Components of Inventory Change And Rental Market Dynamics: Kansas City 1995-2002

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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 Kansas City metropolitan housing market over the period between 1995 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 1995 may have become a medical office in 1997, but returned to being a housing unit in 2000. CINCH

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[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 1995 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 1995 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 1995 and units that were additions to the stock since 1995.

- 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 1995 housing stock by 2002. There are three basic dispositions of 1995 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 1995. There are three basic sources of 2002 units: units that existed in 1995 with the same characteristics (or serving the same market), units that existed in 1995 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 1995 AHS report for Kansas City counted 659,100 occupied units (column B, row 2, Forward-Looking Table 1); the 2002 AHS report counted 697,400 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 (1995 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 Kansas City metropolitan area, the CINCH weights produce population estimates that are very close to the published estimates except for units built after 1989 and owner monthly housing costs less than $500 (both in the backward-looking tables).

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[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.

- 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 594,520 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 48,920 units that were occupied in 1995 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 1995 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, 940 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, 750 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, 940 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, 6,790 units were demolished or destroyed.

- 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

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[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.

extensive damage. Among occupied units, 750 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 5,470 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 1995.[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, 720 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 1995. Among occupied units, 900 had been nonresidential.

- Column H is the CINCH estimate of the number of units from column C that were newly constructed between 1995 and 2002. Among occupied units, 72,840 units were newly constructed.

- 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 1995 or the interior of the 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, 1,270 had been temporarily lost to the stock in 1995.

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[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).

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 for the Kansas City metropolitan area.

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 1990-1995 and 1996-2002 to isolate units newly constructed since the previous AHS survey. [9] Column I shows that losses due to demolition or disasters were heavily concentrated in the older units. Among units built before 1940, 3 percent were demolished or destroyed by 2002, but only 1 percent of the units built in 1940 or later were demolished or destroyed.

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. In the Kansas City area, the Census Bureau listed units in structures of 7 or more stories in the category of structures of 4 to 6 stories. In general, the published reports contain matching data for row 36 only.

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[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 1995 housing stock cannot contain units built after 1995.

[9] 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. 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.

Rows 42-43 divide the housing stock between central cities units and suburban residences to determine how the observed changes vary by location. All of the mobile home move-outs and move-ins and 85 percent of new construction occurred in suburban areas in Kansas City. 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 1995 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 7 years with respect to having serious physical problems. None of the units with serious problems in 1995 had serious problems in 2002, and none of the units with serious problems in 2002 had serious problems in 1995. Little continuity was shown in the analysis for moderate problems, in which 8 percent of the units with moderate problems in 1995 still had moderate problems in 2002, and 10 percent of the units with moderate problems in 2002 had moderate problems in 1995. Fewer than 2 percent of the units had serious problems in either year, and fewer than 4 percent had moderate problems in either year.

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[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 1995 and 2002. In Kansas City, units occupied by Blacks were three times as likely to have been demolished or destroyed by 2002 as units occupied by Whites (2.5 percent versus 0.8 percent).

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. Rental units in Kansas City were four times as likely to be lost due to demolition or disasters as owner-occupied units (2.1 percent versus 0.5 percent).

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).

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[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.

- High-rent units (rents not affordable at 80 percent, but affordable at 100 percent of area median family income).

- 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 Kansas City, there are only four classes, with moderate-rent, 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]

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[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 1995	D 1995 units present in 2002	E Change in character-istics	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 Housing Stock**	715,500	715,500	692,730	0	1,650	930	1,300	9,640	1,290	7,960	1
	Occupancy Status											
2	Occupied	659,100	659,100	594,520	48,920	940	750	940	6,790	750	5,470	2
3	Vacant	55,000	55,000	12,250	35,830	710	180	360	2,660	530	2,490	3
4	Seasonal	1,400	1,400	610	610	0	0	0	180	0	0	4
	Units in Structure											
5	1, detached	499,300	505,290	494,850	0	0	550	550	5,590	190	3,550	5
6	1, attached	46,200	47,770	46,460	0	0	0	0	550	190	570	6
7	2 to 4	44,400	45,180	41,490	0	920	0	0	1,850	0	910	7
8	5 to 9	40,500	40,790	38,420	0	540	0	180	730	180	740	8
9	10 to 19	25,900	24,990	24,080	0	0	0	190	180	0	540	9
10	20 to 49	19,000	39,560	37,580	0	190	0	0	540	370	890	10
11	50 or more	20,400	0	0	0	0	0	0	0	0	0	11
12	Mobile Home/trailer	19,900	11,920	9,860	0	0	380	380	190	370	750	12
	Year Built											
14	1990-1995	54,100	50,980	50,620	0	0	0	0	0	180	180	14
15	1985-1989	69,000	67,170	66,040	0	0	0	380	0	190	570	15
16	1980-1984	38,000	38,110	37,550	0	190	0	0	370	0	0	16
17	1970-1979	179,300	178,740	173,480	0	380	380	190	2,060	190	2,060	17
18	1960-1969	109,900	109,870	107,460	0	0	380	0	1,110	0	920	18
19	1950-1959	97,200	98,760	96,170	0	180	0	0	1,480	190	740	19
20	1940-1949	52,300	53,860	51,090	0	180	0	190	1,120	180	1,110	20
21	1930-1939	34,700	35,560	32,990	0	190	0	540	1,100	0	740	21
22	1920-1929	32,800	33,650	32,010	0	0	0	0	740	0	900	22
23	1919 or earlier	48,300	48,790	45,310	0	540	180	0	1,660	370	730	23

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

	A Characteristics	B Published numbers	C Present in 1995	D 1995 units present in 2002	E Change in character-istics	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											
24	1 – 4 rooms	177,800	172,210	120,290	39,970	1,480	570	1,110	4,050	910	3,840	24
25	5 rooms	158,700	158,310	82,790	70,100	0	0	190	2,970	190	2,060	25
26	6 rooms	139,300	141,510	66,520	71,990	0	190	0	1,690	0	1,120	26
27	7 rooms	116,300	117,740	44,800	71,990	0	0	0	380	190	380	27
28	8 rooms	70,800	72,440	25,570	45,770	180	180	0	550	0	190	28
29	9 rooms	31,500	32,610	8,700	23,720	0	0	0	0	0	190	29
30	10 rooms or more	21,100	20,690	9,910	10,610	0	0	0	0	0	180	30
	Bedrooms											
31	None	8,800	8,100	2,020	4,650	190	0	0	180	180	890	31
32	1	84,300	84,130	66,040	12,980	920	0	180	2,190	370	1,450	32
33	2	198,900	194,860	150,390	34,760	370	570	1,120	4,100	370	3,200	33
34	3	288,700	291,570	235,520	51,760	180	190	0	2,250	380	1,300	34
35	4 or more	134,700	136,830	109,320	25,290	0	180	0	920	0	1,120	35
36	**Multiunit Structures**	150,200	150,520	141,560	0	1,650	0	370	3,300	540	3,090	36
	Stories in Structures											
37	1		7,930	7,360	0	380	0	0	190	0	0	37
38	2		35,640	33,810	0	540	0	190	550	190	360	38
39	3		75,010	70,950	0	730	0	0	1,660	180	1,490	39
40	4 to 6		31,930	29,440	0	0	0	180	900	180	1,240	40
41	7 or more		0	0	0	0	0	0	0	0	0	41
	Metro Status											
42	In central cities		202,690	192,190	0	540	0	550	4,620	730	4,040	42
43	In suburbs		512,810	500,540	0	1,110	930	740	5,020	550	3,920	43
	Mover Status											
44	Moved in last 2 years		167,730	48,300	113,020	380	750	0	2,830	190	2,260	44
45	Not a recent mover		491,370	416,630	65,500	570	0	940	3,960	570	3,210	45

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

	A Characteristics	B Published numbers	C Present in 1995	D 1995 units present in 2002	E Change in character-istics	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**	659,100	659,100	594,520	48,920	940	750	940	6,790	750	5,470	1
	Kitchen											
2	With complete kitchen	652,200	652,560	583,830	53,250	750	750	940	6,790	750	5,470	2
3	Lacking complete kitchen facilities	6,900	6,540	410	5,940	190	0	0	0	0	0	3
	Plumbing											
4	With all plumbing facilities	655,600	655,420	587,500	52,630	570	750	940	6,790	750	5,470	4
5	Lack some plumbing	4,400	3,680	0	3,310	380	0	0	0	0	0	5
6	No hot piped water	0	190	0	0	190	0	0	0	0	0	6
7	No bathtub/shower	400	380	0	0	380	0	0	0	0	0	7
8	No flush toilet	400	3,680	0	3,310	380	0	0	0	0	0	8
	Water											
9	Public/private water	654,100	654,370	589,150	49,740	940	750	940	6,600	750	5,470	9
10	Well	2,900	2,690	2,070	620	0	0	0	0	0	0	10
11	Other water source	2,100	2,050	830	1,030	0	0	0	190	0	0	11
	Sewer											
12	Public sewer	587,200	587,810	525,880	48,920	750	380	750	5,280	570	5,280	12
13	Septic tank/cesspool	71,900	71,290	51,960	16,680	190	380	190	1,510	190	190	13
14	**Severe Problems**	5,800	5,870	0	5,110	380	0	0	190	0	190	14
15	Plumbing	3,400	3,680	0	3,310	380	0	0	0	0	0	15
16	Heating	1,500	1,390	0	1,390	0	0	0	0	0	0	16
17	Electric	200	190	0	0	0	0	0	190	0	0	17
18	Upkeep	600	600	0	410	0	0	0	0	0	190	18
19	Hallways	0	0	0	0	0	0	0	0	0	0	19
20	**Moderate problems**	22,900	23,450	1,860	20,270	0	0	0	940	0	380	20
21	Plumbing	1,800	0	0	0	0	0	0	0	0	0	21
22	Heating	0	190	0	0	190	0	0	0	0	0	22
23	Kitchen	6,100	6,540	410	5,940	190	0	0	0	0	0	23
24	Upkeep	15,500	16,590	830	14,260	0	0	0	1,130	0	380	24
25	Hallways	0	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 1995	D 1995 units present in 2002	E Change in character-istics	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**	659,100	594,520	48,920	940	750	940	6,790	750	5,470		1
	Age											
2	Under 65	520,610	424,430	83,730	570	750	750	5,660	750	3,960		2
3	65 or older	138,490	83,260	52,010	380	0	190	1,130	0	1,510		3
	Children											
4	Some	247,240	129,340	111,670	0	380	380	3,590	190	1,700		4
5	None	411,860	305,010	97,420	940	380	570	3,210	570	3,770		5
	Race/Origin											
6	White	574,630	485,590	76,960	750	750	750	4,720	750	4,340		6
7	Hispanic	12,980	4,550	8,060	0	0	0	190	0	190		7
8	Non-Hispanic	561,650	472,360	77,580	750	750	750	4,530	750	4,150		8
9	Black	69,360	45,870	20,660	0	0	190	1,700	0	940		9
10	Other	15,110	6,300	8,060	190	0	0	380	0	190		10
11	Total Hispanics	16,680	7,440	8,680	0	0	0	380	0	190		11
	Income Source											
12	Wages and salaries	508,960	408,060	90,340	380	380	750	4,910	570	3,590		12
13	Welfare or SSI	34,630	4,340	27,840	0	190	380	1,320	0	570		13
14	Social security or pension	190,940	111,360	75,050	570	0	380	1,700	190	1,700		14

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

	A Characteristics	B Published numbers	C Present in 1995	D 1995 units present in 2002	E Change in character- istics	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**	659,100	594,520	48,920	940	750	940	6,790	750	5,470		1
	Tenure											
2	Owner occupied	442,830	394,210	42,770	0	190	750	2,260	380	2,260		2
3	Percent own occupied	67.2%	66.3%	NA	0.0%	25.0%	80.0%	33.3%	50.0%	41.4%		3
4	Renter occupied	216,270	144,320	62,140	940	570	190	4,530	380	3,210		4
	Rental Affordability											
5	Non-market	36,240	13,220	21,690	190	0	0	940	0	190		5
6	Extremely low rent	83,360	41,840	34,920	750	380	0	2,830	380	2,260		6
7	Very low rent	62,820	22,260	39,620	0	190	190	190	0	380		7
8	Low rent	23,550	4,340	18,650	0	0	0	380	0	190		8
9	Moderate to very high rent	10,290	3,510	6,400	0	0	0	190	0	190		9
	Renter Hsd Income											
12	Less than $20,000	91,480	33,470	53,100	940	190	0	1,130	190	2,450		12
13	$20,000 to $34,999	63,190	14,310	45,870	0	190	0	2,260	190	380		13
14	$35,000 to $59,999	47,000	8,940	36,930	0	190	190	570	0	190		14
15	$60,000 to $99,999	12,140	1,450	10,120	0	0	0	380	0	190		15
16	$100,000 or more	2,460	0	2,270	0	0	0	190	0	0		16
	Owner Monthly Housing Costs											
17	Less than $499	199,260	103,720	91,010	0	0	750	1,700	190	1,890		17
18	$500 to $699	79,060	12,190	65,930	0	190	0	380	190	190		18
19	$700 to $999	89,890	26,650	63,240	0	0	0	0	0	0		19
20	$1,000 to $1,499	51,840	22,540	28,930	0	0	0	190	0	190		20
21	$1,500 or more	22,780	13,690	9,090	0	0	0	0	0	0		21
	Owner Hsd Income											
22	Less than $20,000	72,910	21,640	48,810	0	190	380	750	190	940		22
23	$20,000 to $34,999	98,960	22,160	74,350	0	0	380	940	0	1,130		23
24	$35,000 to $59,999	129,580	39,200	90,000	0	0	0	190	190	0		24
25	$60,000 to $99,999	107,320	35,610	71,330	0	0	0	380	0	0		25
26	$100,000 or more	34,070	16,060	17,820	0	0	0	0	0	190		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 1995	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**	766,500	766,400	678,300	0	890	1,260	84,190	1,760	1
	Occupancy Status									
2	Occupied	697,400	697,400	584,450	37,220	720	900	72,840	1,270	2
3	Vacant	67,300	67,300	11,590	43,540	160	160	11,360	490	3
4	Seasonal	1,700	1,700	650	860	0	190	0	0	4
	Units in Structure									
5	1, detached	541,700	549,560	491,320	0	0	190	57,540	510	5
6	1, attached	98,500	99,860	86,410	0	0	360	12,910	180	6
7	2 to 4	26,100	27,010	25,130	0	0	340	1,170	360	7
8	5 to 9	26,800	26,120	21,510	0	0	180	4,060	360	8
9	10 to 19	26,700	25,910	20,560	0	0	0	5,170	180	9
10	20 to 49	12,800	12,960	10,290	0	0	0	2,670	0	10
11	50 or more	13,700	13,390	12,880	0	0	0	350	160	11
12	Mobile Home/trailer	20,300	11,600	10,200	0	890	180	330	0	12
	Year Built									
13	1996-2002	Included in 14	83,420	6,660	0	360	0	76,210	180	13
14	1990-1995	161,000	62,420	54,250	0	0	180	7,980	0	14
15	1985-1989	70,000	70,460	69,550	0	360	180	0	360	15
16	1980-1984	40,100	39,800	39,620	0	0	0	0	180	16
17	1970-1979	131,200	132,110	131,780	0	160	160	0	0	17
18	1960-1969	109,000	112,800	112,260	0	0	180	0	360	18
19	1950-1959	98,200	101,370	101,190	0	0	180	0	0	19
20	1940-1949	51,700	53,960	53,780	0	0	0	0	180	20
21	1930-1939	33,100	34,910	34,720	0	0	190	0	0	21
22	1920-1929	34,100	35,120	34,800	0	0	0	0	330	22
23	1919 or earlier	38,000	40,040	39,700	0	0	180	0	160	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 1995	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	170,400	166,490	117,450	32,060	340	540	15,030	1,070	24
25	5 rooms	169,200	169,310	80,850	72,570	360	550	14,460	510	25
26	6 rooms	160,700	161,990	65,290	81,510	180	0	14,820	180	26
27	7 rooms	114,800	116,040	43,880	57,120	0	0	15,040	0	27
28	8 rooms	72,500	74,350	25,060	36,940	0	0	12,350	0	28
29	9 rooms	37,400	36,390	8,560	19,650	0	160	8,010	0	29
30	10 rooms or more	41,500	41,830	9,730	27,620	0	0	4,480	0	30
	Bedrooms									
31	None	5,900	5,650	1,950	3,530	0	0	170	0	31
32	1	85,900	86,000	64,480	12,670	0	180	7,780	890	32
33	2	194,500	192,540	147,060	29,770	340	540	14,120	690	33
34	3	308,000	310,080	231,110	47,670	540	540	30,040	180	34
35	4 or more	172,300	172,120	107,460	32,590	0	0	32,080	0	35
36	**Multiunit Structures**	106,100	105,380	90,370	0	0	530	13,420	1,070	36
	Stories in Structures									
37	1		6,960	6,140	0	0	0	820	0	37
38	2		40,370	30,480	0	0	180	9,530	180	38
39	3		42,670	39,060	0	0	340	2,550	720	39
40	4 to 6		9,710	9,190	0	0	0	520	0	40
41	7 or more		5,660	5,490	0	0	0	0	160	41
	Metro Status									
42	In central cities		201,870	187,850	0	0	340	12,260	1,410	42
43	In suburbs		564,530	490,450	0	890	920	71,930	340	43
	Mover Status									
44	Moved in last 2 years		158,470	47,480	79,420	360	180	30,130	900	44
45	Not a recent mover		538,930	402,110	92,670	360	720	42,700	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 1995	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**	697,400	697,400	584,450	37,220	720	900	72,840	1,270	1
	Kitchen									
2	With complete kitchen	690,300	691,090	573,940	42,040	540	720	72,580	1,270	2
3	Lacking complete kitchen facilities	7,200	6,310	410	5,280	180	180	260	0	3
	Plumbing									
4	With all plumbing facilities	693,500	693,340	577,540	40,060	720	900	72,840	1,270	4
5	Lack some plumbing	4,000	4,060	0	4,060	0	0	0	0	5
6	No hot piped water	300	410	0	410	0	0	0	0	6
7	No bathtub/shower	0	0	0	0	0	0	0	0	7
8	No flush toilet	0	0	0	0	0	0	0	0	8
	Water									
9	Public/private water	693,200	693,040	579,170	38,440	720	900	72,530	1,270	9
10	Well	3,000	2,840	2,030	810	0	0	0	0	10
11	Other water source	1,200	1,320	810	200	0	0	300	0	11
	Sewer									
12	Public sewer	639,200	640,070	516,970	51,180	720	900	69,030	1,270	12
13	Septic tank/cesspool	58,200	57,330	51,080	2,440	0	0	3,810	0	13
14	**Severe Problems**	12,500	12,710	0	12,190	0	0	520	0	14
15	Plumbing	4,000	4,060	0	4,060	0	0	0	0	15
16	Heating	8,200	8,240	0	7,720	0	0	520	0	16
17	Electric	200	200	0	200	0	0	0	0	17
18	Upkeep	200	200	0	200	0	0	0	0	18
19	Hallways	200	200	0	200	0	0	0	0	19
20	**Moderate problems**	18,700	18,040	1,830	15,230	180	360	430	0	20
21	Plumbing	1,400	1,220	0	1,220	0	0	0	0	21
22	Heating	1,400	1,200	0	1,020	0	180	0	0	22
23	Kitchen	7,000	6,310	410	5,280	180	180	260	0	23
24	Upkeep	8,600	9,310	810	8,330	0	0	170	0	24
25	Hallways	700	790	0	610	0	180	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 1995	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**	697,400	697,400	584,450	37,220	720	900	72,840	1,270	1
	Age									
2	Under 65	564,600	561,530	417,240	75,760	720	360	66,180	1,270	2
3	65 or older	132,800	135,870	81,850	46,820	0	540	6,660	0	3
	Children									
4	Some	242,600	243,990	127,150	81,800	0	180	34,670	180	4
5	None	454,900	453,410	299,840	112,880	720	720	38,160	1,090	5
	Race/Origin									
6	White	579,700	581,420	477,360	38,030	720	720	64,220	360	6
7	Hispanic	12,500	12,530	4,470	6,500	0	0	1,560	0	7
8	Non-Hispanic	567,300	568,890	464,360	40,060	720	720	62,660	360	8
9	Black	84,100	82,750	45,090	32,700	0	0	4,240	720	9
10	Other	33,700	33,230	6,190	22,290	0	180	4,380	180	10
11	Total Hispanics	29,800	29,320	7,310	19,500	0	0	2,510	0	11
	Income Source									
12	Wages and salaries	568,700	566,640	401,140	96,730	720	540	66,590	900	12
13	Welfare or SSI	22,000	23,330	4,270	18,890	0	0	170	0	13
14	Social security or pension	178,900	181,180	109,480	62,510	0	540	8,650	0	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 1995	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**	697,400	697,400	584,450	37,220	720	900	72,840	1,270	1
	Tenure									
2	Owner occupied	487,100	487,800	387,530	44,730	720	180	54,630	0	2
3	Percent own occupied	69.8%	69.9%	66.3%	NA	100.0%	20.0%	75.0%	0.0%	3
4	Renter occupied	210,300	209,600	141,870	47,530	0	720	18,210	1,270	4
	Rental Affordability									
5	Non-market		32,730	13,000	17,870	0	0	1,860	0	5
6	Extremely low rent		94,870	41,130	50,170	0	540	1,950	1,090	6
7	Very low rent		56,290	21,890	26,860	0	0	7,370	180	7
8	Low rent		17,100	4,270	8,330	0	180	4,330	0	8
9	Moderate to very high rent		8,600	3,450	2,440	0	0	2,710	0	9
	Renter Hsd Income									
12	Less than $20,000	70,900	72,220	32,900	34,930	0	360	3,470	540	12
13	$20,000 to $34,999	58,300	56,010	14,070	39,000	0	180	2,410	360	13
14	$35,000 to $59,999	50,000	49,520	8,780	35,750	0	0	4,630	360	14
15	$60,000 to $99,999	23,100	23,700	1,420	17,060	0	180	5,030	0	15
16	$100,000 or more	8,100	8,150	0	5,480	0	0	2,670	0	16
	Owner Monthly Housing Costs									
17	Less than $499	180,400	163,660	101,960	54,150	540	0	7,010	0	17
18	$500 to $699	49,900	54,300	11,980	39,500	0	0	2,810	0	18
19	$700 to $999	90,900	88,950	26,200	58,240	180	0	4,330	0	19
20	$1,000 to $1,499	103,000	111,470	22,160	71,610	0	180	17,520	0	20
21	$1,500 or more	63,000	69,430	13,460	33,010	0	0	22,970	0	21
	Owner Hsd Income									
22	Less than $20,000	64,300	61,860	21,280	39,710	180	0	690	0	22
23	$20,000 to $34,999	77,600	77,600	21,780	50,780	360	180	4,500	0	23
24	$35,000 to $59,999	115,800	116,520	38,540	69,410	0	0	8,560	0	24
25	$60,000 to $99,999	133,600	134,820	35,000	77,060	180	0	22,580	0	25
26	$100,000 or more	96,000	97,000	15,790	62,910	0	0	18,300	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 Kansas City in both 1995 and 2002, we cannot distinguish among units in the moderate-rent, high-rent, and very-high-rent categories, and therefore have collapsed these three categories into one category, moderate-to-very-high-rent units (column *J*).

Table A shows that there were 216,270 rental units in the Kansas City metropolitan area in 1995. In 2002, 71,950 of these units were no longer rental; 30,580 were owner-occupied, 31,560 were either vacant or being used seasonally, and 9,810 had been lost to the stock. Taken as a proportion of the units in 1995, movement into owner-occupancy was spread fairly evenly across the various rental categories, but losses to the stock were greater among extremely low rent units.

Table B shows there were 209,600 rental units in the Kansas City metropolitan area in 2002, of which 67,730 were not rental units in 1995. The new units came from units that had been owner-occupied (24,980), units that had been vacant or in seasonal use (22,550), newly constructed units (18,210), and other additions (1,990). 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 very-low-rent and low-rent categories.

Looking at both tables, we see that the overall number of rental units was slightly lower in 2002 than in 1995. The number of extremely-low-rent and very-low-rent units combined grew from approximately 145,000 in 1995 to approximately 150,000 in 2002.

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[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 1995	D Non-market in 2002	E Extremely low rent in 2002	F Very low rent in 2002	G Low rent in 2002	J Moderate to very high rent in 2002	K Owner-occupied in 2002	L Vacant or seasonal in 2002	M Lost to stock
Non-market	36,240	13,220	8,060	2,480	1,450	210	4,550	4,960	1,320
Extremely low rent	83,360	5,170	41,840	3,510	210	210	12,810	13,020	6,600
Very low rent	62,820	2,890	17,980	22,260	1,240	0	7,440	10,070	940
Low rent	23,550	1,450	830	9,760	4,340	620	3,930	2,070	570
Moderate to very high rent	10,290	410	210	620	1,860	3,510	1,860	1,450	380
Column sum	216,270	23,140	68,900	38,640	9,090	4,550	30,580	31,560	9,810

Table B: Backward-Looking Rental Dynamics Analysis

Backward looking	C Number in 2002	D Non-market in 1995	E Extremely low rent in 1995	F Very low rent in 1995	G Low rent in 1995	J Moderate to very high rent in 1995	K Owner-occupied in 1995	L Vacant or seasonal in 1995	M New construction	N Other additions
Non-market	32,730	13,000	5,080	2,840	1,420	410	3,450	4,670	1,860	0
Extremely low rent	94,870	7,920	41,130	17,670	810	200	10,360	13,200	1,950	1,630
Very low rent	56,290	2,440	3,450	21,890	9,600	610	6,910	3,860	7,370	180
Low rent	17,100	1,420	200	1,220	4,270	1,830	3,250	410	4,330	180
Moderate to very high rent	8,600	200	200	0	610	3,450	1,020	410	2,710	0
Column sum	209,600	24,980	50,070	43,620	16,710	6,500	24,980	22,550	18,210	1,990

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 1995 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 1995 housing stock but are not part of the 2002 housing stock (LOSSES), and units that are not part of the 1995 housing stock but are part of the 2002 housing stock (ADDITIONS). ADDITIONS are split into NEW CONSTRUCTION and RECOVERIES (structures that existed in 1995 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 1995 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 1995 of SAMES to create weights for the interviewed SAMES. We used the AHS weighted count in 1995 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 1995.

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*.