Notes on the PSRC Data Weighting Process

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Step 1: **Impute incomes for the households with missing income**. This was done using a multinomial logit model of income category, using the 5390 (out of 6094) households that answered the detailed income question. There are 10 possible categories, with the category $75,000-$99,999 specified as the base category with utility = 0. Note that a multinomial logit model is more general than an ordered logit model in that it does not assume proportional odds across adjacent income category alternatives. Also note that we did not carried out a detailed specification search, as the purpose of this model is simply to impute income for about 10% of the data, and a model with some insignificant coefficient estimates is suitable for that purpose.

The model includes attributes of the household, as well as the income distribution in the residence block group, based on the 2008-2012 5 year ACS. The final coefficients are shown in Table 1, with the most positive effects shaded green and the most negative effects shaded red. The t-statistics for the coefficients are shown in Table 2, with a similar color coding. The patterns in the estimated coefficients across the income categories are shown in Figures 1 (household composition), 2 (age of householder and home ownership) and 3 (block group income distribution).

Some notes on the results:

- The household-specific variables provide more explanatory power than the block group-level variables. (This was also found when models were estimated separately with each type of variable – results not included here.)
- The overall model fit, compared to a constants-only model, is a pseudo-R squared of about 0.17. This is quite good for an ordered categorical variable that has 10 different categories.
- Among the household-level variables, the number of full time and part time workers with post-graduate degrees, along with the home ownership variables have the strongest effects, all with trends strongly in favor of the higher income categories.
- The results for the number of full and part time college graduate workers (below post-graduate) are similar to those for post-graduate workers, but not as strong, particularly for the highest income categories.
- Households with part time workers without a college education have positive effects towards the lower income categories, as do households with the head of household under age 25.
- Otherwise, the age of householder effects are generally quite weak, with the exception that senior households are less likely to be in the very low income category (under $10,000).
- The coefficients for block-group-level income distribution generally show the expected pattern, with higher percentages in the lower income groups favoring the lower income category alternatives, and the same for the very high income categories. In fact, the coefficients for incomes categories above

$200,000 are the largest ones in the model, indicating that there may be greatest clustering effects among the highest income groups.

- On the other hand, the income coefficients do not shows as strong of a one-to-one diagonal pattern between block group fractions and actual categories as one might hope. This may be due to widespread variations of incomes even within block groups, as well as fairly high measurement error at the block group level in the ACS data. (The 5 year 2008-12 ACS PUMS has about 70,000 households in the PSRC region spread across 2,641 block groups, which is only about 25 sampled households per block group, on average.)

The model described above was estimated using SPSS, which also has a feature to write out the predicted probabilities for each choice alternative, and to predict a choice as the alternative with the highest probability. The highest probability alternative is tabulated in Table 3 versus the reported income category. The green cells on the diagonal show the number of cases predicted "correctly" the same as the reported category. The percentage is generally high at about 32%, with most of the incorrect cases in cells very close to the diagonal, and very few cases at the upper right or lower left that are far off from the reported alternative. However, the distribution of predictions is "lumpier" than the distribution of reported income, with about 33% in both the $50,000-74,999 and $100,000-149,999 categories, but only 5% in the intermediate category .

Since a logit model is a probabilistic model and not a deterministic one, a more appropriate way of using it to predict a single alternative for each household is to use "Monte Carlo" simulation, drawing a random number between 0 and 1 for each household and using that to select one of the chosen alternatives. This method was applied in SPSS, and the resulting predictions are shown in Table 4, in the same format as Table 3. Because the highest probability alternative is no longer used, the percent predicted correctly is by definition lower than in Table 3. However, the overall distribution of the predictions across the alternatives is now very similar to the observed distribution, and the number of cases in cells far away from the diagonal remains very low.

Finally, a final income variable was created using the following rules:

- If a person answered the detailed income question, the reported detailed category is used.
- If a person did not answer the detailed income question but did answer the broad income follow up question, the Monte Carlo method is used to impute a choice only among the detailed categories within the reported broad categories. These predictions are shown in Table 5.
- If a person did not answer either income question, the Monte Carlo method is used to impute a choice from among all 10 income categories.

The resulting final income category is shown in Table 6 versus the reported detailed income. The shaded column shows the income categories imputed for the 704 respondents who did not answer the detailed income question, which is the outcome of this step. This "final income" variable was used for all of the weighting steps described in the following sections.

Step 2: First stage expansion based only on sampling probabilities

This step is based only on the calculated sampling rates for the different sampling groups. (These are groups that had equal sampling probabilities for all households within each group.) We have 13 sampling segments, with the number of households in each segment, by county and in total , shown in Table 7.

The other data source for this step is be the most recent estimate of the number of households at the block group level- from the 5-year 2008-2012 ACS. These were aggregated to the sampling segments to arrive at the total number of households shown toward the right of Table 7. The ratio of number of ACS 2008-20012 households to the number of households in the sample is the initial expansion factor, which is given in the last column of Table 7.

The highest expansion factors are for the REG segments (regular block groups, which were not oversampled). The factors are around 350, which corresponds to about a 0.3% sample of all households. The next highest factors are for the OS segments (main oversample block groups), with factors around 150 (roughly a 0.7% sample).Next highest are the Bellevue oversample segments, which are at about 200 (0.5% sample) for the BREG block groups that were originally from the REG segments, and around 100 (1.0% sample) for the BOS segments that were originally from the OS segments. So, the Bellevue oversampling resulted in roughly a 50% higher sample rate compared to the REG and OS segments. As expected, the lowest expansion factors are the Urban Village (UOS) segments, with a weight of about 75 (a 1.3% sample). This means that the Urban Village oversampling resulted in roughly a doubling of the sample rate compared to the main oversample (OS) segments.

Note that the different income levels within each sampling segment types have very similar expansion factors. This means that we made a fairly accurate job of job of anticipating differential response rates according to income distributions and sending out more invites to lower income segments. Otherwise, we would have gotten lower sample fractions for the lower income block groups and would have needed higher expansion factors for the lower income segments.

Table 8 shows a comparison of the expanded number of households in the survey sample compared to ACS data at the county level, using the ACS 2007-11 5 year estimates, the ACS 2008-12 5-year estimates, and the ACS 2012 1 year estimates. The match at the county level is quite close for all counties for all three estimates, with the expanded sample slightly low for King County and slightly high for Kitsap and Pierce Counties. These small discrepancies, along with potentially larger discrepancies along other dimensions, are adjusted for in the re-weighting step, described next.

Step 3: Establishing targets for re-weighting

The target dimensions for re-weighting are very similar to those used for weighting the 2006 PSRC survey:

- Household size (1, 2, 3, 4, 5+)
- Number of workers (0, 1, 2, 3+)
- Income group (9 categories, generally the same as in the detailed income question)
- Number of vehicles (0, 1, 2, 3+)
- Lifecycle (8 categories, a combination of presence of children age 0-4, presence of children age 5-17, number of adults - 1 or 2+, and age of householder-under 35, 35-64, 65 or older)

Another question is at which geography to set the targets. In 2006, the targets were set at the county level, but with King County split into the City of Seattle and Other. For this survey, it was decided to set the targets at the 4-county level, but to add a sixth target dimension within each county:

- 2012 PUMA geography (16 in King County, 2 in Kitsap, 7 in Pierce and 6 in Snohomish)

The final question for setting targets is which ACS sample to use to establish the targets. The two best options are the 2008-12 5-year ACS PUMS or the 2012 1-year ACS PUMS. The 1-year 2012 ACS PUMS is more recent, but is based on only 14,000 households in the PSRC region, which is only about twice the size of our sample. Therefore, targets based on the 1-year ACS PUMS will have quite a bit of measurement error compared to the 5-year ACS. If the two ACS versions provided roughly the same target values, then the accuracy would not be a major issue and we would use only the most recent data. However, a comparison of targets based on the two showed a large difference, with over 25% difference in some of the target values.

As an example, Table 9 shows the comparison for the household size targets, with fairly large discrepancies for 4 person and 5+ person households. Comparisons for the other dimensions (not shown here) showed similar discrepancies. Believing that the discrepancies are due more to measurement error than to actual shifts in the county demographics between 2008 and 2012, our decision was to use targets based on the 5-year 2008-2012 sample. (The exception is the target based on PUMA – because the Census bureau shifted to a new PUMA system in 2012 that is consistent with the 2010 block group geography, only the 1-year 2012 sample is used to set the PUMA targets. Because all PUMAs are of similar, substantial size with about 40,000 households, small-cell measurement error is not a major issue for this dimension.

Table 10 shows the ACS-based target values for the 31 PUMAs, compared to the expanded number of households from the first-stage expansion Some of the differences are surprisingly large. It appears that there were much higher response rates in the City of Seattle compared to the rest of King County, even after already adjusting for the higher sampling rates in much of the city. The southern portions of the county are particularly under-expanded. The same pattern appears in Pierce County, with Tacoma over-represented compared to the more rural parts of the county, and in Snohomish, with the Everett

PUMA over-represented. These discrepancies show the need for re-weighting at a finer level of geography than was used for the previous survey.

Tables 11A to 11E show the ACS 2008-12 –based targets for the other five household dimensions, and Tables 12A to 12E show the discrepancies between those targets and the initial expanded sample.

The groups that appear to be underrepresented in our sample due to lower response rates are:

- Larger households: Two-person households are overrepresented, and households of size 4 and 5+ are underrepresented in all counties.
- 3+ worker households: These are underrepresented in all counties, which is likely related to the relationship with household size. Zero-worker households are over-represented in all counties, which may be related to a higher response rate among retired households.
- Low-income households: The lower the income, the more the income category tends to be underweighted in all counties.
- Zero-vehicle households: These are somewhat under-weighted, particularly in the more rural counties. Households with 3+ vehicles are also somewhat underrepresented, probably due to the relationship with large household size.
- Households with children and young single households: The former is related to the large household size, and the latter is typical due to the lack of a phone match for cell-only households and the fact that young single people tend to harder tend to be more transient and harder to contact.

Note that some of these households types – low income, zero vehicle, and young single households – were the ones that we targeted through geographic oversampling. While that oversampling was successful, as indicated by the lower expansion factors for the oversample segments, it does not eliminate the fact that these types of households have higher non-response rates, so need to be re-weighted. In effect, just as we attempt to compensate for the lower response rates by using higher rates of sampling for those groups, the higher re-weighting factors will compensate for the lower initial expansion factors.

The one type of area/household where this compensating relationship does not hold is for households in more urban areas that tend to use transit or other non-auto modes. Not only were those types of areas oversampled, but households in those types of areas appear to have higher response rates as well. This is likely the cause of the overrepresentation of the more urban PUMAs, as seen in Table 10.

Also note that while some substantial reweighting is necessary, the discrepancies in Tables 12A to 12E are not as large as those reported for the 2006 survey reweighting. This fact indicates that the use of address-based sampling, the choice of on-line or telephone interviewing, and the uses of an attractive on-line platform appear to reduce the amount of selective non-response bias compared to the previous survey.

Step 4: Use iterative proportional fitting to adjust the expansion weights to match the ACS targets

A Delphi program was written to perform the following steps:

- Read in all records from the 2008-2012 PUMS households in the PSRC region and use them to calculate the target for reweighting for each county/category cell for each of the 6 target dimensions (the cell values shown in Tables 11A to 11E and Table 10).

- Read in all records from the 2014 survey sample and store the relevant attributes in memory, including the initial expansion weights.

- Loop on IPF iteratioins

    - Loop on IPF target dimensions

        - Loop on the survey households and calculate the current expanded totals on the target dimension for each county/category cell.
        - For each county/category cells, calculate the adjustment factor as the ratio of the ACS target cell value to the current expanded sample cell total
        - Loop again on the survey households and multiply each households expansion weight by the adjustment factor calculated in the previous step for the relevant county/category.

- Write out a file with the resulting expansion factor for each sample household

This program was run for 25 IPF iterations so that each target cell value is matched within 0.1%.

The resulting expansion factors are roughly in the range of 15 to 1500 (a maximum expansion weight of 1500 was used in the program, but was never exceeded), but with the very large majority of them remaining in the range of the initial expansion weights shown in Table 7 (71 to 388). Table 13 shows the resulting mean and standard deviation of the final expansion weights by sampling segment. The mean within segment tends to stay fairly close to the initial expansion weight.

As a check on the reweighting process, a set of tables analogous to tables 12A to 12E was produced, and all cell differences were 0.0%, so the tables are not included here. (The exception is for the PUMA dimension, where the total number of households from the 2012 ACS is slightly different from the 2008-12 ACS. For that dimension, all cell values were matched within 0.7%.)

A further check that can be performed at some point is to compare a few combinations of dimensions that were not explicitly controlled for in the weighting process (for example, zero-vehicle ownership or commute mode share at the PUMA level).

Table 1: Coefficients of income category imputation model

Coefficients/ Alternatives	Under $10,000	$10,000-$24,999	$25,000-$34,999	$35,000-$49,999	$50,000-$74,999	$75,000-$99,999	$100,000-$149,999	$150,000-$199,999	$200,000-$249,999	$250,000 or more
Full time post-graduate workers	-4.15	-2.82	-1.94	-1.43	-.52	.00	.52	1.15	1.53	1.25
Full time college graduate workers	-3.99	-2.48	-1.12	-.92	-.42	.00	.25	.61	.73	.49
Full time lower education workers	-2.65	-1.25	-.65	-.33	-.08	.00	-.02	-.04	.05	-.11
Part time post-graduate workers	-2.43	-.72	-.36	-.56	-.31	.00	.14	.22	.37	.29
Part time college graduate workers	-1.05	.11	.33	-.31	-.22	.00	-.57	-.36	-.82	-1.11
Part time lower education workers	.22	.66	1.08	.71	.50	.00	-.10	.02	-.67	-.37
Children under age 18	-.19	-.09	-.16	-.19	-.17	.00	-.17	-.05	-.04	-.19
Other adults age 18-64	-.30	-.30	-.56	-.42	-.21	.00	.38	.52	.57	.68
Other adults age 65 plus	-1.46	-1.62	-.96	-.53	-.11	.00	.34	.46	.42	.88
Householder age under 25	1.18	.92	.55	.44	.53	.00	-.40	-.52	-.20	-.61
Householder age 25 to 34	-.66	-.44	.13	-.11	.13	.00	-.06	-.31	-1.09	-1.27
Householder age 35 to 44	.01	-.42	-.11	-.06	.39	.00	.14	.16	-.31	.18
Householder age 55 to 64	-.44	.17	.17	-.30	.24	.00	-.13	.03	-.53	-.71
Householder age 65 plus	-1.80	-.18	.36	-.12	.12	.00	-.34	.00	-.91	-.54
Own a house	-2.21	-2.08	-1.29	-.96	-.46	.00	.40	.43	.39	1.16
Own a condo/apartment	-1.91	-1.39	-1.22	-.73	-.40	.00	-.06	.34	.27	1.31
Fraction block group under $10,000	3.62	1.82	1.57	.26	-.51	.00	1.45	1.76	.58	2.63
Fraction block group $10,000-24,999	3.61	2.35	1.89	1.59	.86	.00	.35	.80	1.58	1.45
Fraction block group $25,000-34,999	4.83	2.65	2.79	.97	1.52	.00	1.44	1.64	-.09	2.23
Fraction block group $35,000-49,999	4.72	2.55	2.68	2.53	1.09	.00	1.24	1.29	.76	2.48
Fraction block group $50,000-74,999	1.86	.97	.54	.96	1.12	.00	.94	-.52	-1.11	.02
Fraction block group $100,000-149,999	1.66	-.82	.28	-.15	-.31	.00	2.40	2.21	1.95	2.13
Fraction block group $150,000-199,999	-3.50	-.22	.12	.28	.52	.00	2.18	1.99	-.54	1.09
Fraction block group $200,000 or more	.77	-1.56	-2.50	-1.56	.00	.00	2.35	4.60	6.93	9.79
Constant	.32	1.36	.25	.81	.34	.00	-1.86	-3.68	-4.14	-5.78

Model Fit: Log-likelihood (constants only) = -1.135E4

Log-likeliihood (final) = -0.944 E4

Rho-squared (constants) = 0.168

Table 2: T-statistics of income category imputation model

T-statistics	Under $10,000	$10,000-$24,999	$25,000-$34,999	$35,000-$49,999	$50,000-$74,999	$75,000-$99,999	$100,000-$149,999	$150,000-$199,999	$200,000-$249,999	$250,000 or more
Full time post-graduate workers	-14.7	-12.2	-8.9	-8.4	-4.0	.0	4.4	7.8	7.4	6.2
Full time college graduate workers	-14.1	-14.3	-7.2	-7.0	-3.8	.0	2.4	4.3	3.5	2.5
Full time lower education workers	-3.4	-7.0	-3.6	-2.2	-.7	.0	-.1	-.2	.2	-.4
Part time post-graduate workers	-7.5	-2.0	-1.0	-1.8	-1.2	.0	.6	.7	.9	.8
Part time college graduate workers	-3.0	.5	1.6	-1.5	-1.2	.0	-3.0	-1.4	-1.9	-2.4
Part time lower education workers	1.4	2.3	3.9	2.7	2.0	.0	-.4	.1	-1.2	-.7
Children under age 18	-.7	-.8	-1.5	-2.2	-2.4	.0	-2.5	-.6	-.3	-1.5
Other adults age 18-64	-1.0	-2.2	-3.8	-3.3	-1.9	.0	3.6	3.7	2.9	3.5
Other adults age 65 plus	-5.5	-6.3	-4.3	-2.8	-.7	.0	2.0	1.9	1.1	2.9
Householder age under 25	6.5	2.5	1.4	1.3	1.6	.0	-1.1	-1.0	-.3	-.7
Householder age 25 to 34	-1.8	-2.0	.6	-.6	.8	.0	-.4	-1.5	-3.7	-3.6
Householder age 35 to 44	.0	-1.7	-.5	-.3	2.3	.0	.9	.8	-1.2	.7
Householder age 55 to 64	-1.4	.8	.8	-1.6	1.4	.0	-.8	.2	-1.9	-2.4
Householder age 65 plus	-6.0	-.7	1.5	-.5	.6	.0	-1.7	.0	-2.2	-1.5
Own a house	-6.5	-11.9	-8.0	-6.8	-3.7	.0	3.2	2.4	1.6	3.7
Own a condo/apartment	-1.2	-6.5	-5.6	-3.9	-2.4	.0	-.3	1.3	.7	3.4
Fraction block group under $10,000	2.3	1.5	1.4	.2	-.5	.0	1.5	1.3	.3	1.3
Fraction block group $10,000-24,999	1.8	2.1	1.7	1.7	1.0	.0	.4	.7	.9	.8
Fraction block group $25,000-34,999	2.7	1.9	2.1	.8	1.5	.0	1.3	1.1	.0	1.0
Fraction block group $35,000-49,999	2.7	2.0	2.2	2.4	1.2	.0	1.3	1.0	.4	1.3
Fraction block group $50,000-74,999	1.0	.8	.5	.9	1.3	.0	1.1	-.4	-.6	.0
Fraction block group $100,000-149,999	.5	-.6	.2	-.1	-.3	.0	2.6	1.8	1.1	1.2
Fraction block group $150,000-199,999	-1.5	-.1	.1	.2	.4	.0	1.9	1.3	-.2	.5
Fraction block group $200,000 or more	.6	-1.0	-1.7	-1.3	.0	.0	2.5	3.9	4.5	6.3

Figure 1: Plot of household composition coefficients across alternatives

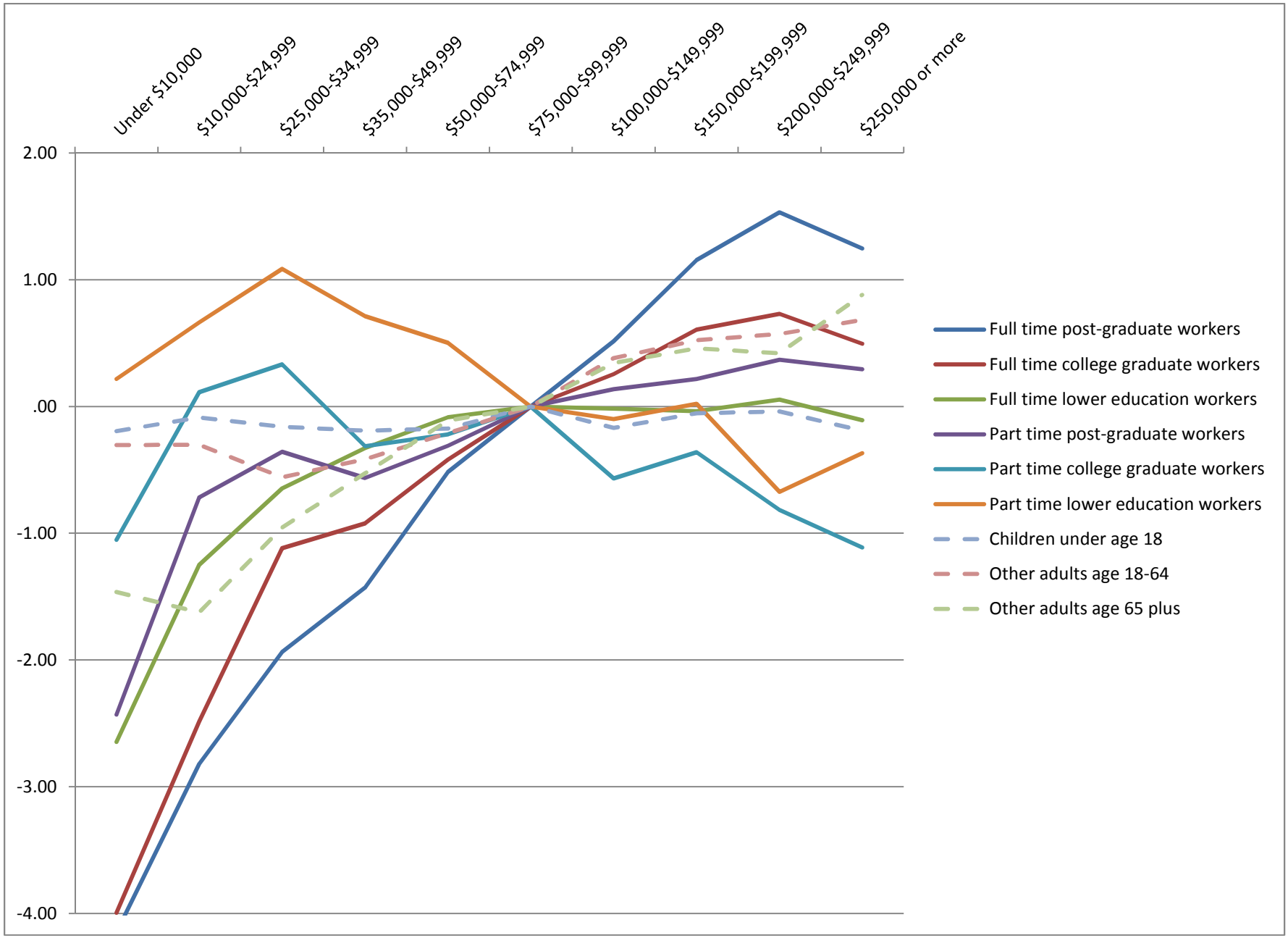

Figure 2: Plot of householder age and home ownership coefficients across alternatives

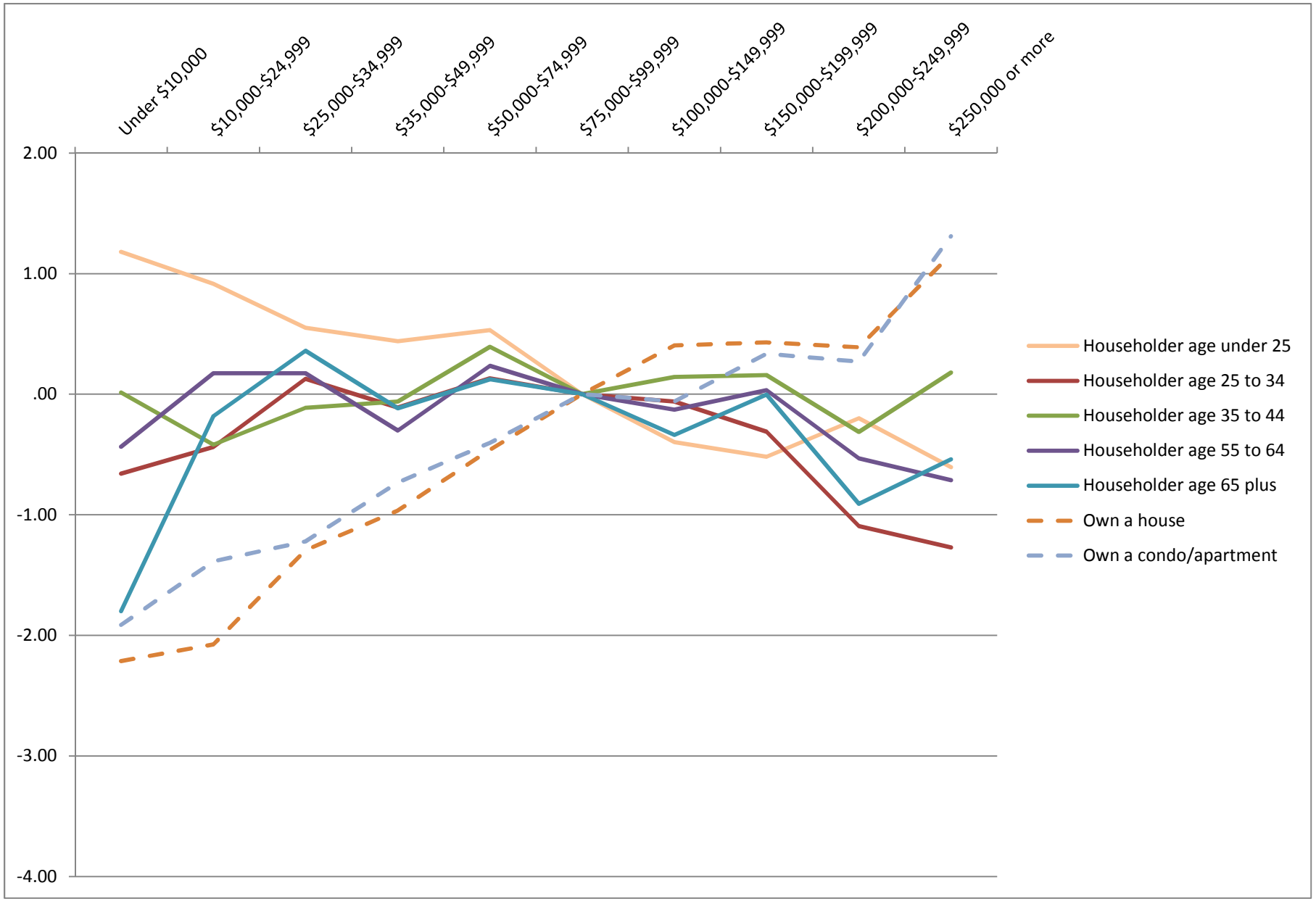

Figure 3: Plot of home block group income distribution coefficients across alternatives

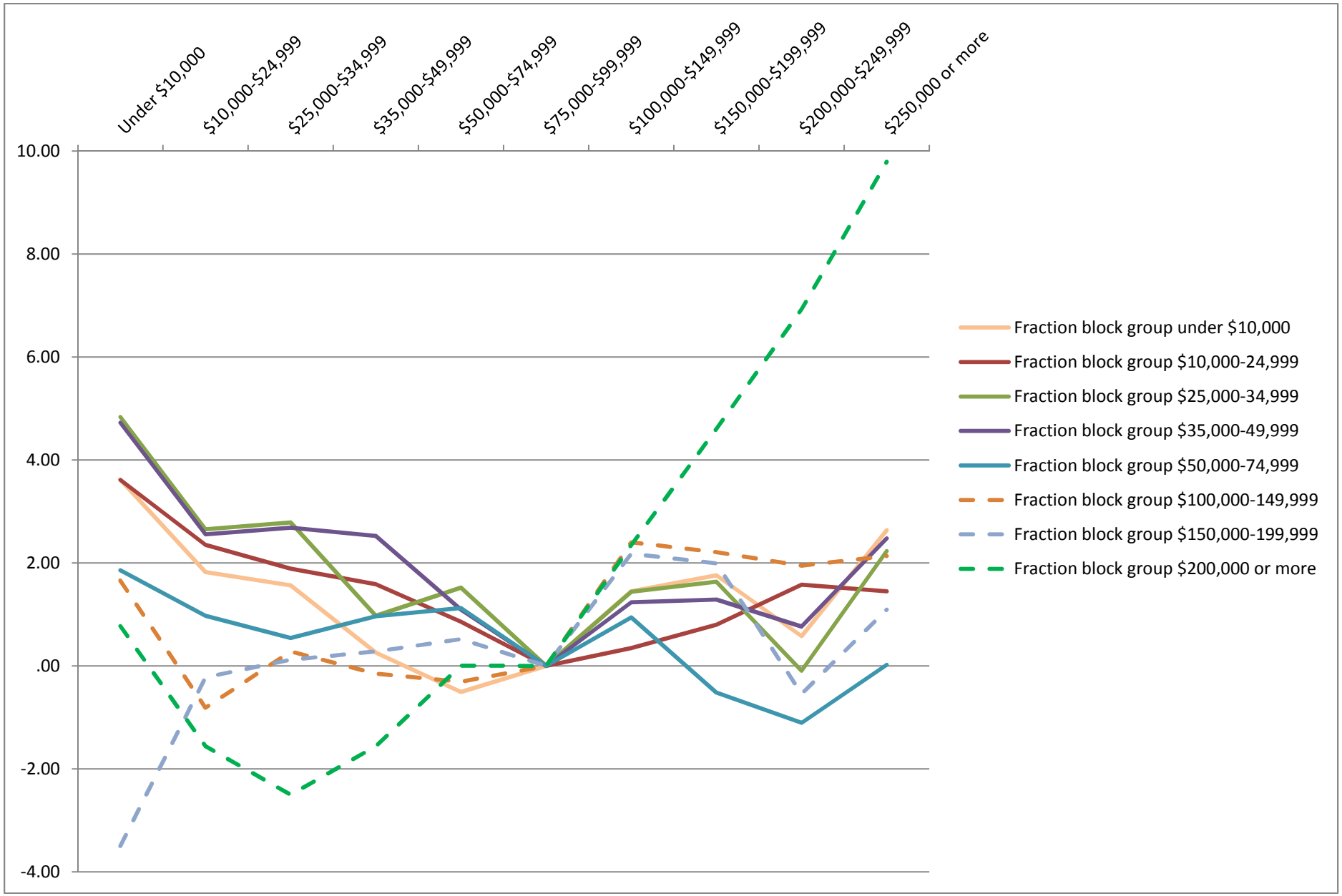

Table 3: Reported income versus predicted using highest probability categority

	Reported household income 2013: Detailed categories											
Highest probability category	Under $10,000	$10,000-$24,999	$25,000-$34,999	$35,000-$49,999	$50,000-$74,999	$75,000-$99,999	$100,000-$149,999	$150,000-$199,999	$200,000-$249,999	$250,000 or more	**Total**	**Percent**
Under $10,000	89	49	22	14	5	5	3	1	0	1	**189**	**3.5%**
$10,000-$24,999	91	249	115	98	88	26	17	4	2	3	**693**	**12.9%**
$25,000-$34,999	2	21	34	19	17	10	7	3	1	0	**114**	**2.1%**
$35,000-$49,999	17	41	48	83	70	36	27	1	4	2	**329**	**6.1%**
$50,000-$74,999	27	133	195	314	518	324	250	63	19	20	**1,863**	**34.6%**
$75,000-$99,999	2	5	13	27	55	96	56	15	2	7	**278**	**5.2%**
$100,000-$149,999	5	21	32	90	248	327	615	261	115	99	**1,813**	**33.6%**
$150,000-$199,999	0	0	0	0	1	5	16	10	4	5	**41**	**0.8%**
$200,000-$249,999	0	0	0	0	0	2	2	5	4	3	**16**	**0.3%**
$250,000 or more	0	0	0	0	4	4	6	13	9	18	**54**	**1.0%**
Total	**233**	**519**	**459**	**645**	**1006**	**835**	**999**	**376**	**160**	**158**	**5390**	**100.0%**
Percent	**4.3%**	**9.6%**	**8.5%**	**12.0%**	**18.7%**	**15.5%**	**18.5%**	**7.0%**	**3.0%**	**2.9%**	**100.0%**	
Percent Correct	**38.2%**	**48.0%**	**7.4%**	**12.9%**	**51.5%**	**11.5%**	**61.6%**	**2.7%**	**2.5%**	**11.4%**	**31.8%**	

Table 4: Predicted income using Monte Carlo simulation versus reported income

	Reported household income 2013: Detailed categories												
Monte Carlo prediction	Under $10,000	$10,000-$24,999	$25,000-$34,999	$35,000-$49,999	$50,000-$74,999	$75,000-$99,999	$100,000-$149,999	$150,000-$199,999	$200,000-$249,999	$250,000 or more		**Total**	**Percent**
Under $10,000	67	77	31	13	21	10	8	1	0	1		**229**	**4.2%**
$10,000-$24,999	54	124	82	89	79	48	28	5	6	3		**518**	**9.6%**
$25,000-$34,999	33	85	60	92	103	65	56	15	3	3		**515**	**9.6%**
$35,000-$49,999	23	73	69	106	130	92	82	34	4	10		**623**	**11.6%**
$50,000-$74,999	35	78	101	134	233	160	181	47	17	16		**1002**	**18.6%**
$75,000-$99,999	15	45	49	91	175	144	166	54	27	25		**791**	**14.7%**
$100,000-$149,999	2	27	53	86	182	208	284	96	51	36		**1025**	**19.0%**
$150,000-$199,999	3	5	10	20	46	59	106	49	27	23		**348**	**6.5%**
$200,000-$249,999	1	2	3	9	19	30	39	34	13	22		**172**	**3.2%**
$250,000 or more	0	3	1	5	18	19	49	41	12	19		**167**	**3.1%**
Total	**233**	**519**	**459**	**645**	**1006**	**835**	**999**	**376**	**160**	**158**		**5390**	**100.0%**
Percent	**4.3%**	**9.6%**	**8.5%**	**12.0%**	**18.7%**	**15.5%**	**18.5%**	**7.0%**	**3.0%**	**2.9%**		**100.0 %**	
Percent Correct	**28.8%**	**23.9%**	**13.1%**	**16.4%**	**23.2%**	**17.2%**	**28.4%**	**13.0%**	**8.1%**	**12.0%**		**20.4%**	

Table 5: Imputed versus reported income for respondents reporting a broad income range

	Reported HH income 2013: Follow up broad categories				
Final (imputed) income category	**Under $25,000**	**$25,000-$49,999**	**$50,000-$74,999**	**$75,000-$99,999**	**$100,000 or more**
Under $10,000	5				
$10,000-$24,999	12				
$25,000-$34,999		18			
$35,000-$49,999		24			
$50,000-$74,999			40		
$75,000-$99,999				32	
$100,000-$149,999					58
$150,000-$199,999					19
$200,000-$249,999					11
$250,000 or more					14
Total	**17**	**42**	**40**	**32**	**102**

Table 6: Final (imputed) income category versus reported income for all households

	Reported household income 2013: Detailed categories											
Final income category	**Under $10,000**	**$10,000-$24,999**	**$25,000-$34,999**	**$35,000-$49,999**	**$50,000-$74,999**	**$75,000-$99,999**	**$100,000-$149,999**	**$150,000-$199,999**	**$200,000-$249,999**	**$250,000 or more**	**Prefer not to answer**	**Total**
Under $10,000	233	0	0	0	0	0	0	0	0	0	27	**260**
$10,000-$24,999	0	519	0	0	0	0	0	0	0	0	45	**564**
$25,000-$34,999	0	0	459	0	0	0	0	0	0	0	63	**522**
$35,000-$49,999	0	0	0	645	0	0	0	0	0	0	71	**716**
$50,000-$74,999	0	0	0	0	1006	0	0	0	0	0	113	**1119**
$75,000-$99,999	0	0	0	0	0	835	0	0	0	0	109	**944**
$100,000-$149,999	0	0	0	0	0	0	999	0	0	0	159	**1158**
$150,000-$199,999	0	0	0	0	0	0	0	376	0	0	59	**435**
$200,000-$249,999	0	0	0	0	0	0	0	0	160	0	25	**185**
$250,000 or more	0	0	0	0	0	0	0	0	0	158	33	**191**
	233	**519**	**459**	**645**	**1006**	**835**	**999**	**376**	**160**	**158**	**704**	**6094**

Table 7: First stage expansion factors by sampling segment

Segment	Block group type	King	Kitsap	Pierce	Snohomish	Total Sample HH	Percent	ACS 2008-12 HH	Expansion factor
REG_LI	**Regular Low Income BG**	57	10	38	36	141	2.3	46129	**327.2**
REG_MI	**Regular Medium Income BG**	316	82	222	216	836	13.7	319084	**381.7**
REG_HI	**Regular High Income BG**	906	104	393	386	1789	29.4	695084	**388.5**
OS_LI	**Oversample Low Income BGI**	308	64	286	88	746	12.2	119814	**160.6**
OS_MI	**Oversample Medium Income BG**	207	52	72	42	373	6.1	56562	**151.6**
OS_HI	**Oversample High Income BG**	316	57	10	30	413	6.8	59654	**144.4**
UVOS_LI	**Urban Village Low Income BG**	573	0	0	0	573	9.4	44241	**77.2**
UVOS_MI	**Urban Village Medium Income BG**	621	0	0	0	621	10.2	44139	**71.1**
UVOS_HI	**Urban Village High Income BG**	268	0	0	0	268	4.4	23380	**87.2**
BREG_MI	**Bellevue Regular Low+Med Inc. BG**	59	0	0	0	59	1.0	9362	**158.7**
BREG_HI	**Bellevue Regular High Income BG**	134	0	0	0	134	2.2	30148	**225.0**
BOS_MI	**Bellevue Oversample Low+Med Inc**	78	0	0	0	78	1.3	7348	**94.2**
BOS_HI	**Bellevue Oversample High Inc BG**	63	0	0	0	63	1.0	7158	**113.6**
Total	**Total**	**3906**	**369**	**1021**	**798**	**6094**	**100.0**	**1462103**	**239.9**

Table 8: Comparison of first stage expansion results to ACS total households at the county level

County	Expanded Sample		ACS 2007-11	% Difference	ACS 2008-12	% Difference	ACS 2012	% Difference
King	783545		790070	-0.8%	796534	-1.6%	804057	-2.6%
Kitsap	101374		96683	4.9%	97665	3.8%	97026	4.5%
Pierce	308154		297839	3.5%	299361	2.9%	300552	2.5%
Snohomish	269029		266331	1.0%	268547	0.2%	270568	-0.6%
Total	**1462103**		**1450923**	**0.8%**	**1462107**	**0.0%**	**1472203**	**-0.7%**

Table 9: Difference between household size targets at the county level for 2012 1-year ACS compared to 2008-12 5-year ACS

		County				
		King	Kitsap	Pierce	Snohomish	Total
HH size	1 person	3.1%	3.9%	3.4%	-0.5%	2.6%
	2 people	-1.8%	5.3%	0.3%	2.2%	-0.1%
	3 people	0.6%	1.8%	2.7%	0.0%	1.0%
	4 people	2.7%	-14.8%	-4.1%	-9.4%	-2.4%
	5 or more people	1.8%	-25.2%	-5.1%	16.8%	1.5%
Total		0.9%	-0.7%	0.4%	0.8%	0.7%

Table 10: PUMA-level targets based on ACS 2012, and difference from initial expanded sample

PUMA 2012	Expanded Sample	ACS 2012 Total	% Difference
Seattle City (Northeast)	91141	67666	34.7%
Seattle City (Northwest)	71592	49210	45.5%
Seattle City (Downtown)--Queen Anne Magnolia	80071	69367	15.4%
Seattle City (Southeast)--Capitol Hill	54102	49456	9.4%
Seattle City (West)--Duwamish Beacon Hill	59371	54055	9.8%
King County (Northwest)--Shoreline, Kenmore Bothell (South) Cities	44777	46108	-2.9%
King County (Northwest)--Redmond, Kirkland Cities, Inglewood Finn Hill	55558	55211	0.6%
King County (Northwest Central)--Greater Bellevue City	52022	56826	-8.5%
King County (Central)--Sammamish, Issaquah, Mercer Island, Newcastle	58424	49062	19.1%
King County (Central)--Renton City, Fairwood, Bryn Mawr, Skyway	39703	51018	-22.2%
King County (West Central)--Burien, SeaTac, Tukwila Cities White Center	30063	48126	-37.5%
King County (Far Southwest)--Federal Way, Des Moines Cities, Vashon Island	36718	47812	-23.2%
King County (Southwest Central)--Kent City	25132	41951	-40.1%
King County (Southwest)--Auburn City Lakeland	24683	36191	-31.8%
King County (Southeast)--Maple Valley, Covington Enumclaw Cities	25552	43113	-40.7%
King County (Northeast)--Snoqualmie City, Cottage Lake, Union Hill Novelty Hill	34634	38885	-10.9%
Kitsap County (North)--Bainbridge Island City Silverdale	54037	47791	13.1%
Kitsap County (South)--Bremerton Port Orchard Cities	47337	49235	-3.9%
Pierce County (Central)--Tacoma City (Central)	68393	46311	47.7%
Pierce County (Northwest)--Peninsula Region Tacoma City (West)	52941	44909	17.9%
Pierce County (West Central)--Lakewood City Joint Base Lewis-McChord	36166	42582	-15.1%
Pierce County (South Central)--Tacoma City (South), Parkland Spanaway	39700	43579	-8.9%
Pierce County (North Central)--Tacoma (Port) Bonney Lake (Northwest) Cities	42331	43499	-2.7%
Pierce County (East Central)--Puyallup City South Hill	37019	44197	-16.2%
Pierce County (Southeast)--Graham, Elk Plain Prairie Ridge	31603	35475	-10.9%
Snohomish County (Southwest)--Edmonds, Lynnwood Mountlake Terrace Cities	58824	47103	24.9%
Snohomish County (West Central)--Mukilteo Everett (Southwest) Cities	43215	45100	-4.2%
Snohomish County (Central)--Everett City (Central & East) Eastmont	47588	45428	4.8%
Snohomish County (South Central)--Bothell (North), Mill Creek Cities Silver Firs	47429	40333	17.6%
Snohomish County (Central & Southeast)--Lake Stevens Monroe Cities	42237	44545	-5.2%
Snohomish County (North)--Marysville Arlington Cities	29736	48059	-38.1%
Total	**1462103**	**1472203**	**-0.7%**

Table 11A: Weighting targets for HH size, based on 2008-2012 ACS

		County				
		King	**Kitsap**	**Pierce**	**Snohomish**	**Total**
HH size	1 person	251406	25176	79046	66889	422517
	2 people	265432	36949	101381	89084	492846
	3 people	120799	14926	48716	47027	231468
	4 people	99468	12957	41653	40605	194683
	5 or more people	59429	7657	28565	24942	120593
Total		**796534**	**97665**	**299361**	**268547**	**1462107**

Table 11B: Weighting targets for HH workers, based on 2008-2012 ACS

		County				
		King	**Kitsap**	**Pierce**	**Snohomish**	**Total**
HH workers	0 workers	147922	23621	65505	48949	285997
	1 worker	329690	39090	120060	105420	594260
	2 workers	263527	29166	94501	91799	478993
	3 or more workers	55395	5788	19295	22379	102857
Total		**796534**	**97665**	**299361**	**268547**	**1462107**

Table 11C: Weighting targets for HH income, based on 2008-2012 ACS

		county				
		King	**Kitsap**	**Pierce**	**Snohomish**	**Total**
HH income	Under $10,000	45304	5151	17426	12946	80827
	$10,000-$24,999	89470	11575	40492	29020	170557
	$25,000-$34,999	64545	9793	28460	21804	124602
	$35,000-$49,999	94550	14209	44462	36304	189525
	$50,000-$74,999	140896	20043	63647	54581	279167
	$75,000-$99,999	106396	14152	41217	41705	203470
	$100,000-$149,999	132436	14448	42788	46481	236153
	$150,000-$199,999	58570	4753	12012	15323	90658
	$200,000-$249,999	25677	1487	4045	5296	36505
	$250,000 or more	38690	2054	4812	5087	50643
Total		**796534**	**97665**	**299361**	**268547**	**1462107**

Table 11D: Weighting targets for HH vehicles, based on 2008-2012 ACS

		county				
		King	**Kitsap**	**Pierce**	**Snohomish**	**Total**
HH vehicles	0 vehicles	73064	4896	16466	12911	107337
	1 vehicle	280059	28680	90421	77433	476593
	2 vehicles	293636	38744	117778	103531	553689
	3 or more vehicles	149775	25345	74696	74672	324488
Total		**796534**	**97665**	**299361**	**268547**	**1462107**

Table 11E: Weighting targets for HH lifecycle, based on 2008-2012 ACS

		county				
		King	**Kitsap**	**Pierce**	**Snohomish**	**Total**
HH lifecycle	Children age 0-4	93752	11294	40749	36020	181815
	Children age 5-17 only	139799	19783	64001	57299	280882
	No children, hhsize 1, householder under 35	58168	4199	14177	10930	87474
	No children, hhsize 1, householder 35-64	128544	12415	41035	36889	218883
	No children, hhsize 1, householder 65+	64694	8562	23818	19070	116144
	No children, hhsize 2+, householder under 35	80266	5462	19078	18379	123185
	No children, hhsize 2+, householder 35-64	164836	24351	67155	64840	321182
	No children, hhsize 2+, householder 65+	66475	11599	29348	25120	132542
Total		**796534**	**97665**	**299361**	**268547**	**1462107**

Table 12A: Difference between expanded sample and ACS-based targets for HH size

		Home county				
		King	**Kitsap**	**Pierce**	**Snohomish**	**Total**
HH size	1 person	1.4%	1.2%	6.6%	-1.8%	1.9%
	2 people	21.7%	28.1%	32.3%	21.4%	24.3%
	3 people	-13.4%	5.8%	-19.2%	-6.5%	-12.0%
	4 people	-18.5%	-38.4%	-22.5%	-16.9%	-20.3%
	5 or more people	-66.7%	-37.3%	-36.8%	-29.9%	-50.1%
Total		**-1.6%**	**3.8%**	**2.9%**	**0.2%**	**0.0%**

Table 12B: Difference between expanded sample and ACS-based targets for HH workers

		Home county				
		King	**Kitsap**	**Pierce**	**Snohomish**	**Total**
HH workers	0 workers	10.1%	36.3%	39.3%	15.0%	19.8%
	1 worker	-0.9%	-1.5%	3.1%	0.9%	0.2%
	2 workers	3.2%	-9.4%	-13.4%	4.1%	-0.7%
	3 or more workers	-60.2%	-26.7%	-41.7%	-51.5%	-53.0%
Total		**-1.6%**	**3.8%**	**2.9%**	**0.2%**	**0.0%**

Table 12C: Difference between expanded sample and ACS-based targets for HH income

		Home county				
		King	**Kitsap**	**Pierce**	**Snohomish**	**Total**
HH income	Under $10,000	-49.8%	-39.4%	-27.6%	-48.3%	-44.1%
	$10,000-$24,999	-42.2%	-20.8%	-21.4%	-22.5%	-32.5%
	$25,000-$34,999	-16.0%	-23.1%	11.8%	-19.7%	-10.9%
	$35,000-$49,999	-19.5%	1.2%	-12.9%	-19.8%	-16.5%
	$50,000-$74,999	-2.6%	20.0%	5.0%	-14.3%	-1.5%
	$75,000-$99,999	9.0%	9.2%	31.7%	36.9%	19.3%
	$100,000-$149,999	34.5%	26.3%	16.5%	32.9%	30.4%
	$150,000-$199,999	27.6%	32.1%	39.7%	10.9%	26.6%
	$200,000 or more	13.0%	-11.0%	-38.7%	2.0%	5.5%
Total		**-1.6%**	**3.8%**	**2.9%**	**0.2%**	**0.0%**

Table 1DC: Difference between expanded sample and ACS-based targets for HH vehicles

		Home county				
		King	**Kitsap**	**Pierce**	**Snohomish**	**Total**
HH vehicles	0 vehicles	-11.5%	-17.5%	-25.0%	-36.0%	-16.8%
	1 vehicle	11.2%	4.9%	10.3%	-2.8%	8.4%
	2 vehicles	-1.5%	3.9%	4.1%	20.6%	4.2%
	3 or more vehicles	-21.1%	6.5%	-1.6%	-18.8%	-13.9%
Total		**-1.6%**	**3.8%**	**2.9%**	**0.2%**	**0.0%**

Table 12E: Difference between expanded sample and ACS-based targets for HH lifecyle

		Home county				
		King	**Kitsap**	**Pierce**	**Snohomish**	**Total**
hhlifecy	Children age 0-4	-16.3%	-18.1%	-23.2%	4.9%	-13.8%
	Children age 5-17 only	-35.3%	-38.1%	-37.3%	-22.8%	-33.4%
	No children, hhsize 1, householder under 35	-20.7%	-18.7%	-41.4%	-38.2%	-26.1%
	No children, hhsize 1, householder 35-64	6.8%	6.2%	13.6%	-4.7%	6.1%
	No children, hhsize 1, householder 65+	10.6%	3.8%	23.1%	24.7%	15.0%
	No children, hhsize 2+, householder under 35	1.8%	29.4%	20.4%	-12.3%	3.8%
	No children, hhsize 2+, householder 35-64	14.3%	9.2%	20.0%	17.0%	15.6%
	No children, hhsize 2+, householder 65+	34.9%	78.9%	66.6%	16.7%	42.3%
Total		**-1.6%**	**3.8%**	**2.9%**	**0.2%**	**0.0%**

Table 13: Resulting mean values of final expansion factor by sampling segment

Sampling segment	Block group type	Sample households	Initial expansion factor	Final expansion factor-Mean	Final expansion factor-Std.Dev.
REG_LI	**Regular Low Income BG**	141	327.1560	382.1015	195.5930
REG_MI	**Regular Medium Income BG**	836	381.6794	392.4430	229.8381
REG_HI	**Regular High Income BG**	1789	388.5321	378.4408	217.9455
OS_LI	**Oversample Low Income BGI**	746	160.6086	189.7926	132.2615
OS_MI	**Oversample Medium Income BG**	373	151.6408	148.3417	112.1266
OS_HI	**Oversample High Income BG**	413	144.4407	117.6285	62.1784
UVOS_LI	**Urban Village Low Income BG**	59	158.6780	205.7835	174.0679
UVOS_MI	**Urban Village Medium Income BG**	134	224.9851	236.1090	169.9533
UVOS_HI	**Urban Village High Income BG**	78	94.2051	84.2113	49.4611
BREG_MI	**Bellevue Regular Low+Med Inc. BG**	63	113.6190	121.4712	76.8233
BREG_HI	**Bellevue Regular High Income BG**	573	77.2094	72.5309	40.2419
BOS_MI	**Bellevue Oversample Low+Med Inc**	621	71.0773	61.4843	55.6330
BOS_HI	**Bellevue Oversample High Inc BG**	268	87.2388	74.1700	43.3150
Total	**Total**	**6094**	**239.9250**	**239.9257**	**213.2328**