American Housing Survey

Components of Inventory Change And Rental Market Dynamics: Phoenix 1994-2002

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Overview

Housing analysts use two techniques—Components of Inventory Change (CINCH) and rental market dynamics—to look at a housing market at two points in time and explain how the observed changes came about in physical (bricks and mortar) terms. CINCH focuses first on the overall number and then the characteristics of units at different times. Using CINCH methods, analysts answer such question as: "What happened to the x units that disappeared from the housing stock between the beginning and the end of the period?" or "Where did the increase in owner-occupied units come from?" Rental market dynamics, which is really a type of CINCH analysis, focuses on the rental market with particular emphasis on the affordability of rental housing. Using rental market dynamics techniques, analysts answer such questions as: "Have the number of rental units affordable to households with very low incomes increased or decreased over the period?" or "What happened to the units that were affordable to low-income households at the beginning of the period?"

Previously HUD commissioned CINCH and rental market dynamics analyses using the national American Housing Survey (AHS).[1] This report focuses on the Phoenix metropolitan housing market over the period between 1994 and 2002. It is one of 13 reports based on local American Housing Surveys conducted in 2002; these 13 metropolitan areas were previously surveyed in either 1994 or 1995.

CINCH and rental market analysis have both forward-looking and backward-looking components. In the forward-looking components, analysts start with the housing stock available at the beginning of the period and then, looking at the end of the period, attempt to explain what happened to those units. Possible answers include some units still exist and serve the same market, some units still exist but serve a different market, some units have been demolished or destroyed in natural disasters, or some units are being used for nonresidential purposes. In the backward-looking component, analysts start with the housing stock available at the end of the period and, looking at the beginning of the period, attempt to explain where those units came from. Possible answers include some units existed at the beginning of the period and served the same market, some units existed at the beginning of the period but served a different market, some units were newly constructed over the period, or some units were being used for nonresidential purposes at the beginning of the period. Neither CINCH nor rental market dynamics try to track the experience of a unit over the entire period; both are interested only in the beginning and the end of the period. For example, a housing unit in 1994 may have become a medical office in 1997, but returned to being a housing unit in 2000. CINCH

[1] See http://www.huduser.org/datasets/cinch.html and http://www.huduser.org/datasets/ahs/ahsReports.html#2.

would record this unit as having undergone no change over the period from 1994 to 2002. In classical analytical jargon, CINCH and rental market dynamics are *comparative static* analyses.

Ideally one would want to combine the forward-looking and backward-looking analyses to produce a complete accounting that can explain the beginning and the end consistently in terms of units that existed in both periods, losses from the stock over the period, and additions to the stock over the period. The analysis in this report uses the AHS, which is a sample of units at both points in time; and, unfortunately, previous efforts using the AHS have demonstrated that creating sample weights that take both periods into account generates some inconsistent or inaccurate results. For this reason, the most recent analyses have separated the forwarding-looking and backward-looking components. This report will do the same. (Weighting is explained briefly in Appendix B and more fully in a separate paper cited in the Appendix.)

The remainder of this report consists of four sections:

- An explanation of how to read the CINCH tables.
- Two sets of four tables each: a set of forward-looking tables tracing the movement of units from 1994 to 2002 and identifying how units were lost to the housing stock; and a set of backward-looking tables tracing where 2002 units came from and distinguishing between units that were part of the stock in 1994 and units that were additions to the stock since 1994.
- A brief discussion of the rental market dynamics.
- Two rental market dynamics tables, one forward-looking and one backward-looking.

At various places, the discussion points out some of the limitations of these analyses or of using the AHS metropolitan samples for these analyses.

Two appendixes explain how the results were tested and how the weights were created.

How to Read CINCH Tables

Rows and columns serve different purposes in CINCH tables. The rows identify classes of units to be analyzed. The columns trace those units either forward or backward.

> The forward-looking tables are concerned with what happened to the 1994 housing stock by 2002. There are three basic dispositions of 1994 units: units that continue to exist in 2002 with the same characteristics (or serving the same market), units that continue to exist in 2002 but with different characteristics (or serving a different market), and units that were lost to the stock.

The backward-looking tables are concerned with where the 2002 housing stock came from in reference to 1994. There are three basic sources of 2002 units: units that existed in 1994 with the same characteristics (or serving the same market), units that existed in 1994 but with different characteristics (or serving a different market), and units that are additions to the housing stock.

Since the essence of the CINCH analysis is in the columns, we will explain the columns in detail.

Columns Common to Both Forward-Looking and Backward-Looking Tables:

- The first and last columns contain the row numbers. The row numbers are identical for the same tables in the forward-looking and backward-looking sets.

Columns A through E set up the analysis and track units that exist in both periods.

- Column A specifies the characteristic that defines the subset of the stock that is being tracked forward or backward in a particular row. For example, row 2 of Table 1 focuses on occupied units; row 15 focuses on units built in 1985 through 1989.

- Column B gives the estimate published in the AHS report for the number of units that satisfy the conditions specified in column A. For example, the 1994 AHS report for Phoenix counted 896,700 occupied units (column B, row 2, Forward-Looking Table 1); the 2002 AHS report counted 1,165,700 occupied units (column B, row 2, Backward-Looking Table 1).

- Column C gives the CINCH estimate of the number of units that satisfy two conditions: (a) being part of the housing stock in the relevant year (1994 for the forward-looking tables and 2002 for the backward-looking tables); and (b) satisfying the condition in column A. CINCH uses different weights than those used in preparing the published reports. Therefore, CINCH estimates can differ from AHS estimates for particular subsets of the housing stock. As explained in Appendix B, the weights were created to match AHS published totals for rows 2 through 4 of Table 1. This perfect match will not be true of other rows.[2] In the case of the Phoenix metropolitan area, the CINCH weights produce population estimates that were reasonably close to the published estimates in most cases. The largest discrepancies appeared in the year-built tables (both forward-looking and backward-looking), and in the estimates of low-income owners and owner-occupied units with low monthly housing costs (both forward-looking and backward-looking). Forward-Looking Table 2 underestimated the number of

[2] Columns B and C will also match, except for rounding, in row 1 of Table 1 because row 1 is defined as the sum of rows 2 through 4.

units with serious physical problems by 15 percent and the number with moderate physical problems by 16 percent.

- Column D is the CINCH estimate of the number of units from column C that (a) are also part of the housing stock in the *other* year, and (b) continue to belong to the subset defined by column A. For example, column D of row 2 of Forward-Looking Table 1 estimates that 787,080 of the occupied units were occupied in 2002.

- Column E is the CINCH estimate of the number of units from column C that (a) are also part of the housing stock in the *other* year, but (b) no longer belong to the subset defined by column A. Column E of row 2 indicates that 94,390 units that were occupied in 1994 are still part of the housing stock in 2002 but are no longer occupied. In some cases, the analysis will not allow a unit to change characteristics between the base year and the other year. Examples include type of structure, year built, and number of stories—characteristics that are considered impossible or unlikely to change.

Columns Unique to Forward-Looking Tables

In forward-looking tables, columns F through K track what happened to units that were lost from 1994 to 2002.

- Column F is the CINCH estimate of the number of units from column C that are not in the 2002 housing stock because they were merged with other units or converted into multiple units. Among occupied units, no units were lost to mergers and conversions.

- Column G is the CINCH estimate of the number of mobile homes from column C that were moved out during the period. Among occupied units, 1,460 mobile homes were moved out. The AHS does not follow a manufactured housing unit that is moved and, therefore, cannot distinguish between units that are relocated and units that are demolished. It treats all moves as losses.

- Column H is the CINCH estimate of the number of units from column C that became nonresidential at the end of the period. For example, a real estate firm, a tax preparation office, a palm reader, or some other business might buy or rent a house to use for business rather than residential purposes.[3] Among occupied units, 2,620 became nonresidential.

- Column I is the CINCH estimate of the number of units from column C that were demolished or were destroyed by fires or natural disasters by 2002. In this case, 5,730 units were demolished or destroyed.

[3] If the owner or tenant both lives in a unit and conducts business out of the unit, the AHS considers the unit to be residential. So nonresidential means strictly no residential use.

- Column J is the CINCH estimate of the number of units from column C that by 2002 were condemned or that were no longer usable for housing because of extensive damage. Among occupied units, 2,200 units are no longer usable for housing.

- Column K is the CINCH estimate of the number of units from column C that were lost by 2002 for other reasons. These include units that the Census Bureau eliminated for sampling purposes and other miscellaneous losses. Among occupied units, there were 3,210 units lost for these miscellaneous reasons.

The columns form a closed system. Column C counts the number of units tracked; columns D through K account for all the possible outcomes. Therefore, column C minus the sum of columns D through K always equals zero, except for rounding.[4]

Columns Unique to Backward-Looking Tables

In backward-looking tables, columns F through I track where units came from that are part of the housing stock in 2002, but were not part of the housing stock in 1994.[5]

- Column F is the CINCH estimate of the number of mobile homes from column C that were moved in during the period. Among occupied units, 1,310 mobile homes were moved in (column F, row 2 of Backward-Looking Table 1).[6] Move-ins are treated as additions to balance the treatment of move-outs as losses.

- Column G is the CINCH estimate of the number of units from column C that had been nonresidential in 1994. Among occupied units, 6,330 had been nonresidential.

- Column H is the CINCH estimate of the number of units from column C that were newly constructed between 1994 and 2002. Among occupied units, 254,570 units were newly constructed; newly constructed units accounted for 22 percent of the 2002 occupied units.

- Column I is the CINCH estimate of the number of units from column C that were added by 2002 for other reasons. These include units that were considered temporary losses because occupancy was prohibited in 1994 or the interior of the

[4] The weighted numbers are rounded to the nearest 10. The AHS publication rounds to the nearest 100. We found that rounding to the nearest 10 worked better for the metropolitan sites. The weights were typically in the range of 100 to 300 and in many rows the numbers in columns F through K were small. With a weight of 149, rounding to the nearest hundred would mean that one sample observation would be rounded to 100, two sample observations to 300, and three sample observations to 400. Rounding to the nearest ten results in weighted totals of 150, 300, and 450 for these cases.
[5] This list does not contain a column for units added through mergers and conversions. The Census Bureau did not code the variable that would normally identify mergers and conversions in 2002 (REUAD=7 or 8).
[6] The Census Bureau did not code the variable that would normally identify mobile home move-ins in 2002 (REUAD=4). We estimated these from another variable (NOINT=13).

unit was exposed to the elements, and also units that the Census Bureau considered temporarily lost to the housing stock for reasons "not classified." Among occupied units, 950 had been temporarily lost to the stock in 1994.

Table 1

Table 1 focuses on the general housing characteristics of the stock. Row 1 provides the highest level CINCH overview of the stock. For this row, column A specifies no conditions other than being part of the stock in the relevant year.

Rows 2-4 divide the housing stock by use. By Census Bureau definition, the number of occupied non-seasonal units equals the number of households. Because households are the basis for all the analyses in Tables 2 through 4, it is important to get a good starting point for these estimates. For this reason, the weights are designed to match published AHS totals for occupied units, vacant units, and seasonal units.

Rows 5-12 divide the housing stock by type of structure to identify what type of units account for losses. [7] The Census Bureau sometimes suppresses data to protect the confidentiality of respondents. For some metropolitan areas, suppression results in zero estimates for certain multiunit structures in the public data file, whereas the published tables contain estimates for these multiunit classes. Because of suppression, units in structures with 50 or more units are listed in row 10 instead of row 11 in Forward-Looking Table 1.

Rows 13-23 divide the housing stock by year built.[8] The published reports use the categories 1990-1994, 1995-1999, and 2000-2004; we use 1990-1994 and 1995-2002 to isolate units newly constructed since the previous AHS survey.[9] Row 23 of Forward-Looking Table 1 estimates that the 1994 housing stock contained only 1,340 units built before 1920; of these, 300 (22 percent) were demolished or destroyed by 2002.

Rows 24-30 and 31-35 divide the housing stock by two different measures of interior space, the number of rooms and the number of bedrooms.[10]

Rows 36-41 focus on multiunit structures only and divide them by number of stories. Column E is forced to be zero and, depending on the metropolitan area, the Census Bureau may suppress information, forcing some rows to be zero. For the 1994 Phoenix AHS public use file, the Census Bureau reported all units in structures with 3 or more

[7] In general, the CINCH estimates exceed published AHS estimates for single-family detached units and fall short of the published AHS estimates for manufactured homes by roughly equal amounts.
[8] Row 13 is not included in the forward-looking tables, because the 1994 housing stock cannot contain units built after 1994.
[9] We use REUAD=3 and not year built to identify new construction. For this reason, there are units built after 1994 that are not considered new construction. In addition, year built is obtained from the respondent interview and may be inaccurate.
[10] Because of small sample sizes in the losses and additions columns, we combined room categories that the published reports list separately.

stories in row 39 and reported no units in rows 40 and 41. In general, the published reports contain matching data for row 36 only.

Rows 42-43 divide the housing stock between central cities units and suburban residences to determine how the observed changes vary by location. The Phoenix metropolitan area lost relatively few units between 1994 and 2002—approximately 1 percent of those in the central city in 1994 and 0.5 percent of those in suburban Phoenix. Rows 44-45 divide the housing stock by whether or not the occupants have moved in within the last two calendar years to determine if certain units consistently have high turnover and to see if high turnover units are more susceptible to loss.

Table 2

This table pertains to issues related to the physical quality of units. Row 1 repeats the analysis from row 2 in Table 1. All the subsequent rows are based on row 1.

Rows 2-3 look at whether the units have complete kitchens; that is, have an installed sink with piped water, a mechanical refrigerator, and built-in burners for the exclusive use of the occupants. Rows 4-5 look at whether the units have complete plumbing facilities; that is, hot and cold piped water, a flush toilet, and a bathtub or shower inside the structure for the exclusive use of the occupants. Rows 6-8 look at each of these requirements separately. In the 1994 AHS, the published reports separate out the "exclusive use" category; in the data used for this report, these units show up in row 8. Rows 2-3, 4-5, and 6-8 attempted to separate out good units from the least desirable units, based on kitchen and bath equipment, to compare how they changed over the period.

Rows 9-13 pertain to how units obtain water and dispose of sewage.

Rows 14-19 look at units with serious problems. Rows 15-19 identify specific types of serious deficiencies. Row 14 counts the units having one or more of these deficiencies. Rows 20-25 look at units with moderate problems. Rows 21-25 identify specific types of deficiencies. Row 20 counts the units having one or more of these deficiencies.[11] These rows are in the analysis to answer two questions: whether poor-quality units in one year are also poor-quality units in the other year, and whether poorer quality units are more likely to be lost. Both the forward-looking and backward-looking analyses indicate that there was no continuity over the 8 years with respect to having serious physical problems. None of the units with serious problems in 1994 had serious problems in 2002, and none of the units with serious problems in 2002 had had serious problems in 1994. There was little continuity with respect to units with moderate problems. Approximately 6 percent of the units with moderate problems in 1994 still had moderate problems in 2002, and 3 percent of the units with moderate physical problems in 2002 had had moderate problems in 1994. Fewer than 2 percent of the units had serious problems in either year, and 4 percent or fewer had moderate problems in either year.

[11] For definitions of serious and moderate problems see pages 998 and 999 of the AHS Codebook, version 1.77, at http://www.huduser.org/intercept.asp?loc=/Datasets/ahs/AHS_Codebook.pdf.

Table 3

This table pertains to the characteristics of occupants. Row 1 repeats the analysis from row 2 in Table 1. All the subsequent rows are based on row 1.

Rows 2-3 look at the age of the householder. Rows 4-5 look at whether the household includes children. Rows 6-11 look at the race or ethnicity of the householder. Rows 12-14 look at three possible sources of household income. In all cases, the analysis seeks to determine how stable the occupancy characteristics are over time, and what part of the market was served by units that lost between 1994 and 2002.

Table 4

Table 4 pertains to tenure, income, and housing costs. Row 1 repeats the analysis from row 2 in Table 1. All the subsequent rows are based on row 1.

Rows 2-4 focus on tenure to determine the extent to which units change tenure characteristics and whether rental or owner-occupied units are more likely to be lost.

Rows 5-11 contain a partial rental dynamics analysis.[12] Row 5 identifies non-market units, a class that includes subsidized units and units provided for no cash rents; for example, units given to maintenance or management personnel or to relatives. The remaining rows divide market rental units into affordability classes. In defining affordability, the analysis sets boundaries for each class based on the highest rent a household in an income group could afford without spending more than 30 percent of its monthly income on rent. Ideally there would be six categories in each metropolitan area:

- Extremely-low-rent units (rents affordable to households with incomes equal to 35 percent of area median family income).
- Very-low-rent units (rents not affordable at 35 percent, but affordable at 50 percent of area median family income).
- Low-rent units (rents not affordable at 50 percent, but affordable at 65 percent of area median family income).
- Moderate-rent units (rents not affordable at 65 percent, but affordable at 80 percent of area median family income).
- High-rent units (rents not affordable at 80 percent, but affordable at 100 percent of area median family income).

[12] The rental dynamics analysis is partial because it traces movement out of, but not into, particular rental classes. Tables A and B in the final section of this report contain a complete rental dynamics analysis.

- Very-high-rent units (rents not affordable at 100 percent of area median family income).

For most metropolitan areas studied, the number of categories is fewer than six, because the Census Bureau had to place an upper limit on the rents reported in the public-use data to protect the confidentiality of respondents. In Phoenix, there are only five classes, with high-rent and very-high-rent units grouped into one class.

Rows 12-16 track rental units by household income; rows 22-26 track owner-occupied units by household income.[13]

Rows 17-21 identify owner-occupied units by total monthly housing costs.[14]

[13] Because of small sample sizes in the losses and additions columns, we combined income categories that the published reports list separately.
[14] Because of small sample sizes in the losses and additions columns, we combined cost categories that the published reports list separately.

Forward-Looking Table 1: Structural and Location Characteristics – All Housing Units

	A Characteristics	B Published numbers	C Present in 1994	D 1994 units present in 2002	E Change in character-istics	F '94 units affected by conversion /merger	G '94 mobile homes moved out	H '94 units changed to nonresidential use	I '94 units lost through demolition or disaster	J '94 units badly damaged or condemned	K '94 units lost in other ways	
1	**Total Housing Stock**	1,032,800	1,032,800	1,011,730	0	240	2,160	4,170	7,770	2,440	4,290	1
	Occupancy Status											
2	Occupied	896,700	896,700	787,080	94,390	0	1,460	2,620	5,730	2,200	3,210	2
3	Vacant	107,900	107,900	21,510	81,320	240	690	1,560	2,040	240	300	3
4	Seasonal	28,200	28,200	8,770	18,660	0	0	0	0	0	770	4
	Units in Structure											
5	1, detached	581,700	604,490	593,910	0	0	780	2,960	4,240	1,570	1,030	5
6	1, attached	76,100	77,020	75,450	0	0	0	0	720	310	530	6
7	2 to 4	57,400	61,370	59,040	0	240	0	300	1,230	310	250	7
8	5 to 9	55,300	61,250	60,760	0	0	0	0	250	250	0	8
9	10 to 19	96,800	102,120	101,260	0	0	0	250	0	0	610	9
10	20 to 49	55,800	66,360	65,060	0	0	140	0	840	0	310	10
11	50 or more	6,700	0	0	0	0	0	0	0	0	0	11
12	Mobile Home/trailer	103,100	60,190	56,240	0	0	1,230	660	500	0	1,550	12
	Year Built											
14	1990-1994	96,900	95,440	94,820	0	0	0	0	0	310	310	14
15	1985-1989	175,500	177,350	175,010	0	0	0	920	600	0	820	15
16	1980-1984	169,500	177,030	175,820	0	0	140	0	530	0	530	16
17	1970-1979	295,000	276,880	273,180	0	0	290	1,460	1,070	310	570	17
18	1960-1969	160,300	161,410	156,700	0	240	1,450	1,010	730	490	780	18
19	1950-1959	89,900	93,130	90,010	0	0	280	530	980	550	780	19
20	1940-1949	26,300	30,140	27,370	0	0	0	0	2,770	0	0	20
21	1930-1939	16,200	16,860	14,800	0	0	0	0	780	780	500	21
22	1920-1929	2,300	3,230	2,980	0	0	0	250	0	0	0	22
23	1919 or earlier	1,000	1,340	1,040	0	0	0	0	300	0	0	23

Forward-Looking Table 1 (continued): Structural and Location Characteristics – All Housing Units

	A Characteristics	B Published numbers	C Present in 1994	D 1994 units present in 2002	E Change in character-istics	F '94 units affected by conversion /merger	G '94 mobile homes moved out	H '94 units changed to nonresidential use	I '94 units lost through demolition or disaster	J '94 units badly damaged or condemned	K '94 units lost in other ways	
	Rooms											
24	1 – 4 rooms	371,000	357,730	292,940	51,950	240	2,160	1,690	3,600	1,890	3,260	24
25	5 rooms	203,900	202,630	94,680	104,630	0	0	1,080	1,490	250	500	25
26	6 rooms	178,200	182,240	80,200	100,190	0	0	530	1,310	0	0	26
27	7 rooms	135,500	132,120	56,560	73,940	0	0	250	530	300	530	27
28	8 rooms	93,000	101,060	40,660	59,260	0	0	300	830	0	0	28
29	9 rooms	38,900	43,980	10,180	33,800	0	0	0	0	0	0	29
30	10 rooms or more	12,400	13,030	3,810	8,910	0	0	310	0	0	0	30
	Bedrooms											
31	None	15,300	13,740	7,980	5,100	0	420	250	0	0	0	31
32	1	155,600	154,790	134,320	14,260	240	1,060	390	1,870	1,020	1,620	32
33	2	353,300	348,380	303,950	35,330	0	680	2,140	2,980	1,420	1,890	33
34	3	337,800	334,110	288,770	41,940	0	0	250	2,370	0	780	34
35	4 or more	170,800	181,780	158,610	21,480	0	0	1,150	550	0	0	35
36	**Multiunit Structures**	272,000	291,110	286,120	0	240	140	550	2,320	560	1,170	36
	Stories in Structures											
37	1		60,020	57,790	0	240	140	300	980	310	250	37
38	2		188,330	185,890	0	0	0	250	1,340	250	610	38
39	3		42,760	42,450	0	0	0	0	0	0	310	39
40	4 to 6		0	0	0	0	0	0	0	0	0	40
41	7 or more		0	0	0	0	0	0	0	0	0	41
	Metro Status											
42	In central cities		561,500	547,070	0	240	930	3,860	5,230	1,160	3,010	42
43	In suburbs		471,300	464,660	0	0	1,230	310	2,540	1,280	1,280	43
	Mover Status											
44	Moved in last 2 years		300,140	104,300	189,140	0	640	1,030	2,060	1,080	1,900	44
45	Not a recent mover		596,560	497,640	90,400	0	830	1,590	3,670	1,120	1,310	45

Forward-Looking Table 2: Condition of Unit – All Occupied Units

	A Characteristics	B Published numbers	C Present in 1994	D 1994 units present in 2002	E Change in character-istics	F '94 units affected by conversion /merger	G '94 mobile homes moved out	H '94 units changed to nonresidential use	I '94 units lost through demolition or disaster	J '94 units badly damaged or condemned	K '94 units lost in other ways	
1	**Occupied Units**	896,700	896,700	787,080	94,390	0	1,460	2,620	5,730	2,200	3,210	1
	Kitchen											
2	With complete kitchen	889,400	892,030	764,920	112,670	0	1,460	2,620	5,730	1,670	2,970	2
3	Lacking complete kitchen facilities	7,300	4,670	0	3,890	0	0	0	0	530	250	3
	Plumbing											
4	With all plumbing facilities	891,900	891,960	777,600	99,380	0	1,460	2,620	5,730	2,200	2,970	4
5	Lack some plumbing	4,800	4,740	0	4,490	0	0	0	0	0	250	5
6	No hot piped water	0	0	0	0	0	0	0	0	0	0	6
7	No bathtub/shower	0	0	0	0	0	0	0	0	0	0	7
8	No flush toilet	0	4,740	0	4,490	0	0	0	0	0	250	8
	Water											
9	Public/private water	796,800	795,070	696,560	84,070	0	1,460	2,620	4,950	2,200	3,210	9
10	Well	5,300	7,680	3,330	4,340	0	0	0	0	0	0	10
11	Other water source	94,500	93,960	0	93,170	0	0	0	780	0	0	11
	Sewer											
12	Public sewer	843,800	840,760	736,680	92,140	0	1,320	1,560	4,700	1,700	2,660	12
13	Septic tank/cesspool	52,900	55,940	38,030	14,620	0	140	1,050	1,030	500	560	13
14	**Severe Problems**	11,200	9,500	0	8,440	0	0	0	250	310	500	14
15	Plumbing	4,800	4,740	0	4,490	0	0	0	0	0	250	15
16	Heating	3,300	2,290	0	2,290	0	0	0	0	0	0	16
17	Electric	1,800	1,070	0	820	0	0	0	0	0	250	17
18	Upkeep	1,700	1,400	0	840	0	0	0	250	310	0	18
19	Hallways	200	0	0	0	0	0	0	0	0	0	19
20	**Moderate problems**	25,000	22,050	1,340	18,910	0	250	0	780	780	0	20
21	Plumbing	2,000	2,660	0	2,660	0	0	0	0	0	0	21
22	Heating	1,200	260	0	260	0	0	0	0	0	0	22
23	Kitchen	6,100	4,670	0	3,890	0	0	0	0	530	250	23
24	Upkeep	16,100	15,820	1,080	13,470	0	250	0	780	250	0	24
25	Hallways	900	0	0	0	0	0	0	0	0	0	25

Forward-Looking Table 3: Household Characteristics – All Occupied Units

	A Characteristics	B Published numbers	C Present in 1994	D 1994 units present in 2002	E Change in character-istics	F '94 units affected by conversion /merger	G '94 mobile homes moved out	H '94 units changed to nonresidential use	I '94 units lost through demolition or disaster	J '94 units badly damaged or condemned	K '94 units lost in other ways	
1	**Occupied units**	896,700	896,700	787,080	94,390	0	1,460	2,620	5,730	2,200	3,210	1
	Age											
2	Under 65	717,800	723,330	580,980	129,080	0	1,320	2,370	5,200	1,950	2,430	2
3	65 or older	178,800	173,370	94,110	77,300	0	150	250	530	250	780	3
	Children											
4	Some	327,800	338,360	185,260	145,980	0	530	1,590	2,570	1,120	1,310	4
5	None	569,000	558,340	367,770	182,470	0	930	1,030	3,160	1,080	1,900	5
	Race/Origin											
6	White	820,300	817,230	613,110	190,990	0	1,180	2,080	4,950	1,700	3,210	6
7	Hispanic	110,400	111,130	45,340	62,120	0	0	780	1,770	870	250	7
8	Non-Hispanic	709,900	706,090	507,280	189,360	0	1,180	1,300	3,180	830	2,970	8
9	Black	31,000	31,590	11,510	19,840	0	0	0	0	250	0	9
10	Other	45,400	47,880	23,470	22,560	0	290	530	780	250	0	10
11	Total Hispanics	130,500	133,530	83,090	45,730	0	0	780	2,550	1,120	250	11
	Income Source											
12	Wages and salaries	707,700	709,900	559,160	139,780	0	1,070	1,340	4,700	1,700	2,150	12
13	Welfare or SSI	45,200	46,780	6,340	37,710	0	390	530	1,030	0	780	13
14	Social security or pension	248,000	240,130	127,900	108,750	0	640	500	1,310	250	780	14

Forward-Looking Table 4: Market Dynamics and Affordability – All Occupied Units

	A Characteristics	B Published numbers	C Present in 1994	D 1994 units present in 2002	E Change in character-istics	F '94 units affected by conversion /merger	G '94 mobile homes moved out	H '94 units changed to nonresidential use	I '94 units lost through demolition or disaster	J '94 units badly damaged or condemned	K '94 units lost in other ways	
1	**Occupied units**	896,700	896,700	787,080	94,390	0	1,460	2,620	5,730	2,200	3,210	1
	Tenure											
2	Owner occupied	580,000	578,030	489,440	83,930	0	1,180	1,340	1,080	0	1,070	2
3	Percent own occupied	64.7%	64.5%	62.2%	NA	NA	80.4%	51.2%	18.9%	0.0%	33.2%	3
4	Renter occupied	316,700	318,670	205,990	102,120	0	290	1,280	4,650	2,200	2,150	4
	Rental Affordability											
5	Non-market		32,780	11,130	19,330	0	0	250	780	790	500	5
6	Extremely low rent		90,500	40,040	43,910	0	290	1,030	2,800	1,400	1,030	6
7	Very low rent		114,160	58,070	56,090	0	0	0	0	0	0	7
8	Low rent		46,740	10,330	35,260	0	0	0	530	0	620	8
9	Moderate rent		20,830	2,220	18,080	0	0	0	530	0	0	9
10	High to very high rent		13,650	2,380	11,270	0	0	0	0	0	0	10
	Renter Hsd Income											
12	Less than $20,000	139,600	142,700	40,710	95,710	0	290	1,030	2,550	1,640	780	12
13	$20,000 to $34,999	92,100	92,840	18,620	72,140	0	0	250	780	560	500	13
14	$35,000 to $59,999	61,700	59,860	10,070	48,750	0	0	0	780	0	250	14
15	$60,000 to $99,999	19,000	17,800	1,560	15,390	0	0	0	530	0	310	15
16	$100,000 or more	4,400	5,470	0	5,160	0	0	0	0	0	310	16
	Owner Monthly Housing Costs											
17	Less than $499	203,600	196,290	93,090	100,700	0	1,180	0	780	0	530	17
18	$500 to $699	78,700	78,540	12,680	64,820	0	0	500	0	0	530	18
19	$700 to $999	142,700	143,370	43,280	100,090	0	0	0	0	0	0	19
20	$1,000 to $1,499	81,500	84,920	34,540	49,230	0	0	850	300	0	0	20
21	$1,500 or more	29,400	28,470	19,030	9,440	0	0	0	0	0	0	21
a	Missing mort data	44,000	46,450	9,700	36,750	0	0	0	0	0	0	a
	Owner Hsd Income											
22	Less than $20,000	97,500	90,910	23,250	66,480	0	930	0	250	0	0	22
23	$20,000 to $34,999	141,500	131,130	32,670	96,610	0	250	0	530	0	1,070	23
24	$35,000 to $59,999	157,000	165,130	46,010	117,790	0	0	1,030	300	0	0	24
25	$60,000 to $99,999	126,100	131,860	36,870	94,680	0	0	310	0	0	0	25
26	$100,000 or more	57,900	59,000	24,460	34,540	0	0	0	0	0	0	26

Backward-Looking Table 1: Structural and Location Characteristics – All Housing Units

	A Characteristics	B Published numbers	C Present in 2002	D 2002 units present in 1994	E Change in character-istics	F '02 mobile homes moved in	G '02 units derived from nonresidential use	H '02 units added by new construction	I '02 units added from temporary losses	
1	**Total**	1,340,400	1,340,300	1,030,400	0	1,430	6,960	300,110	1,400	1
	Occupancy Status									
2	Occupied	1,165,700	1,165,700	810,990	91,550	1,310	6,330	254,570	950	2
3	Vacant	150,600	150,600	21,300	87,070	120	630	41,020	450	3
4	Seasonal	24,000	24,000	6,700	12,790	0	0	4,510	0	4
	Units in Structure									
5	1, detached	816,900	840,780	622,090	0	260	0	217,980	450	5
6	1, attached	144,200	153,130	126,300	0	0	740	26,090	0	6
7	2 to 4	49,900	55,090	45,050	0	0	2,270	7,320	450	7
8	5 to 9	69,800	75,190	58,030	0	0	0	17,160	0	8
9	10 to 19	70,000	69,620	50,440	0	0	290	18,670	230	9
10	20 to 49	56,900	60,620	52,120	0	0	420	8,080	0	10
11	50 or more	30,500	31,140	23,860	0	0	2,760	4,520	0	11
12	Mobile Home/trailer	102,000	54,730	52,510	0	1,170	490	290	270	12
	Year Built									
13	1995-2002	305,900	280,590	3,960	0	0	0	276,500	130	13
14	1990-1994	114,600	115,180	91,860	0	0	0	23,320	0	14
15	1985-1989	169,600	179,960	178,970	0	130	860	0	0	15
16	1980-1984	177,300	186,070	185,420	0	0	420	0	230	16
17	1970-1979	286,000	277,170	275,290	0	1,170	710	0	0	17
18	1960-1969	155,200	159,450	155,200	0	130	3,610	290	230	18
19	1950-1959	87,200	94,530	93,030	0	0	1,360	0	140	19
20	1940-1949	23,400	27,340	27,340	0	0	0	0	0	20
21	1930-1939	17,500	15,870	15,190	0	0	0	0	680	21
22	1920-1929	2,600	3,060	3,060	0	0	0	0	0	22
23	1919 or earlier	900	1,070	1,070	0	0	0	0	0	23

Backward-Looking Table 1 (continued): Structural and Location Characteristics – All Housing Units

	A Characteristics	B Published numbers	C Present in 2002	D 2002 units present in 1994	E Change in character-istics	F '02 mobile homes moved in	G '02 units derived from nonresidential use	H '02 units added by new construction	I '02 units added from temporary losses	
	Rooms									
24	1 – 4 rooms	436,600	426,530	294,990	63,550	1,300	5,600	60,040	1,040	24
25	5 rooms	275,700	277,720	96,740	114,210	0	680	65,860	230	25
26	6 rooms	239,600	243,750	82,290	104,980	0	680	55,670	130	26
27	7 rooms	189,400	193,310	58,050	86,570	130	0	48,550	0	27
28	8 rooms	123,800	125,750	41,890	44,200	0	0	39,660	0	28
29	9 rooms	44,600	43,890	10,500	15,320	0	0	18,070	0	29
30	10 rooms or more	30,700	29,350	3,900	13,190	0	0	12,260	0	30
	Bedrooms									
31	None	15,200	14,740	8,240	2,800	0	3,420	290	0	31
32	1	174,500	165,190	133,490	8,510	650	960	21,350	230	32
33	2	424,500	421,100	308,960	28,510	660	1,220	80,940	820	33
34	3	448,300	457,890	296,120	51,140	130	1,360	108,790	360	34
35	4 or more	278,000	281,380	163,030	29,610	0	0	88,740	0	35
36	**Multiunit Structures**	277,100	291,660	229,500	0	0	5,730	55,750	680	36
	Stories in Structures									
37	1		53,240	47,510	0	0	2,270	3,010	450	37
38	2		188,180	146,250	0	0	1,220	40,480	230	38
39	3		41,890	30,390	0	0	890	10,600	0	39
40	4 to 6		5,650	4,810	0	0	0	840	0	40
41	7 or more		2,710	530	0	0	1,360	820	0	41
	Metro Status									
42	In central cities		633,320	559,950	0	260	4,270	67,570	1,270	42
43	In suburbs		706,980	470,450	0	1,170	2,690	232,540	130	43
	Mover Status									
44	Moved in last 2 years		350,650	107,460	132,080	260	3,910	106,350	590	44
45	Not a recent mover		815,050	511,470	151,530	1,050	2,420	148,230	360	45

Backward-Looking Table 2: Condition of Unit – All Occupied Units

	A Characteristics	B Published numbers	C Present in 2002	D 2002 units present in 1994	E Change in character-istics	F '02 mobile homes moved in	G '02 units derived from nonresidential use	H '02 units added by new construction	I '02 units added from temporary losses	
1	**Occupied Units**	1,165,700	1,165,700	810,990	91,550	1,310	6,330	254,570	950	1
	Kitchen									
2	With complete kitchen	1,133,700	1,134,710	788,150	91,540	1,310	3,610	249,150	950	2
3	Lacking complete kitchen facilities	32,000	30,990	0	22,850	0	2,720	5,420	0	3
	Plumbing									
4	With all plumbing facilities	1,155,500	1,154,870	801,220	92,020	1,310	5,650	253,720	950	4
5	Lack some plumbing	10,200	10,830	0	9,300	0	680	860	0	5
6	No hot piped water	600	800	0	800	0	0	0	0	6
7	No bathtub/shower	0	0	0	0	0	0	0	0	7
8	No flush toilet	100	0	0	0	0	0	0	0	8
	Water									
9	Public/private water	1,157,900	1,156,450	717,720	177,850	1,310	6,330	252,290	950	9
10	Well	6,900	8,320	3,440	2,600	0	0	2,280	0	10
11	Other water source	800	940	0	940	0	0	0	0	11
	Sewer									
12	Public sewer	1,111,900	1,110,580	759,060	97,110	1,180	5,840	246,440	950	12
13	Septic tank/cesspool	53,800	55,120	39,180	7,190	130	490	8,130	0	13
14	**Severe Problems**	15,300	16,120	0	14,580	0	680	860	0	14
15	Plumbing	10,200	10,830	0	9,300	0	680	860	0	15
16	Heating	4,600	4,710	0	4,710	0	0	0	0	16
17	Electric	500	530	0	530	0	0	0	0	17
18	Upkeep	500	580	0	580	0	0	0	0	18
19	Hallways	0	0	0	0	0	0	0	0	19
20	**Moderate problems**	46,900	46,360	1,380	36,460	130	2,320	5,710	360	20
21	Plumbing	3,800	4,600	0	4,190	130	0	290	0	21
22	Heating	3,600	3,680	0	3,680	0	0	0	0	22
23	Kitchen	30,300	30,990	0	22,850	0	2,720	5,420	0	23
24	Upkeep	10,200	11,600	1,110	10,130	0	0	0	360	24
25	Hallways	600	620	0	340	0	290	0	0	25

Backward-Looking Table 3: Household Characteristics – All Occupied Units

	A Characteristics	B Published numbers	C Present in 2002	D 2002 units present in 1994	E Change in character-istics	F '02 mobile homes moved in	G '02 units derived from nonresidential use	H '02 units added by new construction	I '02 units added from temporary losses	
1	**Occupied units**	1,165,700	1,165,700	810,990	91,550	1,310	6,330	254,570	950	1
	Age									
2	Under 65	956,000	964,900	598,630	126,570	1,310	6,330	231,250	820	2
3	65 or older	209,600	200,800	96,970	80,370	0	0	23,330	130	3
	Children									
4	Some	434,200	442,770	190,890	141,780	0	2,610	107,130	360	4
5	None	731,500	722,930	378,940	190,930	1,310	3,720	147,440	580	5
	Race/Origin									
6	White	952,400	948,540	631,740	94,660	1,310	4,060	216,050	720	6
7	Hispanic	112,400	118,040	46,720	55,130	0	290	15,330	590	7
8	Non-Hispanic	840,000	830,500	522,690	101,860	1,310	3,780	200,730	130	8
9	Black	46,600	48,080	11,860	25,450	0	0	10,770	0	9
10	Other	166,800	169,080	24,190	114,650	0	2,270	27,750	230	10
11	Total Hispanics	233,600	240,790	85,620	122,580	0	2,320	29,450	820	11
	Income Source									
12	Wages and salaries	948,200	956,620	576,140	155,070	1,180	5,650	217,770	820	12
13	Welfare or SSI	34,400	34,390	6,530	24,020	0	0	3,710	130	13
14	Social security or pension	278,600	273,690	131,780	101,120	130	230	40,300	130	14

Backward-Looking Table 4: Market Dynamics and Affordability – All Occupied Units

	A Characteristics	B Published numbers	C Present in 2002	D 2002 units present in 1994	E Change in character-istics	F '02 mobile homes moved in	G '02 units derived from nonresidential use	H '02 units added by new construction	I '02 units added from temporary losses	
1	**Occupied units**	1,165,700	1,165,700	810,990	91,550	1,310	6,330	254,570	950	1
	Tenure									
2	Owner occupied	810,300	798,730	504,310	92,820	920	680	199,870	130	2
3	Percent own occupied	69.5%	68.5%	62.2%	NA	70.0%	10.7%	78.5%	13.8%	3
4	Renter occupied	355,400	366,970	212,240	93,170	390	5,650	54,700	820	4
	Rental Affordability									
5	Non-market		31,860	11,740	16,580	0	490	3,060	0	5
6	Extremely low rent		89,230	41,260	42,390	390	1,590	2,780	820	6
7	Very low rent		138,790	59,840	68,390	0	860	9,700	0	7
8	Low rent		61,820	10,640	27,780	0	0	23,400	0	8
9	Moderate rent		25,150	2,280	12,450	0	0	10,410	0	9
10	High to very high rent		20,130	2,450	9,610	0	2,720	5,350	0	10
	Renter Hsd Income									
12	Less than $20,000	105,000	108,110	41,940	53,910	260	3,210	8,560	230	12
13	$20,000 to $34,999	105,000	108,220	19,180	74,990	130	1,930	11,630	360	13
14	$35,000 to $59,999	91,200	95,880	10,380	68,930	0	510	15,840	230	14
15	$60,000 to $99,999	44,400	44,200	1,610	26,970	0	0	15,610	0	15
16	$100,000 or more	9,900	10,570	0	7,510	0	0	3,070	0	16
	Owner Monthly Housing Costs									
17	Less than $499	227,500	202,410	95,920	79,840	390	0	26,250	0	17
18	$500 to $699	67,600	64,760	13,070	42,700	0	0	8,990	0	18
19	$700 to $999	159,100	154,520	44,600	79,620	520	680	29,100	0	19
20	$1,000 to $1,499	221,100	232,920	35,590	123,080	0	0	74,110	130	20
21	$1,500 or more	134,900	144,110	29,600	53,090	0	0	61,420	0	21
	Owner Hsd Income									
22	Less than $20,000	102,400	93,960	23,960	55,460	0	0	14,410	130	22
23	$20,000 to $34,999	130,000	126,060	33,660	71,740	0	680	19,970	0	23
24	$35,000 to $59,999	196,100	198,890	47,410	106,540	790	0	44,150	0	24
25	$60,000 to $99,999	216,600	215,540	37,990	111,010	130	0	66,410	0	25
26	$100,000 or more	165,100	164,280	25,210	84,150	0	0	54,930	0	26

Rental Market Dynamics[15]

Table A expands the analysis in rows 5-11 in Forward-Looking Table 4 into a full rental dynamics analysis by examining in more detail what happened to the units in each row. In particular, the "present in 2002" and "change in characteristics" columns (column D and E in the CINCH tables) are disaggregated into the following options: each of the other rent affordability columns (new columns *D* through *J*), owner-occupancy (new column *K*), and vacant or seasonal status (new column *L*). The remaining columns (columns F through K in the CINCH tables) are collapsed into a "Lost to stock" column (new column *M*). Table B does the same for the analysis of rows 5-11 in Backward-Looking Table 4, with column *M* being additions through new construction and column *N* being additions from other sources.[16] Because the Census Bureau put a cap on the rents it reported for Phoenix in 1994, we cannot distinguish between units in the high-rent and very-high-rent categories, and therefore have collapsed these two categories into one category, high-to-very-high-rent units (column *J*).

Table A shows that there were 318,670 rental units in the Phoenix metropolitan area in 1994. In 2002, 112,690 of these units were no longer rental; 50,430 were owner-occupied, 51,700 were either vacant or being used seasonally, and 10,560 had been lost to the stock. Taken as a proportion of the units in 1994, movement into owner-occupancy was concentrated among the moderate-rent and the high-to-very-high-rent categories, and losses to the stock were concentrated among non-market and extremely-low-rent units.

Table B shows there were 366,970 rental units in the Phoenix metropolitan area in 2002, of which 154,730 were not rental units in 1994. The new units came from units that had been owner-occupied (42,480), units that had been vacant or in seasonal use (50,690), newly constructed units (54,700), and other additions (6,860). Most of the formerly owner-occupied units went to the extremely-low-rent and the very-low-rent categories; most of the newly constructed rental units went to the moderate-rent category.

Looking at both tables, we see that the overall number of rental units increased by approximately 50,000 units. The number of extremely-low-rent and very-low-rent units combined grew from approximately 205,000 in 1994 to approximately 230,000 in 2002.

[15] This rental dynamics analysis differs from previous analyses in two ways: we do not adjust rents for bedroom sizes and we do not adjust area median family income for inflation.

[16] These tables use all the AHS observations for which we have relevant rent data, including observations where the Census Bureau provided an estimate of contract rent when the respondent did not provide an answer to the rent question. These observations are said to have "allocated" rents. The Watson-Eggers paper cited in footnote 1 studied the effect of allocations on rental dynamics analysis. They found that unallocated data show less dispersion. In their study of the six metropolitan areas surveyed as part of the national AHS, they found that the proportion of rental units that remain in the same rent category increased for all categories except non-market, where the proportion decreased slightly. There also appeared to be less movement of more than one rent category.

Table A: Forward-Looking Rental Dynamics Analysis

Forward looking	*C* Number in 1994	*D* Non-market in 2002	*E* Extremely low rent in 2002	*F* Very low rent in 2002	*G* Low rent in 2002	*H* Moderate rent in 2002	*J* High to very high rent in 2002	*K* Owner-occupied in 2002	*L* Vacant or seasonal in 2002	*M* Lost to stock
Non-market	32,780	11,390	4,070	3,760	1,080	0	0	5,670	4,500	2,320
Extremely low rent	90,500	1,690	40,040	16,120	780	0	260	10,240	14,830	6,550
Very low rent	114,160	3,220	12,550	58,070	6,680	0	650	14,580	18,410	0
Low rent	46,740	1,760	1,170	13,990	10,330	1,340	0	8,430	8,580	1,160
Moderate rent	20,830	0	0	330	6,690	2,220	1,540	6,100	3,430	530
High to very high rent	13,650	0	560	0	330	3,010	2,380	5,420	1,960	0
Column sum	318,670	18,050	58,390	92,270	25,870	6,560	4,830	50,430	51,700	10,560

Table B: Backward-Looking Rental Dynamics Analysis

Backward looking	*C* Number in 2002	*D* Non-market in 1994	*E* Extremely low rent in 1994	*F* Very low rent in 1994	*G* Low rent in 1994	*H* Moderate rent in 1994	*J* High to very high rent in 1994	*K* Owner-occupied in 1994	*L* Vacant or seasonal in 1994	*M* New construc-tion	*N* Other additions
Non-market	31,860	11,740	1,740	3,320	1,810	0	0	5,510	4,200	3,060	490
Extremely low rent	89,230	4,190	41,260	12,930	1,210	0	580	9,210	14,270	2,780	2,800
Very low rent	138,790	3,880	16,610	59,840	14,420	340	0	9,490	23,670	9,700	860
Low rent	61,820	1,110	800	6,880	10,640	6,890	340	6,310	5,450	23,400	0
Moderate rent	25,150	0	0	0	1,380	2,280	3,100	7,300	670	10,410	0
High to very high rent	20,130	0	270	670	0	1,580	2,450	4,660	2,430	5,350	2,720
Column sum	366,970	20,920	60,680	83,640	29,450	11,100	6,470	42,480	50,690	54,700	6,860

Appendix A – Internal and External Checks

For the CINCH analysis, we performed two tests of internal consistency:

- For each row, we tested whether the sum of possible outcomes (columns D though K in the forward-looking analysis and columns D through I in the backward-looking analysis) equaled the number of units present in the base year. In every case, equality was achieved except for differences created by rounding.

- Throughout the tables, various sets of rows are related to each other. For example, the year-built rows (13-23) in Table 1 are a disaggregation of the total stock in row 1. Similarly, rows 6 (Whites), 9 (Blacks), and 10 (Other race) in Table 3 are a disaggregation of row 1 (occupied households). In these cases, there should be equality between the parent row and the sum of the break-out rows for all columns except D and E. The difference between column D in the parent row and the sum of column D for the break-out rows should equal the negative of the difference between column E in the parent row and the sum of column E for the break-out rows. In every case, equality was achieved except for differences created by rounding.

Column B provides an external check of how well the CINCH weighting performed. In general, the CINCH estimates are within 5 percent of the AHS published totals and many of the CINCH estimates are very close to the AHS estimates. We have footnoted two places where our coding does not seem to produce the same results as the published estimates. We observed that the correspondence between the CINCH and published estimates were closer in the slower growing metropolitan areas. We also noticed that the CINCH weighting tends to underestimate the number of units built since 1989 and the number of Hispanic households.

Appendix B – Weighting

CINCH separates the AHS samples in 1994 and 2002 into three components: units that exist and are part of the housing stock in both years (SAMES), units that are part of the 1994 housing stock but are not part of the 2002 housing stock (LOSSES), and units that are not part of the 1994 housing stock but are part of the 2002 housing stock (ADDITIONS). ADDITIONS are split into NEW CONSTRUCTION and RECOVERIES (structures that existed in 1994 but were not in the housing stock).

Because CINCH looks at various subsets of the housing stock, we need to know the characteristics of units and their occupants. Therefore, we can use only those SAMES observations that were interviewed in both years. For the same reason, we can use only those LOSSES that were interviewed in 1994 and those ADDITIONS that were interviewed in 2002.

For the forward-looking analysis, we started with the AHS pure weights and used the AHS weighted count in 1994 of SAMES to create weights for the interviewed SAMES. We used the AHS weighted count in 1994 of LOSSES to create weights for interviewed LOSSES. We then adjusted the weights of SAMES and LOSSES to equal the AHS published totals for occupied units, vacant units, and seasonal units in 1994.

For the backward-looking analysis, we started with the AHS pure weights and used the AHS weighted count in 2002 of SAMES to create weights for the interviewed SAMES. We used the AHS weighted counts in 2002 for NEW CONSTRUCTION and for RECOVERIES to create weights for interviewed NEW CONSTRUCTION and interviewed RECOVERIES. We then adjusted the weights for SAMES, NEW CONSTRUCTION, and RECOVERIES to equal AHS published totals for occupied units, vacant units, and seasonal units in 2002.

The logic behind the weighting and the procedures used to create the weights is explained in *Weighting for CINCH and Rental Dynamics Analysis*.