American Housing Survey

Components of Inventory Change And Rental Dynamics: Memphis 1996-2004

July 2006

Econometrica, Inc. and
ICF Consulting
under contract to:

U.S. Department of Housing
and Urban Development
Office of Policy Development
and Research

Principal Authors: Frederick J. Eggers
Fouad Moumen

Acknowledgements

This report was produced by Econometrica, Inc., under Contract No. GS-10F-0269K, Order No. C-CHI-00809, for the U.S. Department of Housing and Urban Development (HUD). Cyrus Baghelai served as Econometrica's Project Director, and the primary analyses and report writing were performed by Frederick J. Eggers and Fouad Moumen. The authors thank David A. Vandenbroucke, the HUD Government Technical Representative, for many helpful suggestions and for his assistance in obtaining needed information from the Census Bureau. The authors also thank Barbara Williams of the Census Bureau for her assistance in answering numerous questions.

Components of Inventory Change and Rental Market Dynamics: Memphis 1996-2004

Overview

Components of Inventory Change (CINCH) and rental market dynamics are two techniques for explaining how changes that take place in a housing market over time 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 rental units that were affordable to low-income households at the beginning of the period?"

This report focuses on the Memphis metropolitan housing market over the period between 1996 and 2004. It is one of 13 reports based on local American Housing Surveys conducted in 2004; these 13 metropolitan areas were previously surveyed in either 1995 or 1996.[1]

CINCH and rental market dynamics have both forward-looking and backward-looking components. The forward-looking component starts with the housing stock available at the beginning of the period and then, looking at the end of the period, attempts 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. The backward-looking component starts with the housing stock available at the end of the period and, looking at the beginning of the period, attempts 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 1996 may have become a medical office in 1997 but returned to being a housing unit in 2000. CINCH would record this unit as having

[1] See http://www.huduser.org/datasets/cinch.html for examples of previous CINCH and rental dynamics studies.

undergone no change over the period from 1996 to 2004. In research 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 research in this report uses the AHS, which is a sample of units at both points in time, and previous research has shown that creating sample weights that take both periods into account can generate some inconsistent or inaccurate results. For this reason, recent CINCH and rental market dynamics studies have separated the forward-looking and backward-looking components. This paper will do the same. (Weighting is explained briefly in Appendix B and more fully in a separate paper referenced in that 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 1996 to 2004 and identifying how units were lost to the housing stock; and a set of backward-looking tables tracing where 2004 units came from and distinguishing between units that were part of the stock in 1996 and units that were additions to the stock since 1996.
- Two tables and accompanying discussion that highlight interesting changes in the Memphis housing stock between 1996 and 2004.
- A brief discussion of the rental market dynamics results using CINCH-like tables.

Two appendices 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 1996 housing stock by 2004. There are three basic dispositions of 1996 units: units that continue to exist in 2004 with the same characteristics (or serving the same market), units that continue to exist in 2004 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 2004 housing stock came from in reference to 1996. There are three basic sources of 2004 units: units that existed in 1996 with the same characteristics (or serving the same market),

units that existed in 1996 but with different characteristics (or serving a different market), and units that are additions to the housing stock.

The essence of the CINCH analysis lies in the columns because they specify the state of a unit in the other time period.

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 1996 AHS report for Memphis counted 401,500 occupied units (row 2, column B, forward-looking Table 1); the 2004 AHS report counted 430,800 occupied units (row 2, column B, 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 (1996 for the forward-looking tables and 2004 for the backward-looking tables), and (b) satisfying the condition in column A. CINCH uses different weights than those used in preparing the published AHS reports. Therefore, CINCH estimates can differ from AHS estimates for particular subsets of the housing stock. As explained in the appendix, the weights were created to match AHS published totals for rows 2 through 4 of Table 1 and rows 2 and 4 of Table 4. This perfect match will not be true of other rows.[2]

- 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-

[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. Categories for which the CINCH weights seem consistently to have trouble matching the published numbers were: the number of mobile homes, units built between 2000-2004, units built between 1995-1999, rental units that do not have a cash rent, and monthly housing costs less than $350 for owners. In a few other cases, the weighted numbers consistently fail to match the published totals, but the authors believe the differences result because the Census Bureau created the published totals using information not available on the public use files or because of coding differences. These cases are: the reasons for incomplete plumbing and households receiving welfare or SSI payment.

looking Table 1 estimates that 339,200 of the occupied units from 1996 were also occupied in 2004.

- 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 47,200 units that were occupied in 1996 are still part of the housing stock in 2004 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; these are 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 1996 to 2004.

- Column F is the CINCH estimate of the number of units from column C that are not in the 2004 housing stock because they were merged with other units or converted into multiple units. Among occupied units, 300 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, 600 mobile homes were moved out.[3]

- Column H is the CINCH estimate of the number of units that 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.[4] Among occupied units, 800 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 2004. In this case, 10,300 units were demolished or destroyed.

- Column J is the CINCH estimate of the number of units from column C that by 2004 were condemned or that were no longer usable for housing because of extensive damage. In Memphis, 2,500 occupied units were lost because of damage or similar cause.

[3] The AHS does not trace where the mobile home is moved to. The move may be within the metropolitan area or outside the metropolitan area. Similarly, column G in the backward-looking tables does not distinguish between move-ins from within or from outside the metropolitan area.
[4] 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 K is the CINCH estimate of the number of units from column C that were lost by 2004 for other reasons. These include units that the Census Bureau eliminated for sampling purposes and other miscellaneous losses. Among occupied units, there were 600 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.[5]

Columns Unique to Backward-Looking Tables

In backward-looking tables, columns G through K track where units came from that are part of the housing stock in 2004 but were not part of the 1996 housing stock.[6]

- Column G is the CINCH estimate of the number of mobile homes from column C that were moved in during the period. Among occupied units, 200 mobile homes were moved in (row 2, column G, of backward-looking Table 1).[7]

- Column H is the CINCH estimate of the number of units from column C that had been nonresidential in 1996. Among occupied units, 1,300 had been nonresidential.

- Column I is the CINCH estimate of the number of units from column C that were newly constructed between 1996 and 2004. Among occupied units, 50,400 units were newly constructed.

- Column J is the CINCH estimate of the number of units from column C that were added by 2004 by the recovery of units that had been temporarily lost to the housing stock because occupancy was prohibited in 1996, or the interior of the unit was exposed to the elements, or for reasons "not classified." The 2004 occupied housing stock includes 1,100 recovered units.

- Column K includes units added by the Census Bureau as sample adjustments. Sample adjustments represent 500 occupied units in 2004.

[5] The weighted numbers are rounded to the nearest 100 to match practices used by the Census Bureau in the AHS publications.
[6] The backward-looking tables do not contain a column F for units added through mergers and conversions. In 2004, the Census Bureau did not code the variable that would normally identify units created from mergers and conversions (REUAD=7 or 8).
[7] In 2004, the Census Bureau did not code the variable that would normally identify mobile home move-ins (REUAD=4). We estimated these from another variable (NOINT=13).

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 (by owner-occupied and renter-occupied), vacant units, and seasonal units.

Rows 5-12 divide the housing stock by type of structure to see what type of units account for losses.[8] Column E is forced to be zero on the grounds that changes in structure types are extremely rare and that any observed changes are most likely data errors. 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. In Memphis, units in structures with 50 or more units are listed in row 10 instead of row 11 in forward-looking Table 1 because of suppression.

Rows 13-24 divide the housing stock by year built.[9] The published reports use the categories 1990-1994, 1995-1999, and 2000-2004; this report uses the same categories in Backward-Looking Table 1 but uses 1990-1996 for row 15 in Forward-Looking Table 1.[10] Column E is again forced to be zero.

Rows 25-31 and 32-36 divide the housing stock by two different measures of interior space, the number of rooms and the number of bedrooms.[11]

Rows 37-42 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 1996 Memphis AHS public use file, the Census Bureau reported all units in structures with 4 or more stories in row 40 and reported no units in rows 41 and 42. The published reports contain matching data for row 37 only.

[8] 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.
[9] Rows 13 and 14 are not included in Forward-Looking Table 1, because the 1996 housing stock cannot contain units built after 1996.
[10] We use REUAD=3 and not year built to identify new construction. For this reason, there are units built after 1995 that are not considered new construction. Year built is obtained from the respondent and may be inaccurate.
[11] Because of small sample sizes in the losses and additions columns, we combined room categories that the published reports list separately.

Rows 43-44 divide the housing stock between central cities units and suburban residences to see how the observed changes vary by location. Rows 45-46 divide the housing stock by whether or not the occupants have moved in within the last 2 calendar years to see if certain units consistently have high turnover, and to see if high turnover units are more susceptible to loss.

Table 2

This table looks at 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 6-9 look at each of these requirements separately.[12] In the 1996 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 6-9 separate out good units from the least desirable units based on kitchen and bath equipment.

Rows 10-15 look at how units obtain water and dispose of sewage.

Rows 16-21 look at units with severe physical problems. Rows 17-21 identify specific types of serious deficiencies. Row 16 counts the units having one or more of these deficiencies. Rows 22-27 look at units with moderate problems. Rows 23-27 identify specific types of deficiencies. Row 22 counts the units having one or more of these deficiencies.[13] 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.

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. In all cases, the analysis seeks to find out how stable occupancy characteristics are over time, and what part of the market was served by units that were lost between 1996 and 2004.

[12] Row 9 is not included in Forward-Looking Table 2, because the public use file does not contain the information needed to identify facilities available "for exclusive use" of the household.
[13] For definitions of serious and moderate problems, see pages 990 and 991 of the AHS Codebook, version 1.78, at http://www.huduser.org/intercept.asp?loc=/Datasets/ahs/AHS_Codebook.pdf.

Rows 2-3 look at the age of the householder. Rows 4-5 look at whether or not the household includes children. Rows 6-11 look at the race or ethnicity of the householder.[14] Rows 12-14 look at three possible sources of household income.

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 see the extent to which units change tenure characteristics and whether rental or owner-occupied units are more likely to be lost.

Rows 5-10 characterize the rental stock using 6 categories based on monthly housing costs. Row 10 identifies units provided to tenants for no cash rents, e.g., units provided to maintenance or management personnel or units provided to relatives. Rows 16-20 identify owner-occupied units by total monthly housing costs.

Rows 11-15 track rental units by household income; rows 21-25 track owner-occupied units by household income.[15]

[14] In compliance with new federal guidelines, the 2004 AHS used different categories for recording race. For 2004, this paper defined "White" as "White only"; Black as "Black only"; and "other" as all other answers.

[15] The published reports list more categories for both monthly housing costs and household income. This report combined categories for two reasons. First, the sample size in each metropolitan area is small, and therefore larger categories provide more stable measurement of the various types of losses and additions. Second, columns D and E track whether the units in each category remain occupied and stay in the same cost or income category. The combined categories create more interesting analysis because bigger changes in monthly housing costs or income are needed to move between broader categories.

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

	A Characteristics	B Published Numbers	C Present in 95	D 95 units present in 2004	E Changed in characteristics	F 95 units affected by conversion /merger	G 95 mobile homes moved out	H 95 units changed to nonresidential use	I 95 units lost through demolition or disaster	J 95 units badly damaged or condemned	K 95 units lost in other ways	
1	**Total**	442,000	442,000	423,000	0	400	800	1,200	13,100	2,900	600	1
	Occupancy Status											
2	Occupied	401,500	401,500	339,200	47,200	300	600	800	10,300	2,500	600	2
3	Vacant	39,300	39,300	10,100	25,500	100	200	300	2,700	300	0	3
4	Seasonal	1,200	1,200	200	900	0	0	0	200	0	0	4
	Units in Structure											
5	1, detached	292,300	300,000	293,200	0	0	0	700	4,500	1,400	200	5
6	1, attached	17,200	16,400	15,500	0	0	0	0	800	100	0	6
7	2 to 4	40,900	39,300	36,400	0	100	0	0	2,500	400	0	7
8	5 to 9	38,000	39,600	36,000	0	100	0	300	2,800	500	0	8
9	10 to 19	20,700	20,700	19,200	0	0	0	0	1,100	300	100	9
10	20 to 49	6,000	16,900	15,400	0	100	0	200	900	200	0	10
11	50 or more	9,700	0	0	0	0	0	0	0	0	0	11
12	Mobile Home/Trailer	17,100	9,000	7,300	0	0	800	0	500	0	200	12
	Year Built											
15	1990-1996	50,700	49,700	49,000	0	0	200	300	0	0	100	15
16	1985-1989	44,400	45,500	44,200	0	0	0	100	900	100	100	16
17	1980-1984	22,900	22,500	21,300	0	0	200	100	500	200	0	17
18	1970-1979	141,000	138,100	132,700	0	100	200	100	3,100	1,600	100	18
19	1960-1969	67,900	70,200	67,600	0	200	0	100	2,000	200	0	19
20	1950-1959	49,200	49,800	47,600	0	0	0	100	1,700	200	100	20
21	1940-1949	27,600	28,000	25,500	0	0	100	0	2,500	0	0	21
22	1930-1939	10,500	10,700	9,800	0	0	0	0	700	100	100	22
23	1920-1929	9,700	9,400	8,800	0	0	0	0	600	0	0	23
24	1919 or earlier	18,100	18,000	16,500	0	0	0	200	1,000	300	0	24

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

	A Characteristics	B Published Numbers	C Present in 95	D 95 units present in 2004	E Changed in characteristics	F 95 units affected by conversion /merger	G 95 mobile homes moved out	H 95 units changed to nonresidential use	I 95 units lost through demolition or disaster	J 95 units badly damaged or condemned	K 95 units lost in other ways	
	Rooms											
25	1 – 4 rooms	122,800	120,000	87,100	21,500	200	400	600	8,300	1,500	400	25
26	5 rooms	98,800	98,800	52,000	43,700	100	500	200	2,000	300	0	26
27	6 rooms	99,900	101,600	53,100	45,900	0	0	100	1,500	900	0	27
28	7 rooms	58,000	59,500	24,000	34,400	0	0	200	700	100	0	28
29	8 rooms	38,200	37,700	13,000	24,100	0	0	0	500	0	100	29
30	9 rooms	15,700	16,200	4,100	11,900	0	0	0	100	0	0	30
31	10 rooms or more	8,700	8,300	2,800	5,300	0	0	0	0	100	100	31
	Bedrooms											
32	None	2,100	2,100	600	1,400	0	0	0	100	0	0	32
33	1	47,000	45,900	32,900	8,700	100	100	400	3,100	400	100	33
34	2	129,500	127,300	97,600	21,300	300	400	400	6,200	1,100	200	34
35	3	193,400	194,900	165,400	26,000	0	400	300	2,200	600	0	35
36	4 or more	69,900	71,800	53,300	15,900	0	0	100	1,500	800	200	36
37	**Multiunit Structures**	115,300	116,600	107,000	0	400	0	500	7,300	1,400	100	37
	Stories in Structures											
38	1	NA	24,300	22,600	0	0	0	100	1,500	100	0	38
39	2	NA	74,300	67,500	0	300	0	300	4,900	1,300	100	39
40	3	NA	18,000	16,800	0	100	0	100	900	0	0	40
41	4 to 6	NA	0	0	0	0	0	0	0	0	0	41
42	7 or more	NA	0	0	0	0	0	0	0	0	0	42
	Metro Status											
43	In central cities	NA	247,500	235,400	0	400	0	200	9,200	2,000	200	43
44	In suburbs	NA	194,500	187,600	0	0	800	900	3,900	900	400	44
	Mover Status											
45	Moved in last 2 years	NA	101,000	29,100	66,300	300	100	400	4,200	600	100	45
46	Not a Recent Mover	NA	300,500	291,100	0	0	500	500	6,100	1,900	500	46

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

	A Characteristics	B Published Numbers	C Present in 95	D 95 units present in 2004	E Changed in characteristics	F 95 units affected by conversion /merger	G 95 mobile homes moved out	H 95 units changed to nonresidential use	I 95 units lost through demolition or disaster	J 95 units badly damaged or condemned	K 95 units lost in other ways	
1	**Occupied Units**	401,500	401,500	339,200	47,200	300	600	800	10,300	2,500	600	1
	Kitchen											
2	With complete kitchen	395,900	396,000	326,900	54,800	300	600	800	9,800	2,100	600	2
3	Lacking complete kitchen facilities	5,600	5,500	600	4,100	0	0	0	500	400	0	3
	Plumbing											
4	With all plumbing facilities	399,300	398,900	335,300	48,900	300	600	800	10,100	2,300	600	4
5	Lack some plumbing	300	2,600	400	1,800	0	0	0	100	200	0	5
6	No hot piped water	200	900	400	100	0	0	0	100	200	0	6
7	No bathtub/shower	100	800	100	400	0	0	0	0	200	0	7
8	No flush toilet	1,900	2,400	100	1,900	0	0	0	100	200	0	8
	Water											
10	Public/private water	391,100	390,600	329,100	47,400	300	500	800	9,800	2,300	500	10
11	Well	9,800	10,100	8,300	1,200	0	100	0	300	0	100	11
12	Other water source	600	800	100	300	0	0	0	100	200	0	12
	Sewer											
13	Public sewer	364,300	363,200	304,700	45,600	300	400	700	9,100	2,000	500	13
14	Septic tank/cesspool	36,700	37,500	27,900	7,800	0	200	100	1,100	300	100	14
15	Other or none	600	800	100	300	0	0	0	100	200	0	15
16	**Severe Problems**	5,100	5,400	600	4,200	0	0	0	400	200	0	16
17	Plumbing	2,200	2,600	400	1,800	0	0	0	100	200	0	17
18	Heating	900	1,800	0	1,800	0	0	0	0	0	0	18
19	Electric	300	300	0	100	0	0	0	0	100	0	19
20	Upkeep	2,100	1,000	0	700	0	0	0	300	0	0	20
21	Hallways	0	0	0	0	0	0	0	0	0	0	21
22	**Moderate problems**	25,600	25,100	2,000	19,700	0	100	0	2,100	1,000	200	22
23	Plumbing	2,700	3,000	100	2,500	0	0	0	0	300	100	23
24	Heating	9,000	10,100	800	7,800	0	100	0	1,100	200	0	24
25	Kitchen	4,700	5,500	600	4,100	0	0	0	500	400	0	25
26	Upkeep	12,100	12,400	100	10,100	0	0	0	1,300	800	100	26
27	Hallways	0	0	0	0	0	0	0	0	0	0	27

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

	A Characteristics	B Published Numbers	C Present in 95	D 95 units present in 2004	E Changed in characteristics	F 95 units affected by conversion /merger	G 95 mobile homes moved out	H 95 units changed to nonresidential use	I 95 units lost through demolition or disaster	J 95 units badly damaged or condemned	K 95 units lost in other ways	
1	**Occupied units**	401,500	401,500	339,200	47,200	300	600	800	10,300	2,500	600	1
	Age of Householder											
2	Under 65	328,200	325,100	244,300	68,600	300	600	800	8,000	1,900	600	2
3	65 or older	73,400	76,400	40,200	33,400	0	0	0	2,200	600	0	3
	Children											
4	Some	161,000	159,900	80,700	71,700	100	0	300	5,500	1,400	100	4
5	None	240,600	241,600	158,200	75,800	100	600	500	4,800	1,100	500	5
	Race/Origin of Householder											
6	White	241,100	240,900	173,700	62,500	0	400	700	2,800	400	400	6
7	Hispanic	4,100	4,100	300	3,500	0	100	0	300	0	0	7
8	NonHispanic	237,000	236,700	166,200	66,300	0	200	700	2,600	400	400	8
9	Black	153,400	153,600	110,100	33,300	300	200	100	7,200	2,100	200	9
10	Other	7,100	7,100	1,700	5,100	0	0	0	300	0	0	10
11	Total Hispanics	6,600	6,800	1,100	5,200	0	100	0	400	0	0	11
	Income Source											
12	Wages and salaries	322,900	320,800	234,500	76,400	300	500	700	6,600	1,100	600	12
13	Welfare or SSI	109,700	113,600	55,500	52,800	0	200	100	3,600	1,100	100	13
14	Social security or pension	31,600	30,900	3,500	22,600	100	100	0	3,500	1,000	0	14

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

	A Characteristics	B Published Numbers	C Present in 95	D 95 units present in 2004	E Changed in characteristics	F 95 units affected by conversion /merger	G 95 mobile homes moved out	H 95 units changed to nonresidential use	I 95 units lost through demolition or disaster	J 95 units badly damaged or condemned	K 95 units lost in other ways	
1	**Occupied units**	401,500	401,500	339,200	47,200	300	600	800	10,300	2,500	600	1
	Tenure											
2	Owner occupied	262,100	262,100	220,300	37,900	0	600	500	2,000	400	500	2
3	Percent own occpd	65.3%	65.3%									3
4	Renter occupied	139,400	139,400	82,900	45,400	300	0	400	8,200	2,200	100	4
	Renter Monthly Housing Costs											
5	Less than $350	34,200	37,200	9,400	20,900	0	0	0	5,500	1,500	0	5
6	$350 to $599	60,600	60,700	19,200	38,900	100	0	100	1,800	400	100	6
7	$600 to $799	26,000	24,400	8,200	15,200	0	0	300	600	0	0	7
8	$800 to $1,249	7,700	9,100	2,000	7,000	0	0	0	100	0	0	8
9	$1,250 or more	2,200	0	0	0	0	0	0	0	0	0	9
10	No cash rent	8,700	8,000	1,100	6,300	100	0	0	300	300	0	10
	Renter Hsd Income											
11	Less than $15,000	48,500	50,500	15,200	28,300	0	0	100	4,900	1,900	0	11
12	$15,000 to $29,999	46,100	45,300	9,000	34,000	100	0	0	1,900	300	100	12
13	$30,000 to $49,999	27,600	27,000	4,700	21,100	100	0	100	1,000	0	0	13
14	$50,000 to $99,999	15,400	15,000	2,600	12,100	0	0	100	300	0	0	14
15	$100,000 or more	1,700	1,500	100	1,300	0	0	0	100	0	0	15
	Owner Monthly Housing Costs											
16	Less than $350	81,100	82,000	27,700	51,800	0	500	100	1,400	200	100	16
17	$350 to $599	51,600	51,500	11,800	39,200	0	0	0	200	0	200	17
18	$600 to $799	46,200	47,700	9,000	38,100	0	100	200	200	0	100	18
19	$800 to $1,249	56,300	55,200	18,500	36,400	0	0	100	0	100	0	19
20	$1,250 or more	26,700	25,800	14,500	11,200	0	0	0	100	0	0	20
	Owner Hsd Income											
21	Less than $15,000	34,200	34,800	10,400	23,100	0	400	0	500	200	200	21
22	$15,000 to $29,999	54,800	53,900	11,200	41,800	0	0	100	800	0	0	22
23	$30,000 to $49,999	62,200	60,600	14,100	45,800	0	0	200	400	0	100	23
24	$50,000 to $99,999	84,400	86,300	35,000	50,400	0	200	100	400	100	100	24
25	$100,000 or more	26,800	26,400	12,400	14,000	0	0	0	0	0	0	25

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

	A Characteristics	B Published Numbers	C Present in 2004	D 04 units present in 95	E Changed in characteristics	G 04 mobile homes moved in	H 04 units derived from nonresidential use	I 04 units added through new construction	J 04 units added from temporary losses	K 04 units added by other means	
1	**Total**	489,200	489,200	429,600	0	400	1,400	55,000	1,500	1,300	1
	Occupancy Status										
2	Occupied	430,800	430,700	348,700	28,500	200	1,300	50,400	1,100	500	2
3	Vacant	57,300	57,300	9,700	41,800	200	100	4,300	500	800	3
4	Seasonal	1,200	1,200	100	800	0	0	300	0	0	4
	Units in Structure										
5	1, detached	337,700	345,000	302,100	0	0	900	40,400	800	800	5
6	1, attached	17,400	16,300	14,900	0	0	0	1,300	100	100	6
7	2 to 4	33,900	35,000	32,600	0	0	300	1,600	200	200	7
8	5 to 9	38,300	38,400	34,000	0	0	100	3,900	300	0	8
9	10 to 19	25,400	25,400	19,800	0	0	0	5,600	0	100	9
10	20 to 49	8,400	8,000	6,900	0	0	0	1,100	0	0	10
11	50 or more	11,800	12,300	11,200	0	0	0	900	100	200	11
12	Mobile Home/Trailer	16,400	8,700	8,100	0	400	0	200	0	0	12
	Year Built										
13	2000-2004	41,800	32,800	1,800	0	100	100	30,300	200	300	13
14	1995-1999	49,500	42,400	20,600	0	0	100	21,600	0	200	14
15	1990-1994	39,500	39,300	35,800	0	100	200	3,100	0	0	15
16	1985-1989	48,300	50,200	49,700	0	0	200	0	0	300	16
17	1980-1984	23,500	24,200	24,100	0	0	100	0	0	0	17
18	1970-1979	96,000	99,900	99,400	0	100	300	0	0	0	18
19	1960-1969	77,300	81,400	80,600	0	0	0	0	600	200	19
20	1950-1959	55,500	56,900	56,200	0	100	200	0	200	200	20
21	1940-1949	28,500	30,700	30,300	0	0	100	0	300	0	21
22	1930-1939	10,900	11,800	11,800	0	0	0	0	0	0	22
23	1920-1929	10,800	11,100	10,900	0	0	0	0	100	100	23
24	1919 or earlier	7,700	8,500	8,400	0	0	0	0	100	0	24

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

	A Characteristics	B Published Numbers	C Present in 2004	D 04 units present in 95	E Changed in characteristics	G 04 mobile homes moved in	H 04 units derived from nonresidential use	I 04 units added through new construction	J 04 units added from temporary losses	K 04 units added by other means	
	Rooms										
25	1 – 4 rooms	119,300	118,600	86,400	19,500	200	400	10,200	700	1,200	25
26	5 rooms	112,000	110,900	53,100	45,300	200	400	11,700	100	100	26
27	6 rooms	115,800	117,800	54,500	51,600	0	200	10,900	600	0	27
28	7 rooms	71,000	72,400	24,800	38,700	0	300	8,500	100	0	28
29	8 rooms	37,500	37,800	13,400	19,300	0	0	5,100	0	0	29
30	9 rooms	18,500	17,100	4,200	8,000	0	0	4,800	0	0	30
31	10 rooms or more	15,200	14,600	2,900	7,900	0	0	3,800	0	0	31
	Bedrooms										
32	None	1,800	2,300	500	1,100	0	0	200	0	500	32
33	1	45,400	45,100	32,900	6,400	0	100	5,200	0	500	33
34	2	124,500	124,600	97,900	17,900	200	400	7,100	800	200	34
35	3	225,800	226,800	169,700	30,100	200	600	25,600	500	100	35
36	4 or more	91,700	90,400	55,000	18,100	0	200	16,800	200	0	36
37	**Multiunit Structures**	117,800	119,200	104,600	0	0	400	13,100	600	500	37
	Stories in Structures										
38	1	NA	21,500	19,400	0	0	300	1,300	100	300	38
39	2	NA	74,800	68,300	0	0	100	5,600	500	200	39
40	3	NA	12,300	6,900	0	0	0	5,400	0	0	40
41	4 to 6	NA	3,300	2,500	0	0	0	800	0	0	41
42	7 or more	NA	7,400	7,400	0	0	0	0	0	0	42
	Metro Status										
43	In central cities	NA	250,400	240,700	0	300	1,000	5,900	1,300	1,200	43
44	In suburbs	NA	238,800	188,900	0	100	400	49,100	200	100	44
	Mover Status										
45	Moved in last 2 years	NA	113,400	25,100	63,800	200	200	23,200	600	300	45
46	Not a Recent Mover	NA	317,300	216,900	71,500	0	1,100	27,200	400	200	46

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

	A Characteristics	B Published Numbers	C Present in 2004	D 04 units present in 95	E Changed in characteristics	G 04 mobile homes moved in	H 04 units derived from nonresidential use	I 04 units added through new construction	J 04 units added from temporary losses	K 04 units added by other means	
1	**Occupied Units**	430,800	430,700	348,700	28,500	200	1,300	50,400	1,100	500	1
	Kitchen										
2	With complete kitchen	419,400	419,100	336,300	30,800	200	1,300	49,400	800	300	2
3	Lacking complete kitchen facilities	11,400	11,600	600	9,600	0	0	1,000	200	200	3
	Plumbing										
4	With all plumbing facilities	427,700	427,300	344,800	29,200	200	1,300	50,400	1,000	500	4
5	Lack some plumbing	3,100	3,400	400	2,900	0	0	0	100	0	5
6	No hot piped water	1,300	1,400	400	900	0	0	0	100	0	6
7	No bathtub/shower	400	400	100	300	0	0	0	0	0	7
8	No flush toilet	300	300	100	100	0	0	0	0	0	8
9	No exclusive use	1,800	2,000	0	2,000	0	0	0	0	0	9
	Water										
10	Public/private water	419,200	418,600	338,300	28,800	200	1,300	48,400	1,100	500	10
11	Well	11,300	11,700	8,600	1,100	0	0	1,900	0	0	11
12	Other water source	400	400	100	300	0	0	0	0	0	12
	Sewer										
13	Public sewer	391,100	391,700	313,200	31,600	200	1,200	44,000	1,100	500	13
14	Septic tank/cesspool	39,400	38,700	28,800	3,400	0	100	6,400	0	0	14
15	Other	300	300	100	100	0	0	0	0	0	15
16	**Severe Problems**	6,900	7,300	600	6,600	0	0	100	100	0	16
17	Plumbing	3,100	3,400	400	2,900	0	0	0	100	0	17
18	Heating	2,800	3,000	0	2,900	0	0	100	0	0	18
19	Electric	0	0	0	0	0	0	0	0	0	19
20	Upkeep	1,100	1,000	0	1,000	0	0	0	0	0	20
21	Hallways	0	0	0	0	0	0	0	0	0	21
22	**Moderate problems**	24,200	24,500	2,000	20,700	0	0	1,300	300	200	22
23	Plumbing	1,400	1,800	100	1,600	0	0	0	100	0	23
24	Heating	3,400	4,000	900	3,100	0	0	0	0	0	24
25	Kitchen	10,200	11,600	600	9,600	0	0	1,000	200	200	25
26	Upkeep	9,400	10,500	100	10,100	0	0	300	0	0	26
27	Hallways	500	900	0	900	0	0	0	0	0	27

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

	A Characteristics	B Published Numbers	C Present in 2004	D 04 units present in 95	E Changed in characteristics	G 04 mobile homes moved in	H 04 units derived from nonresidential use	I 04 units added through new construction	J 04 units added from temporary losses	K 04 units added by other means	
1	**Occupied units**	430,800	430,700	348,700	28,500	200	1,300	50,400	1,100	500	1
	Age of Householder										
2	Under 65	354,700	353,000	251,000	53,200	200	800	46,500	1,000	400	2
3	65 or older	76,100	77,700	41,400	31,700	0	400	3,900	100	100	3
	Children										
4	Some	167,600	168,500	83,000	61,100	100	600	23,000	400	300	4
5	None	263,200	262,200	162,600	70,600	100	600	27,400	600	200	5
	Race/Origin of Householder	0									
6	White	239,000	235,700	179,000	20,600	200	500	35,100	100	200	6
7	Hispanic	10,900	10,700	300	9,000	100	0	1,100	100	100	7
8	Non-Hispanic	228,200	225,000	171,300	19,000	100	500	34,000	0	100	8
9	Black	179,100	182,200	113,000	54,000	0	700	13,300	1,000	200	9
10	Other	12,700	12,800	1,700	8,900	0	0	2,000	0	100	10
11	Total Hispanics	13,600	13,600	1,100	11,000	100	0	1,100	100	100	11
	Income Source										
12	Wages and salaries	345,900	345,000	219,000	79,500	200	1,000	44,200	700	400	12
13	Welfare or SSI	103,500	106,100	57,200	42,100	100	400	5,900	200	100	13
14	Social security or pension	34,500	15,400	3,600	9,900	0	0	1,700	200	100	14

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

	A Characteristics	B Published Numbers	C Present in 2004	D 04 units present in 95	E Changed in characteristics	G 04 mobile homes moved in	H 04 units derived from nonresidential use	I 04 units added through new construction	J 04 units added from temporary losses	K 04 units added by other means	
1	**Occupied units**	430,800	430,700	348,700	28,500	200	1,300	50,400	1,100	500	1
	Tenure										
2	Owner occupied	287,500	287,500	227,800	23,300	0	300	35,700	200	100	2
3	Percent own occpd	66.7%	66.8%								3
4	Renter occupied	143,200	143,200	83,800	42,300	200	1,000	14,600	900	400	4
	Renter Monthly Housing Costs										
5	Less than $350	15,800	17,900	9,500	6,500	0	300	1,200	400	0	5
6	$350 to $599	45,000	46,900	19,400	25,600	0	100	1,200	300	200	6
7	$600 to $799	43,800	42,900	8,300	27,800	200	200	6,100	100	100	7
8	$800 to $1,249	25,600	24,900	2,000	18,000	0	200	4,700	0	0	8
9	$1,250 or more	3,600	4,000	0	2,900	0	0	1,100	0	0	9
10	No cash rent	9,200	6,700	1,200	5,000	0	100	400	0	100	10
	Renter Hsd Income										
11	Less than $15,000	42,000	43,000	15,400	24,000	0	200	3,100	300	0	11
12	$15,000 to $29,999	41,400	41,300	9,100	28,300	0	300	3,000	400	200	12
13	$30,000 to $49,999	32,200	31,500	4,700	22,200	100	300	3,900	100	100	13
14	$50,000 to $99,999	24,300	24,400	2,600	17,800	100	100	3,700	0	100	14
15	$100,000 or more	3,500	2,900	100	1,900	0	0	900	0	0	15
	Owner Monthly Housing Costs										
16	Less than $350	74,200	65,000	28,700	31,500	0	200	4,500	0	100	16
17	$350 to $599	54,400	57,200	12,200	41,000	0	0	3,900	100	0	17
18	$600 to $799	35,300	37,600	9,300	25,500	0	0	2,600	100	0	18
19	$800 to $1,249	66,900	68,600	19,200	40,700	0	100	8,700	0	0	19
20	$1,250 or more	56,700	59,200	15,000	28,100	0	0	16,100	0	0	20
	Owner Hsd Income										
21	Less than $15,000	33,900	33,400	10,800	21,200	0	0	1,300	0	100	21
22	$15,000 to $29,999	38,100	38,400	11,600	24,800	0	100	1,700	100	0	22
23	$30,000 to $49,999	59,000	58,700	14,600	38,100	0	100	5,800	100	0	23
24	$50,000 to $99,999	101,400	102,500	36,200	49,700	0	0	16,600	0	0	24
25	$100,000 or more	55,200	54,500	12,800	31,200	0	100	10,300	0	0	25

Changes in the Memphis Housing Stock: 1996-2004

Forward-looking Table 5 looks at how losses affected certain portions of the Memphis housing stock. The rows were selected because of their inherent interest or because an examination of losses in all 13 metropolitan areas showed that these categories typically had high loss rates. In most cases, if a category had a high loss rate, then a category with the opposite characteristic would have a low loss rate, e.g., units with 1-4 rooms and units with 10 or more rooms.

Forward-Looking Table 5: Selected Loss Rates

Category	Based on Columns in Tables 1-4		
	All Losses 1996-2004 (F+G+H+I+J+K)/C	**Permanent Losses** (I/C)	**Potentially Reversible Losses** (F+G+H+J+K)/C
All units[16]	4.3%	3.0%	1.3%
Vacant units	9.2%	6.9%	2.3%
Units in structures with 2-4 units	7.6%	6.4%	1.3%
Units in structures with 5-9 units	9.3%	7.1%	2.3%
Mobile homes/trailers	16.7%	5.6%	11.1%
Units built 1930-1939	8.4%	6.5%	1.9%
Units built 1920-1929	6.4%	6.4%	0.0%
Units built in 1919 or earlier	8.3%	5.6%	2.8%
Units with 1-4 rooms	9.5%	6.9%	2.6%
Units with no bedrooms	4.8%	4.8%	0.0%
Units in central cities	4.8%	3.7%	1.1%
Units outside of central city	3.5%	2.0%	1.5%
Occupied units[17]	3.8%	2.6%	1.2%
Units with severe problems	11.1%	7.4%	3.7%
Units with moderate problems	13.5%	8.4%	5.2%
Units with a White householder	2.0%	1.2%	0.8%
Units with a Black householder	6.6%	4.7%	1.9%
Units with Hispanic householder	7.4%	5.9%	1.5%
Household receives welfare/SSI	15.2%	11.3%	3.9%
Owner-occupied units	1.5%	0.8%	0.8%
Renter-occupied units	8.0%	5.9%	2.2%
Renter-occupied – monthly housing costs less than $350	18.8%	14.8%	4.0%
Renter-occupied – household income less than $15,000	13.7%	9.7%	4.0%

[16] All the rows above "Occupied units" refer to portions of the entire housing stock.
[17] All the rows below "Occupied units" refer to portions of the occupied housing stock.

By 2004, 4.3 percent of the units in the 1996 housing stock was no longer part of the housing stock; 3.0 percent were permanent losses—that is, the units had either been demolished or destroyed by fire or natural disasters—while 1.3 percent were lost in ways that could be reversed, such as nonresidential use.

Units that were vacant in 1996 had a loss rate more than twice the overall loss rate. Units in small structures and mobile homes also had higher than average loss rates, as did units built prior to 1940. Small units also had higher loss rates. The central city loss rate was higher than the loss rate in the rest of the metropolitan area, but compared to most of the other 13 metropolitan areas studied, the difference between the two areas was relatively small.

Among units occupied in 1996, 3.8 percent were lost by 2004. The loss rate was higher for units with physical problems. The loss rates for units occupied by Black or Hispanic householders were more than 3 times the rate of those occupied by White householders. Units with households on welfare or SSI had very high loss rates.

The loss rate among rental units was more than 5 times the loss rate among owner-occupied units. Low cost rent units and rental units occupied by the lowest income households had high loss rates.

Backward-looking Table 5 presents addition rates for selected areas of the Memphis housing stock. The rows were selected because of their inherent interest or because an examination of additions in all 13 metropolitan areas showed that these categories typically had high addition rates. In most cases, if a category had a high addition rate, then a category with the opposite characteristic would have a low addition rate, e.g., units with 10 or more rooms and units with no bedrooms.

Of all the units in the Memphis housing stock in 2004, 12.2 percent were not in the 1996 housing stock. Most of the new units came from new construction; the return to the housing stock of units that were not available in 1996 accounted for less than 1 percent of the total units in 2004.

Unlike most of the metropolitan areas studied, single units in attached structures and mobile homes had lower than average addition rates. Large units had high addition rates, as did units with no bedrooms. Most of the additions of zero-bedroom units came from sources other than new construction. The addition rate in central cities was less than one-fifth of the addition rate in the rest of the metropolitan area.

New construction formed a higher proportion of the units occupied by White householders than the proportion occupied by Black householders. The addition rates of owner-occupied and renter-occupied units were approximately equal. Rental units with monthly housing costs of $800 to $1,250, owner-occupied units with monthly housing costs greater than $1,250, and owner-occupied units with households with income of $100,000 or more had higher than average addition rates.

Backward-Looking Table 5: Selected Addition Rates

Category	Based on Columns in Tables 1-4		
	All Additions (G+H+I+J+K)/C	**New Construction** I/C	**Other Additions** G+H+J+K/C
All units[18]	12.2%	11.2%	0.9%
Single-unit, attached structure	9.2%	8.0%	1.2%
Mobile homes/trailers	6.9%	2.3%	4.6%
Units with 9 rooms	28.1%	28.1%	0.0%
Units with 10 or more rooms	26.0%	26.0%	0.0%
Units with no bedrooms	30.4%	8.7%	21.7%
Units in central cities	3.9%	2.4%	1.5%
Units outside of central city	20.9%	20.6%	0.3%
Occupied units[19]	12.4%	11.7%	0.7%
Units with a white householder	15.3%	14.9%	0.4%
Units with a Black householder	8.3%	7.3%	1.0%
Units with Hispanic householder	10.3%	8.1%	2.2%
Owner-occupied units	12.6%	12.4%	0.2%
Renter-occupied units	11.9%	10.2%	1.7%
Renter-occupied – monthly housing costs $800 to $1,249	19.7%	18.9%	0.8%
Owner-occupied – monthly housing costs $1,250 or more	27.2%	27.2%	0.0%
Owner-occupied – household income $100,000 or more	19.1%	18.9%	0.2%

Rental Market Dynamics

Tables A and B present the rental market dynamics analysis. Rental market dynamics differs from the analysis in rows 5-10 in the forward-looking and backward-looking tables in two ways. First, rental market dynamics uses categories (rows) based on affordability instead of absolute dollar amount. Affordability is defined relative to local area median income measured at the same time that monthly housing costs are measured. Tables A and B use the following seven categories:

- Non-market (either no cash rent or a subsidized rent).
- Extremely low rent (monthly housing costs affordable to renters with incomes less than or equal to 30 percent of local area median income).[20]

[18] All the rows above "Occupied units" refer to portions of the entire housing stock.
[19] All the rows below "Occupied units" refer to portions of the occupied housing stock.
[20] "Affordable" is defined as monthly housing costs less than or equal to 30 percent of the highest income in the category.

Table A: Forward-Looking Rental Dynamics Analysis, Counts: 1996-2004

Affordability Groups	A Total in 1996	B Non-Market in 2004	C Extremely Low Rent in 2004	D Very Low Rent in 2004	E Low Rent in 2004	F Moderate Rent in 2004	G High Rent in 2004	H Very or Extremely High Rent in 2004	I Owner Occupied in 2004	J Seasonal or Vacant in 2004	K Lost to Stock in 2004
Non-market	24,100	7,200	2,700	2,700	700	100	0	0	2,400	4,000	4,200
Extremely Low Rent	14,000	900	3,800	1,600	400	0	0	100	900	3,700	2,700
Very Low Rent	45,000	1,100	3,600	19,900	2,100	700	0	0	2,400	12,400	2,800
Low Rent	22,000	400	400	9,100	3,400	1,600	0	0	1,400	5,100	500
Moderate Rent	25,200	400	0	4,800	6,500	4,100	0	100	3,700	4,500	900
High Rent	8,400	100	100	100	700	1,600	100	1,000	3,300	1,100	100
Very or Extremely High Rent	700	0	0	0	0	0	100	100	100	300	0
Total	139,400	10,200	10,700	38,200	13,900	8,100	300	1,400	14,200	31,100	11,200

Table B: Backward-Looking Rental Dynamics Analysis, Counts: 2004-1996

Affordability Groups	A Total in 2004	B Non-Market in 1996	C Extremely Low Rent in 1996	D Very Low Rent in 1996	E Low Rent in 1996	F Moderate Rent in 1996	G High Rent in 1996	H Very or Extremely High Rent in 1996	I Owner Occupied in 1996	J Seasonal or Vacant in 1996	K New Construc-tion	L Other Additions
Non-market	18,700	7,300	900	1,200	400	400	100	0	3,300	2,900	1,400	700
Extremely Low Rent	15,900	2,700	3,900	3,600	400	0	100	0	1,400	2,600	800	300
Very Low Rent	56,500	2,700	1,600	20,100	9,200	4,900	100	0	5,500	9,300	2,300	700
Low Rent	26,000	700	400	2,200	3,500	6,600	700	0	4,000	2,900	4,600	400
Moderate Rent	20,200	100	0	700	1,600	4,200	1,600	0	6,800	1,300	3,800	100
High Rent	2,300	0	0	0	0	0	100	100	1,200	300	500	100
Very or Extremely High Rent	3,600	0	100	0	0	100	1,000	100	900	100	1,100	0
Total	143,200	13,700	6,900	27,700	15,100	16,200	3,900	300	22,900	19,400	14,600	2,400

- Very low rent (monthly housing costs affordable to renters with incomes greater than 30 percent but less than or equal to 50 percent of local area median income).

- Low rent (monthly housing costs affordable to renters with incomes greater than 50 percent but less than or equal to 60 percent of local area median income).

- Moderate rent (monthly housing costs affordable to renters with incomes greater than 60 percent but less than or equal to 80 percent of local area median income).

- High rent (monthly housing costs affordable to renters with incomes greater than 80 percent but less than or equal to 100 percent of local area median income).

- Very high rent or extremely high rent (monthly housing costs affordable to renters with incomes greater than 100 percent of local area median income).[21]

The second difference is that rental market dynamics uses different columns in order to highlight changes in availability and affordability. Columns A through H duplicate the rows so that one can trace how rental units change their affordability status. Columns I and J track movement into or out of the owner-occupied stock or the seasonal or vacant stock, respectively. In Table A, the various types of losses are combined in column K, while, in Table B, new construction is recorded in column K and all other additions in column L.

Table A shows that there were 139,400 rental units in the Memphis metropolitan area in 1996. In 2004, 55,600 of those units were no longer rental; 14,200 were owner-occupied, 31,100 were either vacant or being used seasonally, and 11,200 had been lost to the stock. Taken as a proportion of the units in 1996, movement into owner-occupancy was high among units in the moderate and high rent categories, and losses to the stock were high among non-market units and extremely low rent units.

Table B shows there were 143,200 rental units in the Memphis metropolitan area in 2004, of which 59,300 were not rental units in 1996. The new units came from units that had been owner-occupied (22,900), units that had been vacant or in seasonal use (19,400), newly constructed units (14,600), and other additions (2,400). Most of the formerly owner-occupied units went to the moderate rent and very low rent categories; most of the newly constructed rental units went to the low rent and moderate rent categories.

Looking at both tables, we see that the overall number of rental units increased by approximately 4,000 units. The number of extremely low rent and very low rent units combined grew from almost 60,000 in 1996 to over 70,000 in 2004.

[21] Ideally this final category would be two separate categories with a boundary of 120 percent of local area median income. However, the Census Bureau uses top coding of variables to prevent data users from being able to identify specific units. At the metropolitan area level, top coding of the variables used to calculate housing costs results in monthly housing costs never exceeding the 120-percent boundary in one or both years.

Tables A and B paint an interesting picture of the evolution of the rental market in Memphis between 1996 and 2004. Overall, the number of rental units increased by approximately 2.7 percent, but the totals conceal considerable movement into and out of the rental market. The gross flows sum to approximately 115,000 units. Tables A and B also show that there was considerable movement by individual units across the affordability categories. The net effect of the gross flows into and out of the rental stock and the movement across rental categories was a substantial increase in the number of units affordable to the lowest income renters.

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) equaled the number of units present in the base year (column C). In every case, exact equality was achieved prior to rounding.

- Throughout the tables, various sets of rows are related to each other. For example, the year-built rows (13-24) 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, exact equality was achieved prior to 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. Footnote 2 indicates where the CINCH weights or coding used for individual rows does not seem to produce the same results as the published estimates.

Appendix B – Weighting

CINCH separates the AHS samples in 1996 and 2004 into three components: units that exist and are part of the housing stock in both years (SAMES), units that are part of the 1996 housing stock but are not part of the 2004 housing stock (LOSSES), and units that are not part of the 1996 housing stock but are part of the 2004 housing stock (ADDITIONS). ADDITIONS are segmented into NEW CONSTRUCTION and RECOVERIES (structures that existed in 1996 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 1996 and those ADDITIONS that were interviewed in 2004.

For the forward-looking analysis, we started with the AHS pure weights and used the AHS weighted count in 1996 of SAMES to create weights for the interviewed SAMES. We used the AHS weighted count in 1996 of LOSSES to create weights for interviewed LOSSES. We then adjusted the weights of SAMES and LOSSES to equal the AHS published totals for owner-occupied units, renter-occupied units, vacant units, and seasonal units in 1996.

For the backward-looking analysis, we started with the AHS pure weights and used the AHS weighted count in 2004 of SAMES to create weights for the interviewed SAMES. We used the AHS weighted counts in 2004 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 owner-occupied units, renter-occupied units, vacant units, and seasonal units in 2004.

The logic behind the weighting and the procedures used to create the weights are explained in *Weighting Strategy for 2004 Metropolitan CINCH and Rental Dynamics Analysis*.