

American Housing Survey

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

February 2005

Econometrica, Inc.
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, 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. Vandembroucke, 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 Gregory J. Watson of ICF Consulting for assistance in solving the weighting problem, and Dennis Schwanz of the Census Bureau for commenting on the proposed weighting.

Components of Inventory Change and Rental Market Dynamics: Milwaukee 1994-2002

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 Milwaukee metropolitan housing market over the period between 1994 and 2002. It is one of 13 reports based on local American Housing Surveys conducted in 2002; these 13 metropolitan areas were previously surveyed in either 1994 or 1995.

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

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

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

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

The remainder of this report consists of four sections:

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

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

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

How to Read CINCH Tables

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

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

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

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

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

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

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

- Column A specifies the characteristic that defines the subset of the stock that is being tracked forward or backward in a particular row. For example, row 2 of Table 1 focuses on occupied units; row 15 focuses on units built in 1985 through 1989.
- Column B gives the estimate published in the AHS report for the number of units that satisfy the conditions specified in column A. For example, the 1994 AHS report for Milwaukee counted 559,600 occupied units (column B, row 2, Forward-Looking Table 1); the 2002 AHS report counted 584,600 occupied units (column B, row 2, Backward-Looking Table 1).
- Column C gives the CINCH estimate of the number of units that satisfy two conditions: (a) being part of the housing stock in the relevant year (1994 for the forward-looking tables and 2002 for the backward-looking tables); and (b) satisfying the condition in column A. CINCH uses different weights than those used in preparing the published reports. Therefore, CINCH estimates can differ from AHS estimates for particular subsets of the housing stock. As explained in Appendix B, the weights were created to match AHS published totals for rows 2 through 4 of Table 1. This perfect match will not be true of other rows.² In the case of the Milwaukee metropolitan area, the CINCH weights produce population estimates that are very close to the published estimates.
- 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.

Looking Table 1 estimates that 515,030 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 34,290 units that were occupied in 1994 are still part of the housing stock in 2002 but are no longer occupied. In some cases, the analysis will not allow a unit to change characteristics between the base year and the other year. Examples include type of structure, year built, and number of stories—characteristics that are considered impossible or unlikely to change.

Columns Unique to Forward-Looking Tables

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

- Column F is the CINCH estimate of the number of units from column C that are not in the 2002 housing stock because they were merged with other units or converted into multiple units. Among occupied units, 500 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, no mobile homes were moved out.
- 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, 930 became nonresidential.
- Column I is the CINCH estimate of the number of units from column C that were demolished or were destroyed by fires or natural disasters by 2002. In this case, 5,820 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 extensive damage. Among occupied units, 1,190 units are no longer usable for housing.

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

- Column 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 1,830 units lost for these miscellaneous reasons.

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

Columns Unique to Backward-Looking Tables

In backward-looking tables, columns F through I track where units came from that are part of the housing stock in 2002, but were not part of the housing stock in 1994.⁵

- Column F is the CINCH estimate of the number of mobile homes from column C that were moved in during the period. Among occupied units, no mobile homes were moved in (column F, row 2 of Backward-Looking Table 1).⁶
- Column G is the CINCH estimate of the number of units from column C that had been nonresidential in 1994. Among occupied units, 1,040 had been nonresidential.
- Column H is the CINCH estimate of the number of units from column C that were newly constructed between 1994 and 2002. Among occupied units, 44,280 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 1994 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, 660 had been temporarily lost to the stock in 1994.

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.

Rows 13-23 divide the housing stock by year built.⁸ The published reports use the categories 1990-1994, 1995-1999, and 2000-2004; we use 1990-1994 and 1995-2002 to isolate units newly constructed since the previous AHS survey.⁹ Column I shows that the incidence of losses due to demolition or disasters was heavily concentrated in the older units. Among units built in 1919 or earlier, 4 percent were demolished or destroyed by 2002.

Rows 24-30 and 31-35 divide the housing stock by two different measures of interior space, the number of rooms and the number of bedrooms.¹⁰ Column H in the forward-looking table and column G in the backward-looking table show that smaller units in terms of the number of rooms are more likely to move into and out of nonresidential use.

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 general, the published reports contain matching data for row 36 only.

Rows 42-43 divide the housing stock between central cities units and suburban residences to determine how the observed changes vary by location. Rows 44-45 divide the housing stock by whether or not the occupants have moved in within the last two calendar years to

⁷ In general, the CINCH estimates exceed published AHS estimates for single-family detached units and fall short of the published AHS estimates for manufactured homes by roughly equal amounts.

⁸ Row 13 is not included in the forward-looking tables, because the 1994 housing stock cannot contain units built after 1994.

⁹ We use REUAD=3 and not year built to identify new construction. For this reason, there are units built after 1994 that are not considered new construction. In addition, year built is obtained from the respondent interview and may be inaccurate.

¹⁰ Because of small sample sizes in the losses and additions columns, we combined room categories that the published reports list separately.

determine if certain units consistently have high turnover and to see if high turnover units are more susceptible to loss.

Table 2

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

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

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

Rows 14-19 look at units with serious problems. Rows 15-19 identify specific types of serious deficiencies. Row 14 counts the units having one or more of these deficiencies. Rows 20-25 look at units with moderate problems. Rows 21-25 identify specific types of deficiencies. Row 20 counts the units having one or more of these deficiencies.¹¹ These rows are in the analysis to answer two questions: whether poor-quality units in one year are also poor-quality units in the other year, and whether poorer quality units are more likely to be lost. Both the forward-looking and backward-looking analyses indicate that there is little continuity over the 8 years with respect to having serious physical problems. Fewer than 10 percent of the units with serious problems in 1994 had serious problems in 2002, and fewer than 10 percent of the units with serious problems in 2002 had serious problems in 1994. Slightly more continuity was shown in the forward-looking analysis for moderate problems, where approximately 16 percent of the units with moderate problems in 1994 still had moderate problems in 2002. Fewer than 2 percent of the units had serious problems in either year, and fewer than 5 percent had moderate problems in either year.

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.

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.

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

Table 4

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

Rows 2-4 focus on tenure to determine the extent to which units change tenure characteristics and whether rental or owner-occupied units are more likely to be lost. Rental units in Milwaukee were four times as likely to be lost due to demolition or disasters as owner-occupied units.

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

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

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

Components of Inventory Change and Rental Market Dynamics:
Milwaukee 1994–2002

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 Milwaukee, 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

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.

Components of Inventory Change and Rental Market Dynamics:
Milwaukee 1994–2002

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

| | A Characteristics | B Published numbers | C Present in 1994 | D 1994 units present in 2002 | E Change in character- istics | F '94 units affected by conversion /merger | G '94 mobile homes moved out | H '94 units changed to nonresidential use | I '94 units lost through demolition or disaster | J '94 units badly damaged or condemned | K '94 units lost in other ways | |
|----|----------------------------|---------------------------|-------------------------|---------------------------------------|--|--|--|---|---|--|--|----|
| 1 | Total Housing Stock | 593,000 | 593,100 | 580,790 | 0 | 650 | 0 | 1,250 | 7,010 | 1,320 | 2,080 | 1 |
| | Occupancy Status | | | | | | | | | | | |
| 2 | Occupied | 559,600 | 559,600 | 515,030 | 34,290 | 500 | 0 | 930 | 5,820 | 1,190 | 1,830 | 2 |
| 3 | Vacant | 32,400 | 32,400 | 5,470 | 24,890 | 150 | 0 | 320 | 1,190 | 120 | 250 | 3 |
| 4 | Seasonal | 1,100 | 1,100 | 920 | 180 | 0 | 0 | 0 | 0 | 0 | 0 | 4 |
| | Units in Structure | | | | | | | | | | | |
| 5 | 1, detached | 328,800 | 333,470 | 329,060 | 0 | 0 | 0 | 320 | 2,870 | 200 | 1,020 | 5 |
| 6 | 1, attached | 24,900 | 25,430 | 24,550 | 0 | 0 | 0 | 320 | 330 | 0 | 240 | 6 |
| 7 | 2 to 4 | 127,000 | 125,070 | 121,280 | 0 | 500 | 0 | 490 | 1,740 | 370 | 690 | 7 |
| 8 | 5 to 9 | 35,400 | 34,530 | 33,050 | 0 | 0 | 0 | 120 | 860 | 370 | 120 | 8 |
| 9 | 10 to 19 | 18,800 | 19,280 | 18,900 | 0 | 0 | 0 | 0 | 250 | 120 | 0 | 9 |
| 10 | 20 to 49 | 25,400 | 23,980 | 23,370 | 0 | 0 | 0 | 0 | 600 | 0 | 0 | 10 |
| 11 | 50 or more | 29,400 | 29,270 | 28,500 | 0 | 150 | 0 | 0 | 370 | 250 | 0 | 11 |
| 12 | Mobile Home/trailer | 3,400 | 2,080 | 2,080 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 12 |
| | Year Built | | | | | | | | | | | |
| 14 | 1990-1994 | 33,000 | 33,590 | 33,440 | 0 | 0 | 0 | 0 | 0 | 0 | 150 | 14 |
| 15 | 1985-1989 | 24,900 | 25,580 | 25,430 | 0 | 0 | 0 | 0 | 0 | 0 | 150 | 15 |
| 16 | 1980-1984 | 17,500 | 17,990 | 17,840 | 0 | 150 | 0 | 0 | 0 | 0 | 0 | 16 |
| 17 | 1970-1979 | 91,800 | 92,700 | 91,900 | 0 | 0 | 0 | 320 | 490 | 0 | 0 | 17 |
| 18 | 1960-1969 | 96,800 | 96,140 | 95,330 | 0 | 0 | 0 | 0 | 440 | 250 | 120 | 18 |
| 19 | 1950-1959 | 100,200 | 100,210 | 99,010 | 0 | 0 | 0 | 120 | 390 | 250 | 440 | 19 |
| 20 | 1940-1949 | 38,200 | 37,250 | 36,420 | 0 | 0 | 0 | 0 | 640 | 0 | 200 | 20 |
| 21 | 1930-1939 | 68,400 | 67,310 | 65,230 | 0 | 120 | 0 | 0 | 1,450 | 250 | 250 | 21 |
| 22 | 1920-1929 | 51,600 | 50,710 | 49,330 | 0 | 120 | 0 | 320 | 690 | 250 | 0 | 22 |
| 23 | 1919 or earlier | 70,700 | 71,620 | 66,870 | 0 | 250 | 0 | 500 | 2,910 | 330 | 770 | 23 |

Components of Inventory Change and Rental Market Dynamics:
Milwaukee 1994–2002

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

| | A Characteristics | B Published numbers | C Present in 1994 | D 1994 units present in 2002 | E Change in character- istics | F '94 units affected by conversion /merger | G '94 mobile homes moved out | H '94 units changed to nonresidential use | I '94 units lost through demolition or disaster | J '94 units badly damaged or condemned | K '94 units lost in other ways | |
|----|------------------------------|---------------------------|-------------------------|---------------------------------------|--|--|--|---|---|--|--|----|
| | Rooms | | | | | | | | | | | |
| 24 | 1 – 4 rooms | 166,400 | 161,160 | 129,550 | 26,870 | 400 | 0 | 490 | 2,770 | 500 | 570 | 24 |
| 25 | 5 rooms | 147,100 | 148,670 | 82,060 | 63,820 | 0 | 0 | 200 | 1,380 | 620 | 590 | 25 |
| 26 | 6 rooms | 113,000 | 114,010 | 57,210 | 53,810 | 250 | 0 | 250 | 1,970 | 200 | 330 | 26 |
| 27 | 7 rooms | 80,700 | 81,670 | 31,640 | 49,180 | 0 | 0 | 200 | 370 | 0 | 280 | 27 |
| 28 | 8 rooms | 47,800 | 49,610 | 16,410 | 32,490 | 0 | 0 | 0 | 390 | 0 | 320 | 28 |
| 29 | 9 rooms | 22,200 | 22,900 | 6,270 | 16,390 | 0 | 0 | 120 | 120 | 0 | 0 | 29 |
| 30 | 10 rooms or more | 15,600 | 15,080 | 5,330 | 9,750 | 0 | 0 | 0 | 0 | 0 | 0 | 30 |
| | Bedrooms | | | | | | | | | | | |
| 31 | None | 8,400 | 7,960 | 3,480 | 3,500 | 0 | 0 | 0 | 970 | 0 | 0 | 31 |
| 32 | 1 | 73,200 | 71,740 | 60,000 | 9,560 | 250 | 0 | 250 | 940 | 500 | 240 | 32 |
| 33 | 2 | 182,700 | 181,520 | 148,060 | 29,700 | 150 | 0 | 560 | 1,920 | 250 | 890 | 33 |
| 34 | 3 | 237,900 | 240,400 | 203,700 | 33,230 | 120 | 0 | 320 | 2,490 | 250 | 280 | 34 |
| 35 | 4 or more | 90,800 | 91,490 | 71,690 | 17,870 | 120 | 0 | 120 | 690 | 330 | 670 | 35 |
| 36 | Multiunit Structures | 236,000 | 232,120 | 225,100 | 0 | 650 | 0 | 610 | 3,820 | 1,120 | 820 | 36 |
| | Stories in Structures | | | | | | | | | | | |
| 37 | 1 | | 460 | 460 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 37 |
| 38 | 2 | | 19,210 | 19,090 | 0 | 0 | 0 | 0 | 120 | 0 | 0 | 38 |
| 39 | 3 | | 149,040 | 144,900 | 0 | 370 | 0 | 370 | 2,210 | 370 | 820 | 39 |
| 40 | 4 to 6 | | 63,410 | 60,650 | 0 | 280 | 0 | 250 | 1,490 | 740 | 0 | 40 |
| 41 | 7 or more | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 41 |
| | Metro Status | | | | | | | | | | | |
| 42 | In central cities | | 248,890 | 241,530 | 0 | 650 | 0 | 500 | 3,880 | 1,320 | 1,020 | 42 |
| 43 | In suburbs | | 344,210 | 339,270 | 0 | 0 | 0 | 760 | 3,130 | 0 | 1,060 | 43 |
| | Mover Status | | | | | | | | | | | |
| 44 | Moved in last 2 years | | 127,250 | 33,810 | 88,970 | 0 | 0 | 560 | 2,660 | 500 | 760 | 44 |
| 45 | Not a recent mover | | 432,350 | 373,380 | 53,170 | 500 | 0 | 370 | 3,160 | 700 | 1,070 | 45 |

Components of Inventory Change and Rental Market Dynamics:
Milwaukee 1994–2002

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

| | A Characteristics | B Published numbers | C Present in 1994 | D 1994 units present in 2002 | E Change in character- istics | F '94 units affected by conversion /merger | G '94 mobile homes moved out | H '94 units changed to nonresidential use | I '94 units lost through demolition or disaster | J '94 units badly damaged or condemned | K '94 units lost in other ways | |
|----|-------------------------------------|---------------------------|-------------------------|---------------------------------------|--|--|--|---|---|--|--|----|
| 1 | Occupied Units | 559,600 | 559,600 | 515,030 | 34,290 | 500 | 0 | 930 | 5,820 | 1,190 | 1,830 | 1 |
| | Kitchen | | | | | | | | | | | |
| 2 | With complete kitchen | 553,600 | 554,490 | 492,460 | 52,600 | 500 | 0 | 930 | 4,980 | 1,190 | 1,830 | 2 |
| 3 | Lacking complete kitchen facilities | 5,900 | 5,110 | 530 | 3,730 | 0 | 0 | 0 | 850 | 0 | 0 | 3 |
| | Plumbing | | | | | | | | | | | |
| 4 | With all plumbing facilities | 555,900 | 555,990 | 507,010 | 39,800 | 370 | 0 | 690 | 5,100 | 1,190 | 1,830 | 4 |
| 5 | Lack some plumbing | 3,700 | 3,610 | 530 | 1,980 | 120 | 0 | 240 | 730 | 0 | 0 | 5 |
| 6 | No hot piped water | 0 | 1,270 | 0 | 660 | 0 | 0 | 0 | 600 | 0 | 0 | 6 |
| 7 | No bathtub/shower | 700 | 1,920 | 270 | 800 | 0 | 0 | 120 | 730 | 0 | 0 | 7 |
| 8 | No flush toilet | 600 | 3,480 | 270 | 2,240 | 120 | 0 | 120 | 730 | 0 | 0 | 8 |
| | Water | | | | | | | | | | | |
| 9 | Public/private water | 478,300 | 472,140 | 426,420 | 36,630 | 500 | 0 | 810 | 5,070 | 1,190 | 1,520 | 9 |
| 10 | Well | 75,900 | 82,120 | 70,680 | 10,250 | 0 | 0 | 120 | 750 | 0 | 320 | 10 |
| 11 | Other water source | 5,400 | 5,340 | 0 | 5,340 | 0 | 0 | 0 | 0 | 0 | 0 | 11 |
| | Sewer | | | | | | | | | | | |
| 12 | Public sewer | 507,800 | 504,930 | 461,700 | 34,220 | 500 | 0 | 620 | 5,190 | 1,190 | 1,520 | 12 |
| 13 | Septic tank/cesspool | 51,700 | 54,670 | 48,930 | 4,480 | 0 | 0 | 320 | 630 | 0 | 320 | 13 |
| 14 | Severe Problems | 7,400 | 6,790 | 400 | 5,040 | 120 | 0 | 240 | 850 | 120 | 0 | 14 |
| 15 | Plumbing | 3,700 | 3,610 | 270 | 2,240 | 120 | 0 | 240 | 730 | 0 | 0 | 15 |
| 16 | Heating | 2,700 | 2,370 | 130 | 2,240 | 0 | 0 | 0 | 0 | 0 | 0 | 16 |
| 17 | Electric | 500 | 560 | 0 | 430 | 0 | 0 | 0 | 120 | 0 | 0 | 17 |
| 18 | Upkeep | 500 | 260 | 0 | 130 | 0 | 0 | 0 | 0 | 120 | 0 | 18 |
| 19 | Hallways | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 19 |
| 20 | Moderate problems | 12,600 | 12,500 | 1,950 | 9,740 | 0 | 0 | 0 | 810 | 0 | 0 | 20 |
| 21 | Plumbing | 1,300 | 1,570 | 0 | 1,570 | 0 | 0 | 0 | 0 | 0 | 0 | 21 |
| 22 | Heating | 100 | 130 | 0 | 130 | 0 | 0 | 0 | 0 | 0 | 0 | 22 |
| 23 | Kitchen | 3,500 | 5,110 | 530 | 3,730 | 0 | 0 | 0 | 850 | 0 | 0 | 23 |
| 24 | Upkeep | 8,200 | 8,290 | 610 | 6,980 | 0 | 0 | 0 | 690 | 0 | 0 | 24 |
| 25 | Hallways | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 25 |

Components of Inventory Change and Rental Market Dynamics:
Milwaukee 1994–2002

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

| | A Characteristics | B Published numbers | C Present in 1994 | D 1994 units present in 2002 | E Change in character- istics | F '94 units affected by conversion /merger | G '94 mobile homes moved out | H '94 units changed to nonresidential use | I '94 units lost through demolition or disaster | J '94 units badly damaged or condemned | K '94 units lost in other ways | |
|----|-------------------------------|---------------------------|-------------------------|---------------------------------------|--|--|--|---|---|--|--|----|
| 1 | Occupied units | 559,600 | 559,600 | 515,030 | 34,290 | 500 | 0 | 930 | 5,820 | 1,190 | 1,830 | 1 |
| | Age | | | | | | | | | | | |
| 2 | Under 65 | 435,700 | 434,860 | 350,920 | 74,540 | 500 | 0 | 930 | 4,940 | 1,190 | 1,830 | 2 |
| 3 | 65 or older | 123,800 | 124,740 | 70,650 | 53,210 | 0 | 0 | 0 | 880 | 0 | 0 | 3 |
| | Children | | | | | | | | | | | |
| 4 | Some | 198,500 | 199,590 | 108,530 | 86,700 | 250 | 0 | 120 | 2,380 | 620 | 990 | 4 |
| 5 | None | 361,000 | 360,010 | 267,570 | 86,530 | 250 | 0 | 810 | 3,440 | 570 | 840 | 5 |
| | Race/Origin | | | | | | | | | | | |
| 6 | White | 480,900 | 483,370 | 422,150 | 55,420 | 250 | 0 | 680 | 3,440 | 250 | 1,180 | 6 |
| 7 | Hispanic | 14,100 | 14,430 | 7,520 | 6,660 | 0 | 0 | 120 | 120 | 0 | 0 | 7 |
| 8 | Non-Hispanic | 466,800 | 468,940 | 400,660 | 62,720 | 250 | 0 | 560 | 3,320 | 250 | 1,180 | 8 |
| 9 | Black | 69,900 | 67,300 | 47,370 | 15,580 | 120 | 0 | 250 | 2,380 | 950 | 650 | 9 |
| 10 | Other | 8,700 | 8,930 | 4,150 | 4,650 | 120 | 0 | 0 | 0 | 0 | 0 | 10 |
| 11 | Total Hispanics | 15,500 | 15,960 | 8,920 | 6,790 | 0 | 0 | 120 | 120 | 0 | 0 | 11 |
| | Income Source | | | | | | | | | | | |
| 12 | Wages and salaries | 429,500 | 430,060 | 348,340 | 74,800 | 250 | 0 | 810 | 3,210 | 950 | 1,710 | 12 |
| 13 | Welfare or SSI | 51,800 | 51,120 | 10,770 | 36,240 | 250 | 0 | 240 | 2,670 | 820 | 120 | 13 |
| 14 | Social security or pension | 167,800 | 168,470 | 95,260 | 71,710 | 0 | 0 | 0 | 1,250 | 250 | 0 | 14 |

Components of Inventory Change and Rental Market Dynamics:
Milwaukee 1994–2002

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

| | A Characteristics | B Published numbers | C Present in 1994 | D 1994 units present in 2002 | E Change in character- istics | F '94 units affected by conversion /merger | G '94 mobile homes moved out | H '94 units changed to nonresidential use | I '94 units lost through demolition or disaster | J '94 units badly damaged or condemned | K '94 units lost in other ways | |
|----|------------------------------------|---------------------------|-------------------------|---------------------------------------|--|--|--|---|---|--|--|----|
| 1 | Occupied units | 559,600 | 559,600 | 515,030 | 34,290 | 500 | 0 | 930 | 5,820 | 1,190 | 1,830 | 1 |
| | Tenure | | | | | | | | | | | |
| 2 | Owner occupied | 346,800 | 350,240 | 319,650 | 28,690 | 0 | 0 | 120 | 1,470 | 0 | 310 | 2 |
| 3 | Percent own occupied | 62.0% | 62.6% | 62.1% | NA | 0.0% | NA | 12.9% | 25.3% | 0.0% | 16.7% | 3 |
| 4 | Renter occupied | 212,800 | 209,360 | 157,030 | 43,950 | 500 | 0 | 810 | 4,350 | 1,190 | 1,530 | 4 |
| | Rental Affordability | | | | | | | | | | | |
| 5 | Non-market | | 26,610 | 14,120 | 11,280 | 0 | 0 | 0 | 560 | 0 | 640 | 5 |
| 6 | Extremely low rent | | 73,640 | 44,570 | 24,030 | 500 | 0 | 500 | 2,660 | 950 | 450 | 6 |
| 7 | Very low rent | | 66,260 | 20,550 | 44,530 | 0 | 0 | 200 | 740 | 120 | 120 | 7 |
| 8 | Low rent | | 30,300 | 2,880 | 26,780 | 0 | 0 | 120 | 390 | 120 | 0 | 8 |
| 9 | Moderate to very high rent | | 12,540 | 3,130 | 9,100 | 0 | 0 | 0 | 0 | 0 | 320 | 9 |
| | Renter Hsd Income | | | | | | | | | | | |
| 12 | Less than \$20,000 | 97,000 | 94,600 | 38,030 | 51,290 | 370 | 0 | 490 | 3,350 | 500 | 570 | 12 |
| 13 | \$20,000 to \$34,999 | 59,300 | 59,430 | 12,940 | 44,540 | 120 | 0 | 120 | 680 | 700 | 320 | 13 |
| 14 | \$35,000 to \$59,999 | 45,400 | 43,860 | 9,740 | 33,290 | 0 | 0 | 200 | 320 | 0 | 320 | 14 |
| 15 | \$60,000 to \$99,999 | 9,200 | 9,550 | 1,750 | 7,470 | 0 | 0 | 0 | 0 | 0 | 320 | 15 |
| 16 | \$100,000 or more | 1,800 | 1,920 | 170 | 1,760 | 0 | 0 | 0 | 0 | 0 | 0 | 16 |
| | Owner Monthly Housing Costs | | | | | | | | | | | |
| 17 | Less than \$499 | 112,100 | 113,850 | 46,980 | 66,110 | 0 | 0 | 0 | 760 | 0 | 0 | 17 |
| 18 | \$500 to \$699 | 53,600 | 55,670 | 14,610 | 40,860 | 0 | 0 | 0 | 200 | 0 | 0 | 18 |
| 19 | \$700 to \$999 | 78,000 | 79,830 | 19,970 | 59,670 | 0 | 0 | 0 | 200 | 0 | 0 | 19 |
| 20 | \$1,000 to \$1,499 | 57,600 | 57,550 | 23,480 | 33,720 | 0 | 0 | 0 | 200 | 0 | 150 | 20 |
| 21 | \$1,500 or more | 21,400 | 19,570 | 12,020 | 7,550 | 0 | 0 | 0 | 0 | 0 | 0 | 21 |
| a | Missing mort data | 24,200 | 23,770 | 6,400 | 16,980 | 0 | 0 | 120 | 120 | 0 | 150 | a |
| | Owner Hsd Income | | | | | | | | | | | |
| 22 | Less than \$20,000 | 46,700 | 45,290 | 11,980 | 32,750 | 0 | 0 | 0 | 570 | 0 | 0 | 22 |
| 23 | \$20,000 to \$34,999 | 72,900 | 72,410 | 15,690 | 56,020 | 0 | 0 | 120 | 590 | 0 | 0 | 23 |
| 24 | \$35,000 to \$59,999 | 105,400 | 107,810 | 27,120 | 80,070 | 0 | 0 | 0 | 320 | 0 | 310 | 24 |
| 25 | \$60,000 to \$99,999 | 89,200 | 91,320 | 34,490 | 56,830 | 0 | 0 | 0 | 0 | 0 | 0 | 25 |
| 26 | \$100,000 or more | 32,600 | 33,410 | 16,850 | 16,560 | 0 | 0 | 0 | 0 | 0 | 0 | 26 |

Components of Inventory Change and Rental Market Dynamics:
Milwaukee 1994–2002

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

| | A Characteristics | B Published numbers | C Present in 2002 | D 2002 units present in 1994 | E Change in character- istics | F '02 mobile homes moved in | G '02 units derived from nonresidential use | H '02 units added by new construction | I '02 units added from temporary losses | |
|----|---------------------------|---------------------------|-------------------------|---------------------------------------|---|--------------------------------------|---|---|---|----|
| 1 | Total | 626,500 | 626,500 | 575,080 | 0 | 0 | 1,970 | 48,320 | 1,130 | 1 |
| | Occupancy Status | | | | | | | | | |
| 2 | Occupied | 584,600 | 584,600 | 513,730 | 24,880 | 0 | 1,040 | 44,280 | 660 | 2 |
| 3 | Vacant | 40,500 | 40,500 | 4,880 | 30,180 | 0 | 930 | 4,040 | 470 | 3 |
| 4 | Seasonal | 1,400 | 1,400 | 890 | 510 | 0 | 0 | 0 | 0 | 4 |
| | Units in Structure | | | | | | | | | |
| 5 | 1, detached | 352,600 | 361,960 | 333,430 | 0 | 0 | 130 | 28,270 | 120 | 5 |
| 6 | 1, attached | 41,200 | 40,510 | 33,520 | 0 | 0 | 690 | 5,890 | 400 | 6 |
| 7 | 2 to 4 | 112,700 | 108,550 | 106,760 | 0 | 0 | 250 | 1,160 | 380 | 7 |
| 8 | 5 to 9 | 39,600 | 38,640 | 35,120 | 0 | 0 | 130 | 3,270 | 120 | 8 |
| 9 | 10 to 19 | 17,700 | 17,540 | 15,980 | 0 | 0 | 0 | 1,560 | 0 | 9 |
| 10 | 20 to 49 | 30,400 | 29,200 | 23,310 | 0 | 0 | 440 | 5,330 | 120 | 10 |
| 11 | 50 or more | 28,800 | 27,760 | 24,600 | 0 | 0 | 330 | 2,830 | 0 | 11 |
| 12 | Mobile Home/trailer | 3,500 | 2,340 | 2,340 | 0 | 0 | 0 | 0 | 0 | 12 |
| | Year Built | | | | | | | | | |
| 13 | 1995-2002 | 44,100 | 41,550 | 950 | 0 | 0 | 0 | 40,600 | 0 | 13 |
| 14 | 1990-1994 | 40,400 | 41,410 | 32,650 | 0 | 0 | 1,030 | 7,720 | 0 | 14 |
| 15 | 1985-1989 | 24,200 | 25,040 | 25,040 | 0 | 0 | 0 | 0 | 0 | 15 |
| 16 | 1980-1984 | 17,900 | 18,250 | 18,250 | 0 | 0 | 0 | 0 | 0 | 16 |
| 17 | 1970-1979 | 90,200 | 91,210 | 91,210 | 0 | 0 | 0 | 0 | 0 | 17 |
| 18 | 1960-1969 | 93,700 | 93,520 | 93,520 | 0 | 0 | 0 | 0 | 0 | 18 |
| 19 | 1950-1959 | 97,400 | 98,510 | 98,380 | 0 | 0 | 130 | 0 | 0 | 19 |
| 20 | 1940-1949 | 36,300 | 36,340 | 36,220 | 0 | 0 | 120 | 0 | 0 | 20 |
| 21 | 1930-1939 | 65,800 | 64,890 | 64,200 | 0 | 0 | 310 | 0 | 380 | 21 |
| 22 | 1920-1929 | 50,000 | 49,440 | 48,940 | 0 | 0 | 120 | 0 | 380 | 22 |
| 23 | 1919 or earlier | 66,400 | 66,340 | 65,710 | 0 | 0 | 260 | 0 | 370 | 23 |

Components of Inventory Change and Rental Market Dynamics:
Milwaukee 1994–2002

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

| | A Characteristics | B Published numbers | C Present in 2002 | D 2002 units present in 1994 | E Change in character- istics | F '02 mobile homes moved in | G '02 units derived from nonresidential use | H '02 units added by new construction | I '02 units added from temporary losses | |
|----|------------------------------|---------------------------|-------------------------|---------------------------------------|---|--------------------------------------|---|---|---|----|
| | Rooms | | | | | | | | | |
| 24 | 1 – 4 rooms | 180,000 | 173,020 | 127,180 | 30,930 | 0 | 1,410 | 12,990 | 500 | 24 |
| 25 | 5 rooms | 145,900 | 144,790 | 81,280 | 54,340 | 0 | 320 | 8,580 | 260 | 25 |
| 26 | 6 rooms | 124,100 | 126,530 | 56,830 | 60,480 | 0 | 120 | 8,880 | 240 | 26 |
| 27 | 7 rooms | 77,400 | 79,700 | 31,520 | 40,520 | 0 | 110 | 7,410 | 130 | 27 |
| 28 | 8 rooms | 50,500 | 52,470 | 16,370 | 31,320 | 0 | 0 | 4,780 | 0 | 28 |
| 29 | 9 rooms | 24,400 | 25,120 | 6,250 | 15,820 | 0 | 0 | 3,040 | 0 | 29 |
| 30 | 10 rooms or more | 24,200 | 24,870 | 5,300 | 16,930 | 0 | 0 | 2,640 | 0 | 30 |
| | Bedrooms | | | | | | | | | |
| 31 | None | 5,700 | 5,450 | 3,380 | 1,650 | 0 | 280 | 150 | 0 | 31 |
| 32 | 1 | 75,200 | 71,810 | 58,840 | 7,810 | 0 | 680 | 4,240 | 250 | 32 |
| 33 | 2 | 187,700 | 183,130 | 146,200 | 20,730 | 0 | 650 | 15,180 | 380 | 33 |
| 34 | 3 | 255,900 | 261,290 | 202,600 | 38,560 | 0 | 250 | 19,510 | 370 | 34 |
| 35 | 4 or more | 102,100 | 104,810 | 71,390 | 23,930 | 0 | 110 | 9,250 | 130 | 35 |
| 36 | Multiunit Structures | 229,200 | 221,700 | 205,780 | 0 | 0 | 1,150 | 14,150 | 620 | 36 |
| | Stories in Structures | | | | | | | | | |
| 37 | 1 | | 3,340 | 3,190 | 0 | 0 | 0 | 150 | 0 | 37 |
| 38 | 2 | | 102,850 | 96,650 | 0 | 0 | 530 | 5,560 | 120 | 38 |
| 39 | 3 | | 84,290 | 77,470 | 0 | 0 | 620 | 6,200 | 0 | 39 |
| 40 | 4 to 6 | | 21,870 | 19,120 | 0 | 0 | 0 | 2,250 | 500 | 40 |
| 41 | 7 or more | | 9,350 | 9,350 | 0 | 0 | 0 | 0 | 0 | 41 |
| | Metro Status | | | | | | | | | |
| 42 | In central cities | | 242,720 | 238,360 | 0 | 0 | 1,080 | 2,150 | 1,130 | 42 |
| 43 | In suburbs | | 383,780 | 336,720 | 0 | 0 | 890 | 46,170 | 0 | 43 |
| | Mover Status | | | | | | | | | |
| 44 | Moved in last 2 years | | 111,430 | 33,720 | 62,310 | 0 | 780 | 14,480 | 130 | 44 |
| 45 | Not a recent mover | | 473,170 | 367,740 | 74,840 | 0 | 260 | 29,800 | 530 | 45 |

Components of Inventory Change and Rental Market Dynamics:
Milwaukee 1994–2002

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

| | A Characteristics | B Published numbers | C Present in 2002 | D 2002 units present in 1994 | E Change in character- istics | F '02 mobile homes moved in | G '02 units derived from nonresidential use | H '02 units added by new construction | I '02 units added from temporary losses | |
|----|-------------------------------------|---------------------------|-------------------------|---------------------------------------|---|--------------------------------------|---|---|---|----|
| 1 | Occupied Units | 584,600 | 584,600 | 513,730 | 24,880 | 0 | 1,040 | 44,280 | 660 | 1 |
| | Kitchen | | | | | | | | | |
| 2 | With complete kitchen | 560,700 | 561,420 | 491,210 | 25,830 | 0 | 720 | 43,270 | 400 | 2 |
| 3 | Lacking complete kitchen facilities | 23,900 | 23,180 | 530 | 21,040 | 0 | 330 | 1,020 | 260 | 3 |
| | Plumbing | | | | | | | | | |
| 4 | With all plumbing facilities | 577,500 | 577,910 | 505,730 | 26,190 | 0 | 1,040 | 44,280 | 660 | 4 |
| 5 | Lack some plumbing | 7,100 | 6,690 | 530 | 6,160 | 0 | 0 | 0 | 0 | 5 |
| 6 | No hot piped water | 800 | 830 | 0 | 830 | 0 | 0 | 0 | 0 | 6 |
| 7 | No bathtub/shower | 600 | 670 | 270 | 400 | 0 | 0 | 0 | 0 | 7 |
| 8 | No flush toilet | 600 | 670 | 270 | 400 | 0 | 0 | 0 | 0 | 8 |
| | Water | | | | | | | | | |
| 9 | Public/private water | 515,500 | 497,310 | 425,340 | 35,410 | 0 | 1,040 | 34,860 | 660 | 9 |
| 10 | Well | 67,500 | 85,630 | 70,500 | 6,000 | 0 | 0 | 9,130 | 0 | 10 |
| 11 | Other water source | 1,600 | 1,650 | 0 | 1,360 | 0 | 0 | 290 | 0 | 11 |
| | Sewer | | | | | | | | | |
| 12 | Public sewer | 527,600 | 524,730 | 460,530 | 26,590 | 0 | 1,040 | 35,920 | 660 | 12 |
| 13 | Septic tank/cesspool | 57,000 | 59,870 | 48,810 | 2,690 | 0 | 0 | 8,370 | 0 | 13 |
| | Severe Problems | | | | | | | | | |
| 14 | Severe Problems | 10,100 | 9,630 | 790 | 8,830 | 0 | 0 | 0 | 0 | 14 |
| 15 | Plumbing | 7,100 | 6,690 | 530 | 6,160 | 0 | 0 | 0 | 0 | 15 |
| 16 | Heating | 2,500 | 2,370 | 130 | 2,240 | 0 | 0 | 0 | 0 | 16 |
| 17 | Electric | 100 | 130 | 0 | 130 | 0 | 0 | 0 | 0 | 17 |
| 18 | Upkeep | 400 | 430 | 0 | 430 | 0 | 0 | 0 | 0 | 18 |
| 19 | Hallways | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 19 |
| | Moderate problems | | | | | | | | | |
| 20 | Moderate problems | 29,400 | 28,470 | 1,950 | 24,910 | 0 | 330 | 1,020 | 260 | 20 |
| 21 | Plumbing | 500 | 510 | 0 | 510 | 0 | 0 | 0 | 0 | 21 |
| 22 | Heating | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 22 |
| 23 | Kitchen | 22,300 | 23,180 | 530 | 21,040 | 0 | 330 | 1,020 | 260 | 23 |
| 24 | Upkeep | 6,300 | 6,510 | 610 | 5,900 | 0 | 0 | 0 | 0 | 24 |
| 25 | Hallways | 500 | 830 | 0 | 830 | 0 | 0 | 0 | 0 | 25 |

Components of Inventory Change and Rental Market Dynamics:
Milwaukee 1994–2002

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

| | A Characteristics | B Published numbers | C Present in 2002 | D 2002 units present in 1994 | E Change in character- istics | F '02 mobile homes moved in | G '02 units derived from nonresidential use | H '02 units added by new construction | I '02 units added from temporary losses | |
|----|-----------------------------|----------------------------------|--------------------------------|--|--|---|--|--|--|----|
| 1 | Occupied units | 584,600 | 584,600 | 513,730 | 24,880 | 0 | 1,040 | 44,280 | 660 | 1 |
| | Age | | | | | | | | | |
| 2 | Under 65 | 459,000 | 457,550 | 350,030 | 69,370 | 0 | 720 | 36,900 | 530 | 2 |
| 3 | 65 or older | 125,700 | 127,050 | 70,470 | 48,740 | 0 | 330 | 7,390 | 130 | 3 |
| | Children | | | | | | | | | |
| 4 | Some | 195,100 | 197,630 | 108,250 | 71,440 | 0 | 260 | 17,280 | 400 | 4 |
| 5 | None | 389,500 | 386,970 | 266,890 | 92,030 | 0 | 780 | 27,000 | 260 | 5 |
| | Race/Origin | | | | | | | | | |
| 6 | White | 486,000 | 489,090 | 421,080 | 25,140 | 0 | 780 | 41,960 | 130 | 6 |
| 7 | Hispanic | 21,500 | 21,490 | 7,500 | 13,180 | 0 | 0 | 800 | 0 | 7 |
| 8 | Non-Hispanic | 464,500 | 467,600 | 399,650 | 25,880 | 0 | 780 | 41,150 | 130 | 8 |
| 9 | Black | 74,000 | 71,700 | 47,250 | 22,870 | 0 | 0 | 1,060 | 530 | 9 |
| 10 | Other | 24,600 | 23,810 | 4,140 | 18,130 | 0 | 260 | 1,270 | 0 | 10 |
| 11 | Total Hispanics | 31,900 | 31,310 | 8,900 | 21,040 | 0 | 130 | 1,240 | 0 | 11 |
| | Income Source | | | | | | | | | |
| 12 | Wages and salaries | 466,700 | 468,100 | 347,460 | 82,630 | 0 | 330 | 37,150 | 530 | 12 |
| 13 | Welfare or SSI | 25,900 | 25,300 | 10,740 | 13,160 | 0 | 260 | 870 | 260 | 13 |
| 14 | Social security or pension | 166,800 | 167,290 | 95,020 | 60,980 | 0 | 590 | 10,700 | 0 | 14 |

Components of Inventory Change and Rental Market Dynamics:
Milwaukee 1994–2002

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

| | A Characteristics | B Published numbers | C Present in 2002 | D 2002 units present in 1994 | E Change in character- istics | F '02 mobile homes moved in | G '02 units derived from nonresidential use | H '02 units added by new construction | I '02 units added from temporary losses | |
|----|--|---------------------------|-------------------------|---------------------------------------|---|--------------------------------------|---|---|---|----|
| 1 | Occupied units | 584,600 | 584,600 | 513,730 | 24,880 | 0 | 1,040 | 44,280 | 660 | 1 |
| | Tenure | | | | | | | | | |
| 2 | Owner occupied | 371,500 | 377,560 | 318,840 | 25,150 | 0 | 0 | 33,300 | 260 | 2 |
| 3 | Percent own occupied | 63.6% | 64.6% | 62.1% | NA | NA | 0.0% | 75.2% | 40.0% | 3 |
| 4 | Renter occupied | 213,100 | 207,040 | 156,630 | 37,990 | 0 | 1,040 | 10,990 | 400 | 4 |
| | Rental Affordability | | | | | | | | | |
| 5 | Non-market | | 26,940 | 14,080 | 12,460 | 0 | 0 | 400 | 0 | 5 |
| 6 | Extremely low rent | | 97,050 | 44,450 | 50,950 | 0 | 550 | 690 | 400 | 6 |
| 7 | Very low rent | | 62,120 | 20,500 | 36,940 | 0 | 330 | 4,370 | 0 | 7 |
| 8 | Low rent | | 13,920 | 2,870 | 6,810 | 0 | 160 | 4,080 | 0 | 8 |
| 9 | Moderate to very high rent | | 7,010 | 3,120 | 2,430 | 0 | 0 | 1,460 | 0 | 9 |
| | Renter Hsd Income | | | | | | | | | |
| 12 | Less than \$20,000 | 76,000 | 73,850 | 37,930 | 33,950 | 0 | 390 | 1,460 | 130 | 12 |
| 13 | \$20,000 to \$34,999 | 54,300 | 52,250 | 12,910 | 36,740 | 0 | 330 | 2,150 | 130 | 13 |
| 14 | \$35,000 to \$59,999 | 53,100 | 51,430 | 9,710 | 37,040 | 0 | 330 | 4,220 | 130 | 14 |
| 15 | \$60,000 to \$99,999 | 25,100 | 25,020 | 1,750 | 20,540 | 0 | 0 | 2,730 | 0 | 15 |
| 16 | \$100,000 or more | 4,400 | 4,490 | 170 | 3,890 | 0 | 0 | 440 | 0 | 16 |
| | Owner Monthly Housing Costs | | | | | | | | | |
| 17 | Less than \$499 | 94,700 | 88,030 | 46,860 | 36,730 | 0 | 0 | 4,440 | 0 | 17 |
| 18 | \$500 to \$699 | 52,600 | 51,810 | 14,580 | 35,270 | 0 | 0 | 1,960 | 0 | 18 |
| 19 | \$700 to \$999 | 66,700 | 65,380 | 19,920 | 40,930 | 0 | 0 | 4,400 | 130 | 19 |
| 20 | \$1,000 to \$1,499 | 96,300 | 101,810 | 23,420 | 70,070 | 0 | 0 | 8,190 | 130 | 20 |
| 21 | \$1,500 or more | 61,300 | 70,530 | 18,370 | 37,860 | 0 | 0 | 14,300 | 0 | 21 |
| | Owner Hsd Income | | | | | | | | | |
| 22 | Less than \$20,000 | 40,200 | 39,780 | 11,950 | 26,160 | 0 | 0 | 1,670 | 0 | 22 |
| 23 | \$20,000 to \$34,999 | 48,700 | 49,550 | 15,650 | 31,790 | 0 | 0 | 2,110 | 0 | 23 |
| 24 | \$35,000 to \$59,999 | 87,400 | 88,250 | 27,050 | 54,200 | 0 | 0 | 6,730 | 260 | 24 |
| 25 | \$60,000 to \$99,999 | 113,800 | 116,550 | 34,410 | 71,630 | 0 | 0 | 10,520 | 0 | 25 |
| 26 | \$100,000 or more | 81,500 | 83,430 | 16,810 | 54,360 | 0 | 0 | 12,260 | 0 | 26 |

Rental Market Dynamics¹⁵

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 Milwaukee in both 1994 and 2002, we cannot distinguish between 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 209,360 rental units in the Milwaukee metropolitan area in 1994. In 2002, 52,330 of these units were no longer rental; 16,990 were owner-occupied, 26,960 were either vacant or being used seasonally, and 8,380 had been lost to the stock. Taken as a proportion of the units in 1994, movement into owner-occupancy was concentrated in the moderate-to-very-high-rent category, and losses to the stock were concentrated among non-market and extremely-low-rent units. Movements among rental classes favored the extremely-low-rent class; this category kept 60 percent of its units and gained enough from other categories to have more units in 2002 than in 1994 without considering gains from other sources. On the other hand, the very-low-rent group kept only 31 percent of its units; 41 percent became extremely-low-rent units.

Table B shows there were 207,040 rental units in the Milwaukee metropolitan area in 2002, of which 50,420 were not rental units in 1994. The new units came from units that had been owner-occupied (21,320), units that had been vacant or in seasonal use (16,670), newly constructed units (10,990), and other additions (1,440). Most of the formerly owner-occupied units went to the non-market, 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. As in Table A, the extremely-low-rent units gained from the very-low-rent units.

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.

Components of Inventory Change and Rental Market Dynamics:
Milwaukee 1994–2002

Looking at both tables, we see that the overall number of rental units was approximately equal in 1994 and 2002. The number of extremely-low-rent and very-low-rent units combined grew from approximately 140,000 in 1994 to approximately 160,000 in 2002.

Components of Inventory Change and Rental Market Dynamics:
Milwaukee 1994–2002

Table A: Forward-Looking Rental Dynamics Analysis

| Forward looking | <i>C</i> Number in 1994 | <i>D</i> Non- market in 2002 | <i>E</i> Extremely low rent in 2002 | <i>F</i> Very low rent in 2002 | <i>G</i> Low rent in 2002 | <i>J</i> Moderate to very high rent in 2002 | <i>K</i> Owner- occupied in 2002 | <i>L</i> Vacant or seasonal in 2002 | <i>M</i> Lost to stock |
|----------------------------|----------------------------------|---------------------------------------|--|---|------------------------------------|---|---|--|---------------------------------|
| Non-market | 26,610 | 14,120 | 5,210 | 1,960 | 130 | 0 | 1,430 | 2,550 | 1,210 |
| Extremely low rent | 73,640 | 3,230 | 44,570 | 4,200 | 0 | 130 | 6,820 | 9,650 | 5,040 |
| Very low rent | 66,260 | 2,570 | 27,320 | 20,550 | 430 | 0 | 4,410 | 9,810 | 1,180 |
| Low rent | 30,300 | 1,060 | 830 | 19,780 | 2,880 | 430 | 2,380 | 2,310 | 640 |
| Moderate to very high rent | 12,540 | 260 | 430 | 1,740 | 2,080 | 3,130 | 1,950 | 2,650 | 320 |
| Column sum | 209,360 | 21,240 | 78,350 | 48,220 | 5,520 | 3,700 | 16,990 | 26,960 | 8,380 |

Table B: Backward-Looking Rental Dynamics Analysis

| Backward looking | <i>C</i> Number in 2002 | <i>D</i> Non- market in 1994 | <i>E</i> Extremely low rent in 1994 | <i>F</i> Very low rent in 1994 | <i>G</i> Low rent in 1994 | <i>J</i> Moderate to very high rent in 1994 | <i>K</i> Owner- occupied in 1994 | <i>L</i> Vacant or seasonal in 1994 | <i>M</i> New construc- tion | <i>N</i> Other additions |
|----------------------------|----------------------------------|---------------------------------------|--|---|------------------------------------|---|---|--|--------------------------------------|--------------------------------|
| Non-market | 26,940 | 14,080 | 3,220 | 2,560 | 1,060 | 260 | 3,880 | 1,470 | 400 | 0 |
| Extremely low rent | 97,050 | 5,190 | 44,450 | 27,250 | 830 | 430 | 8,760 | 8,490 | 690 | 950 |
| Very low rent | 62,120 | 1,950 | 4,190 | 20,500 | 19,730 | 1,730 | 4,880 | 4,450 | 4,370 | 330 |
| Low rent | 13,920 | 130 | 0 | 430 | 2,870 | 2,070 | 2,740 | 1,440 | 4,080 | 160 |
| Moderate to very high rent | 7,010 | 0 | 130 | 0 | 430 | 3,120 | 1,050 | 820 | 1,460 | 0 |
| Column sum | 207,040 | 21,360 | 52,000 | 50,740 | 24,920 | 7,610 | 21,320 | 16,670 | 10,990 | 1,440 |

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

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

Appendix B – Weighting

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

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

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

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

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