boston, MA--NH	MG_RT_B1	1.541	4.058	New Hampshire	MG_RT_1A	1.541	4.143
California	MG_RT_CA	1.723	4.588	New Hampshire	MG_RT_1A	1.541	4.143
Chicago, IL	MG_RT_C2	1.566	4.303	New Jersey	MG_RT_1B	1.520	4.115
Cleveland--Lorain--Elyria, OH	MG_RT_CL	1.474	4.030	New Jersey	MG_RT_1B	1.520	4.115
Colorado	MG_RT_CO	1.563	4.030	New Mexico	MG_RT_P3	1.413	3.971
Connecticut	MG_RT_1A	1.541	4.143	New York	MG_RT_NY	1.641	4.281
Connecticut	MG_RT_1A	1.541	4.143	New York, NY	MG_RT_N1	1.631	4.179
Delaware	MG_RT_1B	1.520	4.115	North Carolina	MG_RT_1C	1.415	4.033
Denver, CO	MG_RT_D4	1.541	4.013	North Dakota	MG_RT_P2	1.474	4.066
District of Columbia	MG_RT_1B	1.520	4.115	Ohio	MG_RT_OH	1.474	4.054
Florida	MG_RT_FL	1.415	4.057	Oklahoma	MG_RT_P2	1.474	4.066
Georgia	MG_RT_1C	1.415	4.033	Oregon	MG_RT_P5	1.630	4.460
Hawaii	MG_RT_P5	1.630	4.460	Pennsylvania	MG_RT_1B	1.520	4.115
Houston, TX	MG_RT_H3	1.450	3.915	Pennsylvania	MG_RT_1B	1.520	4.115
Idaho	MG_RT_P4	1.512	4.105	Puerto Rico	MG_RT_US	1.484	4.114
Illinois	MG_RT_P2	1.474	4.066	Rhode Island	MG_RT_1A	1.541	4.143
Indiana	MG_RT_P2	1.474	4.066	San Francisco, CA	MG_RT_S5	1.881	4.562
Indiana	MG_RT_P2	1.474	4.066	Seattle--Bellevue--Everett, WA	MG_RT_SE	1.630	4.355
Iowa	MG_RT_P2	1.474	4.066	South Carolina	MG_RT_1C	1.415	4.033
Kansas	MG_RT_P2	1.474	4.066	South Dakota	MG_RT_P2	1.474	4.066
Kentucky	MG_RT_P2	1.474	4.066	Tennessee	MG_RT_P2	1.474	4.066
Los Angeles--Long Beach, CA	MG_RT_L5	1.615	4.611	Texas	MG_RT_TX	1.438	3.966
Louisiana	MG_RT_P3	1.413	3.971	Utah	MG_RT_P4	1.512	4.105
Maine	MG_RT_1A	1.541	4.143	Vermont	MG_RT_1A	1.541	4.143
Maryland	MG_RT_1B	1.520	4.115	Virginia	MG_RT_1C	1.415	4.033
Massachusetts	MG_RT_MA	1.541	4.066	Washington	MG_RT_WA	1.630	4.370
Miami, FL	MG_RT_M1	1.415	4.178	West Virginia	MG_RT_1C	1.415	4.033
Michigan	MG_RT_P2	1.474	4.066	Wisconsin	MG_RT_P2	1.474	4.066
Minnesota	MG_RT_MN	1.525	3.955	Wisconsin	MG_RT_P2	1.474	4.066
Mississippi	MG_RT_P3	1.413	3.971	Wyoming	MG_RT_P4	1.512	4.105

Source: Energy Information Administration

Transit Use Costs

The transit costs are largely based on the National Transit Database (NTD), and where those data were not available, information on transit costs were sought on a system by system basis.

Specifically, data were collected on three levels, with one being the ideal data choice, followed by the second and then the third options when the other two data options were not available. Outlined below, these three levels are:

1. National Transit Database Source

Data Option 1 used the NTD 2000 database to identify the total revenue of transit agencies. The total revenue data was aggregated to urbanized areas as that is the geography the NTD uses to report its data. The urbanized areas were brought into GIS and were then proportionally summed to the metropolitan areas included in this analysis.

Listed in the 2000 NTD Data Dictionary the variables used to identify total revenue were Total Passenger Fares for Directly Operated Transit Service (OC_40102) and Purchased Transportation Fare Revenues (OC_415). These two variables were summed together to identify the total farebox.

The total farebox recovery was only available at the urbanized area. However, for the purposes of this study it was necessary to evaluate the total farebox at the MSA/PMSA level. When an urbanized area was entirely within an MSA/PMSA then 100% of the farebox recovery was assigned to that metropolitan area. There were instances where urbanized areas crossed multiple MSA/PMSA boundaries. In these cases, Census Block Group data on journey to work patterns; specifically, the total number of transit commuters, were aggregated to the urbanized area using GIS. The proportion of the total transit commuters in each urbanized area was used to estimate the total transit revenue within that urbanized area. Once that amount was assigned to the urbanized area the total revenue was divided by the total transit commuters to come up with an average fare per transit commuter. The average fairbox per transit commuter was assigned to the MSA/PMSA boundaries that were within the geographic extent of the urbanized area. Using GIS and the same Census Block Group data on journey to work, the total transit commuters were also aggregated to the MSA/PMSA boundaries and these values were multiplied by the average fairbox per transit commuter. This number represented the total transit fairbox at the metropolitan level.

2. Combination of NTD and Transit Agency Average Fare Data

Data option 2 was used when total revenue data were not available from the NTD but total trips were reported. In these cases, the variable, Service Consumed/Unlinked Passenger Trips/Annual Total (iUnlnkTrip) was used to identify the total unlinked passenger trips for each transit agency. These data were multiplied by current transit agency average fare data to obtain an estimated total revue. The estimated revenue was then aggregated to urbanized areas. Similar to Data Option 1, there were instances where urbanized areas crossed multiple MSA/PMSA boundaries. In these cases, Census Block Group data on journey to work patterns; specifically, the total number of transit commuters, were aggregated to the urbanized area using

GIS. The proportion of the total transit commuters in each urbanized area was used to estimate the total transit revenue within that urbanized area. Once that amount was assigned to the urbanized area the total revenue was divided by the total transit commuters within each urbanized area to come up with an average fare per transit commuter. Using GIS and the same Census Block Group data on journey to work, the total transit commuters were also aggregated to the MSA/PMSA boundaries and these values were multiplied by the average fairbox per transit commuter. This number represented the total transit fairbox at the metropolitan level.

3. Average Transit Revenue based Data Option 1 & Data Option 2

When the NTD did not report total revenue or total trips then the average transit revenue and subsequent fare data across all metropolitan areas estimated in Data Option 1 & Data Option 2 were assigned to the remainder of the metropolitan areas.

HOUSING COST CALCULATION

Housing Costs were determined using the 2000 US Census Summary File 3 variables Selected Monthly Owner Costs for All Owner-Occupied Housing Units with a Mortgage and Gross Rent for Renters Paying Cash.

The US Census defines Selected Monthly Owner Costs (SMOC) as:

> "The data on selected monthly owner costs were obtained from answers to long-form questionnaire Items 45a-d, 47b, 48b, 49, 50, 52, and 53b, which were asked on a sample basis at owner-occupied housing units. Selected monthly owner costs are the sum of payments for mortgages, deeds of trust, contracts to purchase, or similar debts on the property (including payments for the first mortgage, second mortgage, home equity loans, and other junior mortgages); real estate taxes; fire, hazard, and flood insurance on the property; utilities (electricity, gas, and water and sewer); and fuels (oil, coal, kerosene, wood, etc.). It also includes, where appropriate, the monthly condominium fees or mobile home costs (installment loan payments, personal property taxes, site rent, registration fees, and license fees). Selected monthly owner costs were tabulated separately for all owner-occupied units, specified owner-occupied units, and owner-occupied mobile homes and, usually, are shown separately for units 'with a mortgage' and for units 'not mortgaged.'"

Gross Rent (GR) is defined as:

> "The data on gross rent were obtained from answers to long-form questionnaire Items 45a-d which were asked on a sample basis. Gross rent is the contract rent plus the estimated average monthly cost of utilities (electricity, gas, water and sewer) and fuels (oil, coal, kerosene, wood, etc.) if these are paid by the renter (or paid for the renter by someone else). Gross rent is intended to eliminate differentials that result from varying practices with respect to the inclusion of utilities and fuels as part of the rental payment. The estimated costs of utilities and fuels are reported on an annual basis but are converted to monthly figures for the tabulations. Renter units occupied without payment of cash rent are shown separately as 'No cash rent' in the tabulations."

Because Selected Monthly Owner Costs for All Owner-Occupied Housing Units are obtained as categorical data, an average was derived by calculating an aggregate value divided by the appropriate count of Owner-Occupied Housing Units. The aggregate Selected Monthly Owner Costs value was calculated using the midpoint of each cost bin. For the uppermost bin ($3,000 or more), a value of $4,500 was utilized as recommended through communications with the U.S. Census Bureau. Average Gross Rent was calculated directly from the Aggregate Gross Rent value available.

Overall Average Housing Costs were calculated from the average Selected Monthly Owner Costs and average Gross Rent weighted by the ratio of owners with a mortgage to renters paying cash. For the purposes of this study, housing costs are estimated using only renters paying cash and owners paying mortgages. Renters paying with vouchers (e.g. subsidized housing) and owners who no longer have mortgage payments are therefore excluded.