SACSIM/05
Activity-Based Travel Forecasting Model for SACOG
Featuring ***DaySim***—the Person Day Activity and Travel Simulator

Technical Memo Number 2
Population Synthesis
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Introduction

The synthesis of a 2000 base year population household/person file for the Sacramento region included the following steps:

1. Process the 2000 PUMS 5% microdata sample in order to extract relevant variables and to arrange the file in a manner most convenient for sampling.

2. Process the 2000 Census CTPP data to determine sampling targets for each demographic segment within each TAZ.

3. Draw households randomly from the 2000 PUMS data in order to match the sampling targets.

Each of those steps is described below.

Processing the PUMS Microdata

The 2000 PUMS 5% data from the 14 PUMAs within the SACOG region was extracted into a file with 22 data fields on each record, as shown in Table 2-1 below.

Table 2-1. PUMS Data Items

Variable	Definition	Minimum	Maximum	Mean
1. SERIALNO	PUMS household ID	290	9999952	5030100.77
2. PNUM	Person number within household	1	16	2.27
3. PUMA	PUMA code	800	1700	1398.33
4. SCELL	Sampling cell	1	80	50.16
5. PERSONS	# of persons in household	1	16	3.55
6. TENURE	Ownership status	0	4	1.83
7. BLDGSZ	Residence building size/type	0	10	2.83
8. P65	# of persons age 65+	0	6	.24
9. P18	# of persons age under 18	0	12	1.32
10. NPF	# of persons part of family	0	15	3.16
11. NOC	# of own children in the household	0	12	1.16
12. HINC	Household income ($)	-20000	838900	62698.89
13. VEHICL	# of vehicles owned by household	0	6	1.93
14. RELATE	Relationship to householder	1	23	3.77
15. SEX	Gender	1	2	1.51
16. AGE	Age	0	93	35.21
17. GRADE	Current education school type	0	7	1.28
18. HOURS	Hours worked per week	0	99	19.97
19. WORKER	Employed worker?	0	1	.44
20. STUDENT	Enrolled student?	0	1	.30
21. NWORKERS	# of employed workers in household	0	8	1.41
22. NSTUDENT	# of enrolled students in household	0	10	1.31
23. EXFAC	Expansion factor (assigned later)	1	1	1.00

The file includes 95,684 person records, in 37,317 households. To make the file most useful for sampling, it is sorted by (1) PUMA, (2) SCELL, (3) SAMPID and (4) PNUM. The resulting file is a dBase IV format file named PUMSSRT.DBF.

The distribution of households by PUMA is shown in Table 2-2 below. The overall sampling rate is 5.4% of households in the region, varying by PUMA from a low of 4.0% in Sacramento PUMA 1501, to a high of 7.2% in Sacramento PUMA 1402. In sampling, the households in PUMA's with a lower sampling rate will need to be replicated more times to achieve a full representative sample.

Table 2-2: Distribution of PUMS Data by PUMA

County	PUMA	Actual 2000 HH	PUMS Sample HH	Sampling Rate	PUMS Sample Persons	Avg. HH Size
Sutter+Yuba	800	47,555	2,990	6.29%	8,073	2.70
Yolo	900	59,380	3,270	5.51%	8,337	2.55
Sacramento	1401	43,668	2,599	5.95%	6,052	2.33
Sacramento	1402	32,915	2,383	7.24%	5,693	2.39
Sacramento	1403	55,973	3,223	5.76%	8,691	2.70
Sacramento	1501	52,337	2,106	4.02%	5,986	2.84
Sacramento	1502	42,012	2,105	5.01%	5,172	2.46
Sacramento	1503	52,736	2,786	5.28%	6,665	2.39
Sacramento	1504	76,411	3,767	4.93%	8,536	2.27
Sacramento	1505	58,417	2,552	4.37%	7,738	3.03
Sacramento	1506	39,092	1,756	4.49%	4,688	2.67
Placer	1601	45,290	2,918	6.44%	7,588	2.60
Placer	1602	43,024	1,906	4.43%	4,808	2.52
El Dorado	1700	45,347	2,956	6.52%	7,657	2.59
Total		694,157	37,317	5.38%	95,684	2.56

The variable SCELL is based on a 4 x 4 x 5 classification of household size (1, 2, 3, 4+), household workers (0,1,2,3+), and household income (0-15K, 15-30K, 25-50K, 50-75K, 75K+). Because it is not possible to have more workers than persons in a household, only 65 of the 80 possible values of SCELL actually appear in the data. Table 2-3 shows the mean household characteristics of each sampling cell in the PUMS data. Not surprisingly, the mean # persons, # workers and mean income are almost perfectly defined by the cells. Other variables that were not used to define the cells are also quite well defined. In particular, only the 0-worker households with 3 or fewer people tend to include people age 65+. Also, only households with 3 or more people and fewer workers than people tend to include people under age 18. So, one would hope that controlling for the other variables will also give a good distribution by age and household composition.

Table 2-4 shows the distribution of PUMS households by PUMA and sampling cell. The spread is quite good, with only 14 PUMA/cell combinations without any households (0's shown in bold in the table). Almost all of these cases are in cells with 3+ workers but income below $15K. In sampling, any households to be drawn from one of these 14 cell/PUMA combinations were instead drawn from the same sampling cell, but from a nearby PUMA.

Table 2-3: Average Characteristics of Sampling Cells in PUMS Households

Cell	Mean # Persons	Mean # Workers	Mean HH Income	Mean # Stud-ents	Mean # Age 65+	Mean # Age <18	Mean # Own Childrn	Mean # Cars	Fraction who Rent	Fraction living in Apartmnt
1	1.00	0.00	4151	0.14	0.30	0.00	0.00	0.39	0.29	0.24
2	1.00	0.00	21568	0.03	0.76	0.00	0.00	0.93	0.35	0.29
3	1.00	0.00	37765	0.04	0.72	0.00	0.00	1.09	0.25	0.23
4	1.00	0.00	59328	0.04	0.65	0.00	0.00	1.17	0.24	0.23
5	1.00	0.00	129625	0.04	0.64	0.00	0.00	1.19	0.16	0.16
6	1.00	1.00	6441	0.23	0.06	0.00	0.00	0.71	0.57	0.43
7	1.00	1.00	22289	0.14	0.08	0.00	0.00	1.06	0.70	0.54
8	1.00	1.00	38103	0.11	0.05	0.00	0.00	1.20	0.52	0.41
9	1.00	1.00	59293	0.06	0.04	0.00	0.00	1.27	0.34	0.26
10	1.00	1.00	131201	0.07	0.06	0.00	0.00	1.34	0.29	0.22
21	2.00	0.00	8077	0.42	0.59	0.26	0.23	1.09	0.61	0.41
22	2.00	0.00	22182	0.10	1.27	0.05	0.04	1.48	0.27	0.14
23	2.00	0.00	38956	0.09	1.43	0.04	0.03	1.68	0.13	0.08
24	2.00	0.00	60034	0.06	1.41	0.02	0.01	1.82	0.07	0.05
25	2.00	0.00	137257	0.06	1.31	0.01	0.01	1.97	0.05	0.03
26	2.00	1.00	8748	0.69	0.10	0.41	0.40	1.20	0.75	0.51
27	2.00	1.00	22657	0.50	0.29	0.34	0.33	1.43	0.60	0.37
28	2.00	1.00	38782	0.38	0.34	0.26	0.25	1.72	0.38	0.20
29	2.00	1.00	60690	0.27	0.38	0.14	0.14	1.87	0.23	0.13
30	2.00	1.00	141499	0.16	0.44	0.05	0.05	2.14	0.10	0.05
31	2.00	2.00	9379	0.78	0.02	0.02	0.02	1.48	0.78	0.58
32	2.00	2.00	23602	0.57	0.07	0.04	0.03	1.68	0.74	0.53
33	2.00	2.00	40308	0.38	0.08	0.03	0.02	1.91	0.52	0.32
34	2.00	2.00	61641	0.25	0.07	0.01	0.01	2.07	0.35	0.18
35	2.00	2.00	124085	0.16	0.07	0.00	0.00	2.23	0.14	0.07
41	3.00	0.00	7344	1.28	0.15	1.37	1.20	1.03	0.81	0.51
42	3.00	0.00	21086	0.94	0.43	0.97	0.80	1.36	0.62	0.35
43	3.00	0.00	38993	0.69	0.72	0.64	0.51	1.81	0.36	0.17
44	3.00	0.00	60451	0.57	1.04	0.43	0.29	2.14	0.25	0.14
45	3.00	0.00	134960	0.59	0.68	0.54	0.49	2.10	0.13	0.06
46	3.00	1.00	8516	1.26	0.06	1.30	1.19	1.24	0.76	0.47
47	3.00	1.00	22605	1.16	0.14	1.16	1.08	1.49	0.67	0.35
48	3.00	1.00	38999	1.05	0.22	1.06	0.97	1.77	0.48	0.23
49	3.00	1.00	60721	0.76	0.34	0.81	0.75	1.95	0.27	0.09
50	3.00	1.00	138768	0.74	0.34	0.74	0.70	2.21	0.11	0.07
51	3.00	2.00	8825	1.41	0.04	0.71	0.63	1.61	0.82	0.55
52	3.00	2.00	23098	0.95	0.06	0.76	0.65	1.78	0.74	0.49
53	3.00	2.00	40679	0.81	0.06	0.79	0.73	2.03	0.49	0.25
54	3.00	2.00	61801	0.77	0.08	0.79	0.73	2.23	0.30	0.10
55	3.00	2.00	120397	0.78	0.10	0.73	0.69	2.39	0.11	0.04
56	3.00	3.00	10316	1.38	0.15	0.15	0.00	1.69	0.77	0.62
57	3.00	3.00	23881	1.27	0.03	0.17	0.17	2.17	0.77	0.40
58	3.00	3.00	40531	1.04	0.07	0.19	0.16	2.36	0.54	0.34
59	3.00	3.00	62551	0.83	0.08	0.12	0.11	2.54	0.43	0.17
60	3.00	3.00	119149	0.67	0.05	0.15	0.14	2.94	0.19	0.07
61	5.40	0.00	7035	2.76	0.03	3.42	2.92	1.08	0.83	0.38
62	5.43	0.00	21467	2.77	0.17	3.13	2.74	1.36	0.72	0.38
63	5.43	0.00	38142	2.29	0.34	2.68	2.26	1.69	0.46	0.21
64	5.55	0.00	59558	2.50	0.32	2.64	2.14	2.05	0.38	0.13
65	5.55	0.00	123015	2.26	0.37	2.49	1.65	2.17	0.21	0.15
66	5.05	1.00	9552	2.48	0.06	2.96	2.71	1.37	0.79	0.38
67	5.40	1.00	22223	2.66	0.10	3.12	2.82	1.62	0.68	0.30

68	5.12	1.00	38716	2.22	0.13	2.76	2.38	1.87	0.47	0.16
69	5.10	1.00	60737	2.31	0.16	2.69	2.43	2.12	0.27	0.06
70	4.85	1.00	141882	2.19	0.12	2.55	2.41	2.31	0.14	0.05
71	5.47	2.00	8872	2.80	0.11	2.70	2.33	1.92	0.66	0.31
72	5.42	2.00	22952	2.41	0.09	2.67	2.31	1.87	0.69	0.34
73	5.09	2.00	39986	2.26	0.10	2.51	2.22	2.13	0.44	0.15
74	4.85	2.00	61742	2.19	0.08	2.41	2.16	2.28	0.25	0.07
75	4.67	2.00	118739	2.19	0.11	2.27	2.13	2.43	0.11	0.03
76	5.60	3.38	9682	3.68	0.00	1.89	1.56	2.97	0.92	0.62
77	6.04	3.43	23582	2.63	0.05	2.19	1.59	1.97	0.81	0.41
78	6.15	3.34	40778	2.53	0.12	2.34	1.71	2.41	0.55	0.14
79	5.91	3.43	62723	2.31	0.12	1.95	1.50	2.82	0.40	0.14
80	5.60	3.53	129500	2.01	0.21	1.55	1.09	3.28	0.17	0.04

Table 2-4: Distribution of PUMS Households by Sampling Cell and PUMA

Cell	800	900	1401	1402	1403	1501	1502	1503	1504	1505	1506	1601	1602	1700
1	354	438	513	318	289	139	168	295	384	177	187	205	127	188
2	80	69	74	97	116	54	88	73	145	63	35	70	57	80
3	32	45	33	60	64	28	38	42	97	32	16	42	42	51
4	12	13	9	19	20	5	8	18	33	6	10	14	13	18
5	7	24	8	20	16	5	5	14	32	4	4	20	15	10
6	103	127	100	62	69	42	39	53	99	31	38	52	23	56
7	90	93	151	87	85	67	80	62	177	38	47	68	49	84
8	64	101	158	117	136	73	109	109	208	76	71	85	66	69
9	24	46	65	88	88	53	44	98	118	50	36	50	47	55
10	10	34	41	31	44	17	23	51	51	23	11	39	29	32
21	69	60	69	58	65	32	15	22	38	32	27	27	26	37
22	105	50	49	48	55	43	50	54	54	43	35	73	30	79
23	82	61	28	50	86	59	60	63	99	44	37	122	71	92
24	35	38	11	34	50	18	34	57	59	31	22	54	54	75
25	29	39	8	32	48	12	25	56	65	15	17	63	48	53
26	52	49	30	30	28	25	23	14	42	19	19	16	11	28
27	97	56	39	46	60	50	44	45	84	49	34	72	32	63
28	90	86	59	54	84	78	71	57	91	61	51	84	38	92
29	59	68	32	45	74	31	64	86	79	48	40	56	61	75
30	51	74	19	37	57	40	45	97	100	44	43	110	59	97
31	2	16	7	7	3	2	5	10	11	5	2	6	6	9
32	31	50	38	18	16	15	22	12	53	10	15	28	10	34
33	65	70	64	57	59	53	68	49	83	38	43	69	39	68
34	72	105	89	77	92	70	69	94	143	80	53	97	66	101
35	88	139	72	107	169	80	112	243	194	144	107	225	132	209
41	25	33	17	31	38	13	12	14	19	20	7	4	1	13
42	26	13	18	18	20	17	6	5	15	17	8	9	4	13
43	13	18	8	8	18	11	5	10	9	13	7	11	8	12
44	6	7	4	4	8	3	7	5	12	1	4	4	4	7
45	2	4	1	1	2	2	2	4	11	10	4	10	6	4
46	30	27	20	17	18	12	5	8	17	18	10	7	10	12
47	54	30	41	28	43	37	20	14	50	29	18	25	17	23
48	47	37	31	31	50	44	32	31	62	39	27	32	22	39

49	33	30	24	9	35	20	29	32	33	26	15	31	20	42
50	14	19	8	12	25	8	20	62	38	28	21	34	20	42
51	5	13	3	6	3	1	4	1	6	2	4	4	1	3
52	24	22	12	15	15	10	10	11	17	13	8	9	6	19
53	47	33	33	27	44	39	39	20	48	55	21	30	16	39
54	47	53	27	35	60	58	39	49	59	59	36	60	38	50
55	48	83	20	42	72	55	64	111	107	89	62	88	81	84
56	1	3	2	2	1	1	**0**	**0**	2	1	**0**	**0**	**0**	**0**
57	4	5	1	4	2	2	0	3	2	1	1	1	2	2
58	5	6	10	5	4	7	11	4	6	6	5	5	6	3
59	11	15	12	9	10	9	13	9	26	10	11	17	7	9
60	20	23	11	18	22	21	23	44	29	39	23	39	27	43
61	33	28	31	31	44	24	7	7	19	43	7	4	2	13
62	31	28	28	26	32	16	8	5	17	21	15	2	2	8
63	24	24	17	19	34	14	4	1	9	28	10	6	7	8
64	8	8	7	4	14	6	3	3	4	8	4	5	3	5
65	7	6	4	**0**	4	4	2	2	5	5	4	10	5	4
66	31	26	27	28	42	25	11	7	24	28	15	12	5	10
67	70	70	66	42	84	47	26	19	48	69	22	29	21	29
68	91	53	59	42	71	65	32	28	66	65	45	39	23	52
69	47	44	14	20	48	37	38	34	28	64	34	57	34	59
70	34	48	12	13	34	25	23	82	33	53	24	101	61	88
71	15	15	9	7	7	2	2	3	8	3	1	3	**0**	3
72	42	31	30	26	34	23	9	13	32	32	13	21	12	19
73	110	72	54	41	69	78	50	35	51	64	41	42	21	71
74	86	98	50	40	100	103	72	72	84	113	66	88	47	88
75	77	146	32	41	107	64	79	165	130	175	83	179	127	147
76	**0**	5	2	1	2	1	1	1	**0**	**0**	**0**	1	**0**	**0**
77	6	13	6	7	9	4	3	2	5	6	1	6	1	5
78	22	24	11	12	24	10	10	5	11	15	14	15	8	18
79	37	42	31	19	44	33	21	22	29	35	17	35	16	34
80	54	64	40	43	57	64	54	69	57	86	48	96	64	81

Processing the CTPP Target Data

The 2000 CTPP standard table 1-75 contains a joint distribution by household size, workers and income for each TAZ in the region. Using this single table to obtain the joint distribution, we do not need to rely on any IPF procedures for the base year.

The CTPP table was read from file MT00_MARG.DBF, a dBase IV-format file with 66 data fields for each of the 1309 SACOG zones:

- 1: The TAZ number
- 2-66: The number of households in the TAZ in 2000 for each of the 65 non-empty sampling cells.

A summary of the target values by PUMA and cell is shown in Table 2-5. Although it is the values at the TAZ level that are used in sampling, aggregating to PUMA level is useful for reporting purposes. There are 8 empty cells, shown in Bold. These same 8 cells are all empty or nearly empty in the PUMS data (Table 2-4) as well.

Table 2-6 shows the average/expected number of times that households in each PUMA/cell combination are sampled to create a full synthetic population. This is the ratio of the values in Table 2-5 to those in Table 2-4, or the inverse of the sampling rate per PUMA/cell. If sampling had been a uniform 5% across PUMAs and cells, then Table 2-6 would contain the value 20.0 in every cell. We have already seen in Table 2-2, however, that the sampling rate was not uniform across PUMA's, and there is bound to be random variation and sampling biases across demographic segments as well. Table 2-6 shows that there are very few cases where households will enter the full sample more than 40 times (the bold cells), and these are typically small numbers of HH in absolute terms. In the few cases where there are no PUMS households (the cells with '**NONE**'), households from nearby PUMA's are used.

Another concern in sampling is the maximum number of times a given household will be sampled within any given TAZ. Table 2-7 shows the maximum number of households within any TAZ in a PUMA/cell, divided by the number of PUMS HH in the PUMA/cell. The extreme cases shown in bold are those where some HH will appear more than 5 times in a specific TAZ/cell combination. There are not many such cases, and they typically concern small numbers of households in absolute terms.

Table 2-5: CTPP-based Sampling Targets by Sampling Cell and PUMA

Cell	800	900	1401	1402	1403	1501	1502	1503	1504	1505	1506	1601	1602	1700
1	3272	3738	4407	2651	3210	2010	2170	2029	4866	2459	1623	2203	1710	2047
2	1647	1632	1349	1269	2059	1227	1726	1714	3454	1335	1165	1332	1552	1271
3	516	838	559	736	1161	662	979	1066	2032	635	555	654	902	693
4	195	311	217	225	483	175	277	338	805	159	175	285	413	278
5	112	373	149	153	272	122	134	306	601	96	139	268	193	131
6	1026	1306	2296	703	1043	763	715	657	1923	627	533	470	540	369
7	1594	2025	3427	1385	1583	1780	1802	1346	3723	940	1196	1038	967	1040
8	1280	2114	3243	1747	2486	2242	2166	2118	4595	1827	1832	1308	1553	1068
9	472	1049	1540	1154	1597	1277	972	1616	2631	1420	1177	746	1277	907
10	247	670	550	391	742	472	389	1000	1256	472	427	633	599	500
21	1100	1224	1062	731	1072	914	367	495	1184	1012	543	501	422	643
22	1678	1073	884	772	1245	1090	994	1083	1324	1191	745	1118	680	1540
23	1183	972	452	670	1317	1247	1402	1206	2074	1227	915	1630	1888	1941
24	630	700	262	403	889	431	739	1060	1370	670	589	1057	1236	1212
25	554	617	144	277	927	232	453	1093	1451	328	480	999	1072	893
26	618	859	542	433	371	543	366	338	863	490	383	225	310	373
27	1205	1090	807	723	1118	1270	915	885	1710	1155	768	922	664	813
28	1454	1728	1112	955	1738	1858	1481	1325	2150	1366	1224	1365	930	1386
29	1135	1072	738	611	1425	1160	1078	1648	1692	1343	1066	1184	1307	1410
30	905	1381	424	444	1150	876	698	1747	2075	1015	1060	1696	1197	1447
31	48	428	159	138	72	68	60	92	261	55	108	58	94	78
32	583	1029	700	350	276	532	534	362	1119	260	308	332	231	335
33	1146	1452	1449	855	991	1514	1407	1129	1899	882	987	893	1024	817
34	1224	1778	1418	1257	1585	1798	1818	1804	2909	1793	1411	1350	1586	1403
35	1571	3012	1253	1574	3090	1993	2000	4749	4003	2712	2530	3149	2851	3428
41	474	649	518	427	570	392	219	165	446	492	189	91	66	84
42	356	227	291	260	340	440	189	163	359	435	133	181	108	157
43	175	194	109	123	267	212	139	162	265	320	199	126	138	216
44	149	145	85	65	144	96	129	118	124	141	83	155	97	134
45	57	96	33	48	125	79	42	103	172	136	66	176	77	149
46	385	630	301	195	412	353	113	205	453	373	263	235	212	143
47	798	762	630	361	711	1066	367	365	921	709	451	381	426	344
48	672	740	676	463	919	1106	749	725	1133	1044	631	502	551	614
49	585	680	368	233	562	664	589	715	747	740	479	619	611	635
50	331	616	148	181	521	330	324	1084	791	551	367	715	592	808
51	115	233	68	59	76	87	83	31	98	70	52	92	22	25
52	453	412	234	176	225	377	276	225	484	280	205	176	166	123
53	662	799	466	434	823	1066	814	558	792	981	462	519	503	484
54	892	925	498	461	914	1119	954	979	1121	1254	850	963	976	794
55	861	1605	432	677	1486	1272	1030	2197	1635	1873	1338	1702	1723	1732
56	4	117	36	12	3	10	**0**	**0**	30	13	7	**0**	**0**	**0**
57	23	101	22	14	67	28	**0**	28	59	10	19	9	47	15
58	93	252	132	61	70	135	131	103	163	116	90	53	135	40
59	162	287	128	124	170	305	255	154	374	218	200	208	149	208
60	359	490	219	245	458	516	431	835	769	711	459	658	519	666
61	683	504	636	445	989	646	105	138	572	991	234	68	70	168

62	714	531	527	421	717	578	98	158	465	779	310	116	75	90
63	463	387	337	238	458	321	120	70	269	562	242	82	188	135
64	159	115	112	63	182	223	91	80	108	223	94	94	61	113
65	155	139	40	28	115	114	88	106	83	197	61	134	123	68
66	637	565	541	376	711	592	266	174	484	825	159	159	130	213
67	1256	1298	1043	731	1350	1424	560	412	1268	1569	618	445	424	438
68	1430	1228	1040	719	1425	1728	769	766	1195	1999	1001	662	541	875
69	896	941	443	374	803	1227	719	838	667	1707	911	1016	819	1044
70	660	907	199	220	614	619	495	1794	952	1312	647	2115	1531	1689
71	127	283	98	78	161	101	69	102	144	136	76	59	41	93
72	635	565	499	447	580	597	312	287	496	676	313	360	219	206
73	1513	1345	786	767	1184	1810	1069	821	1064	1606	907	749	594	817
74	1639	1778	851	866	1537	2180	1520	1419	1562	2716	1497	1514	1228	1407
75	1603	2845	465	646	2096	2012	1509	3465	2243	3844	1912	3004	2782	2731
76	11	183	28	14	35	25	30	5	22	12	21	**0**	**0**	11
77	97	452	99	109	121	93	64	33	122	112	109	76	4	46
78	416	408	322	207	262	321	218	156	343	430	232	202	178	165
79	581	704	425	308	720	697	487	518	560	769	393	423	354	507
80	893	1261	384	549	1128	1171	942	1344	938	1793	1019	1248	1365	1230

Table 2-6: Average # of Times PUMS Households Sampled by Sampling Cell and PUMA

Cell	800	900	1401	1402	1403	1501	1502	1503	1504	1505	1506	1601	1602	1700
1	9.2	8.5	8.6	8.3	11.1	14.5	12.9	6.9	12.7	13.9	8.7	10.7	13.5	10.9
2	20.6	23.6	18.2	13.1	17.7	22.7	19.6	23.5	23.8	21.2	33.3	19	27.2	15.9
3	16.1	18.6	16.9	12.3	18.1	23.7	25.8	25.4	21	19.8	34.7	15.6	21.5	13.6
4	16.2	23.9	24.1	11.9	24.1	35.1	34.6	18.8	24.4	26.5	17.5	20.4	31.7	15.5
5	16	15.5	18.6	7.7	17	24.5	26.7	21.9	18.8	23.9	34.8	13.4	12.9	13.1
6	10	10.3	23	11.3	15.1	18.2	18.3	12.4	19.4	20.2	14	9	23.5	6.6
7	17.7	21.8	22.7	15.9	18.6	26.6	22.5	21.7	21	24.7	25.5	15.3	19.7	12.4
8	20	20.9	20.5	14.9	18.3	30.7	19.9	19.4	22.1	24	25.8	15.4	23.5	15.5
9	19.7	22.8	23.7	13.1	18.2	24.1	22.1	16.5	22.3	28.4	32.7	14.9	27.2	16.5
10	24.7	19.7	13.4	12.6	16.9	27.8	16.9	19.6	24.6	20.5	38.8	16.2	20.7	15.6
21	15.9	20.4	15.4	12.6	16.5	28.6	24.4	22.5	31.2	31.6	20.1	18.6	16.2	17.4
22	16	21.5	18	16.1	22.6	25.4	19.9	20.1	24.5	27.7	21.3	15.3	22.7	19.5
23	14.4	15.9	16.2	13.4	15.3	21.1	23.4	19.1	21	27.9	24.7	13.4	26.6	21.1
24	18	18.4	23.8	11.8	17.8	24	21.7	18.6	23.2	21.6	26.8	19.6	22.9	16.2
25	19.1	15.8	18	8.7	19.3	19.3	18.1	19.5	22.3	21.8	28.2	15.9	22.3	16.8
26	11.9	17.5	18.1	14.4	13.3	21.7	15.9	24.1	20.6	25.8	20.1	14.1	28.2	13.3
27	12.4	19.5	20.7	15.7	18.6	25.4	20.8	19.7	20.4	23.6	22.6	12.8	20.7	12.9
28	16.2	20.1	18.9	17.7	20.7	23.8	20.9	23.3	23.6	22.4	24	16.2	24.5	15.1
29	19.2	15.8	23.1	13.6	19.3	37.4	16.8	19.2	21.4	28	26.6	21.1	21.4	18.8
30	17.7	18.7	22.3	12	20.2	21.9	15.5	18	20.7	23.1	24.6	15.4	20.3	14.9
31	24.1	26.8	22.8	19.7	23.9	33.9	11.9	9.2	23.8	11.1	**53.9**	9.7	15.7	8.6
32	18.8	20.6	18.4	19.4	17.2	35.5	24.3	30.1	21.1	26	20.5	11.9	23.1	9.9
33	17.6	20.7	22.6	15	16.8	28.6	20.7	23	22.9	23.2	23	12.9	26.2	12

34	17	16.9	15.9	16.3	17.2	25.7	26.3	19.2	20.3	22.4	26.6	13.9	24	13.9
35	17.9	21.7	17.4	14.7	18.3	24.9	17.9	19.5	20.6	18.8	23.6	14	21.6	16.4
41	19	19.7	30.5	13.8	15	30.2	18.3	11.8	23.5	24.6	26.9	22.7	**66**	6.5
42	13.7	17.5	16.2	14.5	17	25.9	31.5	32.5	23.9	25.6	16.6	20.2	27.1	12.1
43	13.4	10.8	13.7	15.3	14.8	19.3	27.8	16.2	29.4	24.6	28.4	11.4	17.3	18
44	24.9	20.7	21.2	16.2	18	32	18.4	23.7	10.3	**141.3**	20.7	38.7	24.2	19.2
45	28.4	24	33	**48.1**	**62.3**	39.7	21.2	25.7	15.7	13.6	16.6	17.6	12.8	37.1
46	12.8	23.3	15.1	11.4	22.9	29.4	22.6	25.6	26.6	20.7	26.3	33.5	21.2	11.9
47	14.8	25.4	15.4	12.9	16.5	28.8	18.3	26.1	18.4	24.5	25	15.3	25.1	15
48	14.3	20	21.8	14.9	18.4	25.1	23.4	23.4	18.3	26.8	23.4	15.7	25.1	15.7
49	17.7	22.7	15.3	25.9	16.1	33.2	20.3	22.3	22.6	28.5	31.9	20	30.6	15.1
50	23.6	32.4	18.5	15.1	20.8	**41.2**	16.2	17.5	20.8	19.7	17.5	21	29.6	19.2
51	22.9	17.9	22.6	9.9	25.4	**87**	20.7	30.7	16.3	35	13	23.1	22.2	8.2
52	18.9	18.7	19.5	11.7	15	37.7	27.6	20.5	28.5	21.5	25.7	19.6	27.7	6.5
53	14.1	24.2	14.1	16.1	18.7	27.3	20.9	27.9	16.5	17.8	22	17.3	31.4	12.4
54	19	17.4	18.4	13.2	15.2	19.3	24.5	20	19	21.3	23.6	16.1	25.7	15.9
55	17.9	19.3	21.6	16.1	20.6	23.1	16.1	19.8	15.3	21	21.6	19.3	21.3	20.6
56	3.8	38.9	17.8	6.2	3	10.1	**NONE**	**NONE**	15.1	13.3	**NONE**	**NONE**	**NONE**	**NONE**
57	5.8	20.2	22	3.4	33.3	14.1	**NONE**	9.2	29.6	9.9	19.3	9.4	23.4	7.5
58	18.7	**42.1**	13.2	12.1	17.5	19.3	11.9	25.9	27.2	19.3	18.1	10.7	22.5	13.3
59	14.7	19.1	10.6	13.8	17	33.9	19.6	17.1	14.4	21.8	18.1	12.3	21.2	23.2
60	17.9	21.3	19.9	13.6	20.8	24.6	18.7	19	26.5	18.2	20	16.9	19.2	15.5
61	20.7	18	20.5	14.4	22.5	26.9	14.9	19.8	30.1	23	33.4	17.1	35.2	12.9
62	23	19	18.8	16.2	22.4	36.1	12.3	31.6	27.4	37.1	20.6	58	37.3	11.2
63	19.3	16.1	19.8	12.5	13.5	22.9	29.9	**69.8**	29.9	20.1	24.2	13.6	26.9	16.9
64	19.9	14.4	15.9	15.8	13	37.1	30.3	26.7	26.9	27.9	23.5	18.9	20.4	22.6
65	22.1	23.2	9.9	**NONE**	28.6	28.4	**44.1**	**52.9**	16.6	39.3	15.1	13.4	24.5	17
66	20.5	21.7	20	13.4	16.9	23.7	24.2	24.9	20.2	29.5	10.6	13.2	26	21.3
67	17.9	18.5	15.8	17.4	16.1	30.3	21.5	21.7	26.4	22.7	28.1	15.3	20.2	15.1
68	15.7	23.2	17.6	17.1	20.1	26.6	24	27.4	18.1	30.8	22.2	17	23.5	16.8
69	19.1	21.4	31.7	18.7	16.7	33.2	18.9	24.7	23.8	26.7	26.8	17.8	24.1	17.7
70	19.4	18.9	16.6	16.9	18.1	24.7	21.5	21.9	28.8	24.7	27	20.9	25.1	19.2
71	8.5	18.9	10.8	11.2	23	**50.6**	34.4	33.9	18	**45.4**	75.6	19.6	**NONE**	30.9
72	15.1	18.2	16.6	17.2	17.1	26	34.7	22.1	15.5	21.1	24	17.2	18.3	10.8
73	13.8	18.7	14.6	18.7	17.2	23.2	21.4	23.5	20.9	25.1	22.1	17.8	28.3	11.5
74	19.1	18.1	17	21.6	15.4	21.2	21.1	19.7	18.6	24	22.7	17.2	26.1	16
75	20.8	19.5	14.5	15.8	19.6	31.4	19.1	21	17.3	22	23	16.8	21.9	18.6
76	**NONE**	36.5	13.8	14.1	17.6	24.8	29.9	5.3	**NONE**	**NONE**	**NONE**	**0**	**NONE**	**NONE**
77	16.1	34.7	16.5	15.6	13.5	23.2	21.3	16.6	24.4	18.7	**108.7**	12.7	4.3	9.2
78	18.9	17	29.3	17.2	10.9	32.1	21.8	31.2	31.2	28.7	16.5	13.4	22.2	9.2
79	15.7	16.8	13.7	16.2	16.4	21.1	23.2	23.6	19.3	22	23.1	12.1	22.1	14.9
80	16.5	19.7	9.6	12.8	19.8	18.3	17.4	19.5	16.4	20.8	21.2	13	21.3	15.2

Table 2-7: Maximum # of Times PUMS Households Sampled in Single TAZ by Cell/PUMA

Cell	800	900	1401	1402	1403	1501	1502	1503	1504	1505	1506	1601	1602	1700
1	0.3	0.5	0.4	0.7	0.5	1	1.2	0.4	0.7	0.8	0.8	0.7	0.8	0.6
2	0.8	1.2	0.9	0.7	0.9	1.7	1.7	1.7	1.2	1	2.8	1.8	1.6	0.9
3	0.6	0.9	0.8	0.8	0.9	1.9	2.5	1.4	1.2	0.9	3.6	0.9	2.2	0.7
4	0.9	2	1.9	0.9	1.3	3.1	4.1	1.2	1.3	1.5	2.3	2	2.8	1.4
5	0.9	1.1	1.9	1	1.2	3.1	2.4	1.9	1.3	1.5	**5.3**	1.8	1.5	0.7
6	0.4	0.8	1	0.8	0.8	1.8	2.1	0.7	1.6	1	1.5	1	1.5	0.4
7	0.7	1.3	1.1	1.1	0.9	2	2.2	1.3	1.7	1.3	2.5	1.2	1.5	0.7
8	0.8	1.2	1.1	0.9	1.4	2.6	1.5	1.2	1.5	1.2	2.4	0.9	1.2	1
9	0.6	1.4	1.7	1	1.5	2.3	2.2	1	1.5	2.3	3.4	1	1.6	1.4
10	1.1	1.6	2.4	1.4	1.6	3.1	1.8	1.2	2.1	2	3.4	1	1.1	1.6
21	0.6	1.6	0.9	1.2	0.9	2.5	1.8	1.9	2	1.8	1.9	1.1	1.2	0.8
22	0.6	1.4	1.4	1.7	1.1	2	1.7	1.5	0.8	1.3	1.9	0.8	2.6	1
23	0.6	0.7	1.2	0.9	0.6	1.8	1.7	1.4	0.6	1.5	1.9	0.8	3.6	1
24	0.8	0.8	1.4	1	0.9	2.3	1.7	1.1	0.8	1.1	3.2	1.1	3.3	1
25	0.9	1.7	1.5	1	1.1	1.6	1.8	0.9	0.8	1.8	7.2	0.8	3.8	0.8
26	0.5	1.8	1	1	0.8	2.2	1.3	1.8	1.8	2	2.8	1.5	2.1	0.8
27	0.4	1.1	1.3	1	0.8	1.8	1.3	1.6	1.1	1.1	2.2	1.1	1.2	0.6
28	0.6	0.7	1.4	1.3	0.9	1.6	1.5	1.4	1	1.1	1.5	0.9	1.8	0.8
29	0.8	0.8	1.6	0.8	1.2	2.8	1	1.1	0.9	1.6	1.4	1	1.6	1.4
30	0.7	1.6	1.4	1.2	1.3	2.4	1.4	1.1	0.7	1.5	3.4	1	2	1.2
31	1.1	3.4	1	1.9	1.6	4.4	1.7	0.6	1.8	0.8	8.9	1	1	0.7
32	0.9	1.8	0.8	1.8	0.9	2.8	1.9	1.9	1.6	1.9	2.7	0.9	1.8	0.7
33	0.6	1.2	0.9	0.9	0.9	2.4	1.3	1.4	1.2	1.2	1.9	1	1.5	0.7
34	0.7	0.7	1.2	1.4	0.9	2.2	1.8	1.3	0.9	1.5	2.3	0.7	1.6	0.7
35	0.8	1.4	1.6	1.3	1.3	3	1.2	1	0.8	1.8	2.1	0.7	1.5	1
41	0.7	1.4	2.1	1.2	0.8	3	1.9	1	1.4	1.6	2.8	2.8	**5.1**	0.7
42	0.5	2.5	1.2	1.8	1.2	2.3	3.9	3.9	1.5	1.3	2.1	2.3	2.5	1.6
43	0.5	0.6	1.3	2.5	0.9	1.7	2.4	1.2	1.3	1.3	2.2	1.5	1.6	1.5
44	1.3	1.4	1.6	2.4	1.5	2.3	1.4	1.7	0.6	8.9	1.4	1.8	1.9	1.3
45	1.6	2.3	2.7	4.2	3.1	3.8	3.1	2.2	0.7	1.2	**5.9**	1.3	1	2.2
46	0.5	1.7	1.3	1.2	1.6	2.5	2	2.2	1.9	1.2	2.6	3.7	1.1	1.1
47	0.5	1.7	0.9	0.9	0.9	1.9	1.8	2.1	0.8	1.3	2.4	1.3	1.8	1
48	0.5	1.3	2.1	1	0.9	2.2	2	1.4	0.7	1.2	1.6	2.7	1.7	1.8
49	0.7	0.9	1.3	1.6	0.7	3.1	1.7	1.4	1	1.7	2.3	1	2	1.4
50	1	2	1.7	1.2	1.4	3.7	1.5	1.2	0.7	1.8	1.1	1.7	3.1	1.6
51	1	2.3	2.1	0.8	1.7	**9.5**	1.5	4.6	0.9	2.4	2.2	2.4	2.4	1.2
52	0.8	1.5	1.1	0.8	1	2.7	2.2	1.5	1.5	1.5	3.7	0.9	1.8	0.7
53	0.8	0.9	0.9	1.1	1	1.9	1.5	2.4	0.8	0.8	1.8	1.2	2	0.9
54	0.7	0.6	1.5	0.9	0.8	1.8	2.3	1.6	0.8	1.3	1.9	0.8	1.9	0.8
55	0.9	1.4	1.6	1.4	1.7	2.8	1.2	1.1	0.7	1.7	1.2	0.7	2	1.4
56	0.5	8.1	1.8	1.1	0.6	3.7	**NONE**	**NONE**	1.6	2.1	**NONE**	**NONE**	**NONE**	**NONE**
57	0.3	2.7	3.1	0.3	1.6	1.7	**NONE**	1.4	3.6	3.3	2.2	1.4	2.8	2
58	0.7	3.4	0.6	0.9	1.5	1.9	1	2.1	2	1.2	1.8	1.4	1.6	1.2
59	1.2	1.2	1.3	1.7	1.2	3.1	1.7	1.9	0.6	1.2	1.9	0.9	2.7	1.8
60	1.1	1.3	1.3	1.4	1.6	2.2	1.6	1.2	1	1.1	1	0.8	1.3	1.3
61	0.7	3.1	2.6	1.9	1.6	1.9	2.2	3.8	2.9	1.7	4.4	1.6	4.1	1.2

62	0.9	2.1	1.5	2	2	2.3	1.8	**5.4**	1.8	2.5	2.1	**9.6**	3.5	0.7
63	0.8	1.6	1.6	2.1	1	2.3	3.4	**19.2**	2.2	1.2	2.5	3.3	1.5	2.3
64	1.3	1.4	2.1	2.2	1.1	3.1	4.1	4.2	2.7	1.7	1.9	2.2	1.6	1.7
65	1.1	1.9	0.9	**NONE**	2.9	2.4	3.3	3.6	1.1	2.2	1.2	1.8	1.5	2.5
66	0.9	2.6	2	1.6	1.3	2	2.3	2.5	1.7	1.6	1	1.4	1.3	1.6
67	0.9	1.7	1.5	2.4	1.3	2.6	1.8	3.4	1.7	1.1	3.9	1.6	1.3	1
68	0.7	1.2	1.2	2.3	1.5	1.5	2.2	2.4	0.6	1.6	2.4	1.3	1.5	0.9
69	1	0.8	3	2.3	0.9	3.4	1.5	1.4	0.9	1.7	1.7	0.9	2.3	1.2
70	1.2	1.4	1.2	1.8	1	3.8	2.1	1.8	1.2	2.3	2.6	1.7	2.1	2.3
71	0.7	1.6	0.9	1	1.5	**6.9**	4	3.5	1.3	4.2	**7.5**	1.7	**NONE**	3.9
72	0.7	1.1	1.3	2.1	1.6	1.9	2.5	2.4	0.9	1.1	2.1	1.8	1.3	0.6
73	0.6	1.2	1.1	2.2	1.2	1.7	1.5	1.8	0.9	1.5	1.7	1	1.2	0.6
74	0.8	0.8	1.5	1.6	1.1	2.2	2.1	1.6	0.8	1.2	1.7	0.7	2.1	1
75	0.9	1.2	1.3	1.4	1.6	5	1.4	1.6	0.7	1.8	1.7	0.8	1.7	1.6
76	**NONE**	5.8	1.7	4.4	2.5	4.6	5.8	2.4	**NONE**	**NONE**	**NONE**	0	**NONE**	**NONE**
77	0.7	4.4	1.3	2.7	0.7	2.3	3	3.7	1.6	1.7	**6.3**	1.5	0.9	0.9
78	0.9	0.8	2.5	2.6	1	2.6	1.5	3.1	1.8	1.5	1.4	1	1.7	0.9
79	0.7	1.1	0.9	1.9	1.1	1.9	2.3	1.8	1.1	1.2	2.2	0.9	1.9	0.8
80	0.7	0.7	0.8	1.2	1.1	1.9	1.5	1.1	0.8	1.8	1.3	0.6	1.7	0.8

Drawing a Sample

The process for drawing a sample is as follows:

1. Read in the PUMS data and CTPP data, as described above. Divide the households in each PUMA/cell into B "bins" of the same size, where B is a number specified by the user (9 or 10 are typical values.)

2. Loop on zones with non-0 # of HH's in both the parcel data file and CTPP data file

    a. Loop on cells and set the integer target number of draws, N, for each cell based on the target values derived from CTPP and the parcel data. Compare a uniform 0 to 1 random number against the fractional part of the target to determine whether the target should be rounded up to the nearest integer or rounded down to the nearest integer. Repeat this process until the sum across all cells is equal to the correct overall zonal total.

    End first loop on zones

3. Randomly pick a zone/cell pair with positive number of draws N remaining to be made. (Random ordering is done so that the order of simulating households is not geographically or demographically biased.)

    a. If reading the random number seed for the zone/cell from an external file (for replicability), read in a new seed from the file. Otherwise, write out the current seed value to a file for possible use in a later run.

    b. Increment the bin for the first draw by 1. (If greater than B, cycle back to bin 1.)

    c. Loop on the N draws

        i. Draw a PUMS household without replacement from those still available in the current PUMA/cell/bin.

        ii. Reduce the number of available households in the bin by 1. If no more households are available in the bin, check if any of the other bins for the PUMA/cell have households still available. If not, then reset all households in all bins for the PUMA/cell to be available for the next draw.

        iii. Increment the bin number for the next draw by 1. If bin is empty, repeat until finding a non-empty bin. (If greater than B, cycle back to bin 1.)

        iv. Randomly select a parcel from among all parcels within the TAZ that have housing units remaining available. Decrement the number of available housing units on the selected parcel by 1.

v. Write all person records for the selected household to the output file. The output record is in the same format as the original input PUMS records, except that the PUMA data item is replaced by the TAZ, and the SCELL data item is replaced by the Parcel ID.

d. End of loop on draws

Repeat (3) until all zone/cell pairs have been processed.

This process results in a synthetic sample with 693,723 households, and 1,843,521 persons. The output file is a dBaseIV-format file with the same record format as shown in Table 2-1, except with the third and fourth data items now being Htaz and Hparcel, the household residence zone and parcel. The sample file name is provided by the user.

As a check on the correct functioning of the program, Table 2-8 shows the current drawing cycle for each PUMA/Cell, printed out at the time that the program terminates. In one "drawing cycle", every household in the PUMA/Cell is used in the sample exactly once. So, at the end of the program, every household in the PUMA/Cell has been used either this many times, or else one less time if the HH is still available to be drawn in the last cycle. As one would expect, the values in Table 2-8 for the number of times drawn are equal to the values in Table 2-6 for the "expected" number of times drawn, but rounded up to the next highest integer. The only exceptions are cells adjacent to the "missing cells", because these households are also sampled to be used in the nearby PUMA with no households of its own.

Table 2-8: Number of Drawing Cycles Used for Households in Each PUMA/Cell

Cell	800	900	1401	1402	1403	1501	1502	1503	1504	1505	1506	1601	1602	1700
1	10	9	9	9	12	15	13	7	13	14	9	11	14	11
2	21	24	19	14	18	23	20	24	24	22	34	19	28	16
3	17	19	17	13	19	24	26	26	21	20	36	16	22	14
4	16	24	24	12	25	36	35	19	25	28	18	21	32	16
5	17	16	19	8	18	24	28	23	19	25	36	14	14	13
6	10	11	23	12	16	19	19	13	20	21	15	10	24	7
7	18	22	23	16	19	27	23	22	22	25	26	16	20	13
8	20	21	21	15	19	31	20	20	23	25	26	16	24	16
9	20	24	24	14	19	25	23	17	23	29	33	16	28	17
10	26	20	14	13	17	28	17	20	25	21	40	17	21	16
21	16	21	16	13	17	29	25	23	32	32	21	19	17	18
22	17	22	18	17	23	26	20	21	25	28	22	16	23	20
23	15	16	17	14	16	22	24	20	21	29	25	14	27	22
24	19	19	25	12	18	25	22	19	24	22	27	20	23	17
25	20	16	18	9	20	20	19	20	23	22	29	16	23	17
26	12	18	19	15	14	22	16	25	21	27	21	15	29	14
27	13	20	21	16	19	26	21	20	21	24	23	13	21	13
28	17	21	19	18	21	24	21	24	24	23	25	17	25	16

29	20	16	24	14	20	38	17	20	22	28	27	22	22	19
30	18	19	23	13	21	22	16	19	21	24	25	16	21	15
31	26	27	23	20	25	35	13	9	24	11	54	11	16	9
32	19	21	19	20	18	36	25	31	22	27	21	12	24	10
33	18	21	23	16	17	29	21	24	23	24	23	13	27	13
34	18	17	16	17	18	26	27	20	21	23	27	14	25	14
35	18	22	18	15	19	25	18	20	21	19	24	14	22	17
41	20	20	31	14	15	30	19	12	24	25	28	23	71	7
42	14	18	17	15	17	26	33	33	24	26	17	21	26	12
43	14	12	15	16	15	20	29	17	30	25	28	12	18	19
44	24	21	21	16	18	33	18	23	11	142	22	40	24	20
45	29	24	36	48	62	43	22	25	16	15	18	17	13	37
46	14	24	15	12	23	30	23	26	27	21	26	34	22	13
47	15	26	16	13	17	29	19	27	19	25	26	15	26	15
48	15	21	22	15	19	26	24	24	19	27	24	16	26	16
49	18	23	16	27	17	34	21	23	23	29	32	21	31	16
50	24	33	19	15	21	42	16	18	21	20	17	22	30	20
51	24	19	22	10	27	88	22	33	16	37	14	26	21	8
52	20	19	20	12	16	38	29	21	29	22	26	20	28	7
53	15	25	15	17	19	28	21	28	17	18	23	18	32	13
54	20	18	19	14	16	20	25	21	20	22	24	17	26	16
55	18	20	22	17	21	24	17	20	16	22	22	20	22	21
56	5	40	20	7	3	10	**1**	**1**	18	21	**1**	**1**	**1**	**1**
57	6	21	24	4	35	15	**1**	9	29	12	23	11	23	8
58	19	43	14	13	18	19	12	27	27	20	19	11	23	14
59	15	19	11	14	17	35	20	18	15	22	19	12	21	23
60	19	22	20	14	21	25	19	19	27	19	21	18	20	16
61	21	19	21	15	23	27	16	20	31	24	35	18	33	13
62	24	20	19	17	23	36	13	32	28	37	21	61	37	12
63	20	17	20	13	14	24	30	67	30	21	25	14	27	18
64	21	15	16	17	14	38	31	28	26	29	23	20	22	24
65	23	23	11	**1**	37	29	44	57	17	40	14	14	25	18
66	21	22	21	14	17	24	25	25	21	30	11	13	26	22
67	18	19	16	18	17	31	22	22	27	23	29	16	21	16
68	16	24	18	18	21	27	25	28	19	31	23	18	24	17
69	19	22	32	19	17	34	19	25	25	27	27	18	25	18
70	20	19	17	18	19	25	22	22	29	25	27	22	26	20
71	9	20	11	12	23	51	37	35	19	47	78	18	**1**	46
72	16	19	17	18	18	26	35	23	16	22	24	18	19	11
73	14	19	15	19	18	24	22	24	21	26	23	18	29	12
74	20	19	18	22	16	22	22	20	19	25	23	18	27	17
75	21	20	15	16	20	32	20	22	18	22	24	17	22	19
76	**1**	40	13	16	18	24	31	28	**1**	**1**	**1**	42	**1**	**1**
77	15	35	17	16	14	24	21	17	25	19	109	14	5	11
78	20	18	29	18	12	33	22	32	32	29	17	14	23	9
79	16	17	14	17	17	22	24	24	20	23	24	12	23	15
80	17	20	10	13	20	19	18	20	17	21	22	14	22	16

Allocating Households to Parcels

Within each TAZ, we have a series of parcel records, along with 2000 estimates of the number of housing units in each parcel. These values are rescaled so that the sum of households in the parcel data file within a TAZ is exactly equal to the sum of the marginal file household for that same TAZ.

For the base year, each sampled household is randomly allocated to a particular parcel in the zone that has available housing units. The number of available units in that parcel is than decreased by one, and the same process is carried out for the next household.

In future work, it may be possible to enhance this procedure by making certain types of households more likely to live on some parcels than others, depending on the mix of housing types on that parcel—single family vs. multi-family, rental vs. owned, etc. These variables are not currently available in the parcel database, and will rely on more work being done for both the base and forecast years.

Generating a Forecast Year Sample

SACOG has developed a method to translate the distribution of land use types within a given TAZ to a distribution of households types across the 65 sampling cells within that area. The translation is based on 2000 relationships, and then applied to land use type forecasts from the PLACES model in the forecast year.

(This section may be updated as SACOG makes further develops these methods).