



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



# **American Housing Survey**

## **Components of Inventory Change and Rental Dynamics: Boston 1998-2007**

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**Components of Inventory Change  
and Rental Dynamics:  
Boston 1998–2007**

*Prepared for:*  
U.S. Department of Housing & Urban Development  
Office of Policy Development & Research

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# Components of Inventory Change and Rental Market Dynamics: Boston 1998–2007

## Overview

Components of Inventory Change (CINCH) and rental market dynamics are two techniques for explaining how changes that take place in a housing market over time came about in physical (bricks and mortar) terms. CINCH focuses first on the overall number and then the characteristics of units at different times. Using CINCH methods, analysts answer such question as: “What happened to the  $x$  units that disappeared from the housing stock between the beginning and the end of the period?” or “Where did the increase in owner-occupied units come from?” Rental market dynamics, which is really a type of CINCH analysis, focuses on the rental market with particular emphasis on the affordability of rental housing. Using rental market dynamics techniques, analysts answer such questions as: “Have the number of rental units affordable to households with very low incomes increased or decreased over the period?” or “What happened to the rental units that were affordable to low-income households at the beginning of the period?”<sup>1</sup>

This report focuses on the Boston metropolitan housing market over the period between 1998 and 2007. It is one of seven reports based on local American Housing Surveys (AHS) conducted in 2007; these seven metropolitan areas were previously surveyed in either 1998 or 2002.

CINCH and rental market dynamics have both forward-looking and backward-looking components. The forward-looking component starts with the housing stock available at the beginning of the period and then, looking at the end of the period, attempts to explain what happened to those units. Possible answers include: Some units still exist and serve the same market; some units still exist but serve a different market; some units have been demolished or destroyed in natural disasters; or some units are being used for nonresidential purposes. The backward-looking component starts with the housing stock available at the end of the period and, looking at the beginning of the period, attempts to explain where those units came from. Possible answers include: Some units existed at the beginning of the period and served the same market; some units existed at the beginning of the period but served a different market; some units were newly constructed over the period; or some units were being using 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 1998 may have become a medical office in 2003 but returned to being a housing unit in 2006. CINCH would record this unit as having undergone no change over the period from 1998 to 2007. In research jargon, CINCH and rental market dynamics are *comparative static* analyses.

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

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

The remainder of this report consists of five sections:

- A discussion of some data issues that complicate the 1998–2007 comparisons for the Boston metropolitan area.
- 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 1998 to 2007 and identifying how units were lost to the housing stock, and a set of backward-looking tables tracing where 2007 units came from and distinguishing between units that were part of the stock in 1998 and units that were additions to the stock since 1998.
- Two tables, and accompanying discussion, that highlight interesting changes in the Boston housing stock between 1998 and 2007.
- A brief discussion of the rental market dynamics results, using CINCH-like tables.

There are three appendices:

- Appendix A compares the 1998 AHS geography for the Boston metropolitan area to the AHS geography in 2007.
- Appendix B explains how the results were tested.
- Appendix C explains how the weights were created.

## ***Data Issues Affecting the Analyses***

The AHS underwent three changes between 1998 and 2007 that complicate the CINCH and rental dynamics analyses in this paper:

- In 2007, the U.S. Department of Housing and Urban Development (HUD) reduced the sample sizes of both the national and metropolitan AHS surveys because of its reduced research budget. In 1998, the AHS sample for Boston contained 4,741 housing units; the 2007 sample contained only 2,771 housing units.
- In 2005, the Census Bureau replaced approximately half of the manufactured housing units (mobile homes) in the AHS samples—both national and metropolitan—with newly sampled units to improve the coverage of mobile homes constructed before 2000.
- In 2007, the Census Bureau revised the geography used for the Boston metropolitan area. The Boston estimates are no longer based on the Metropolitan Statistical Area (MSA)



that contains the city of Boston; they are now based on the New England City and Town Area Division (NECTAD) of Boston. Appendix A compares the old geography used for the Boston metropolitan area (2,481.8 square miles and 3.4 million people) to the new geography (1,537.8 square miles and 2.8 million people).

For housing units that existed in 1998 and 2007, CINCH and rental dynamic analyses can use only those sample units whose householders were interviewed in both years. Decreases in sample sizes, the dropping and adding of mobile home units to the sample, and changes in geography combine with difficulties in obtaining interviews to reduce substantially the useable sample. The forward-looking CINCH analysis for Boston uses a sample of 1,022 units, of which only 3 are mobile homes; the backward-looking CINCH analysis uses a sample of 1,538, of which only 4 are mobile homes. The forward-looking analysis can track what happens only to 1998 housing units that are in the places common to both the old and new geographical boundaries. The backward-looking analysis explains where all additions to the 2007 housing stock in the new geography came from, but for 2007 units that existed in 1998, it can explain the characteristics only of those units common to both geographies.

The small sample sizes, particularly the paucity of mobile homes, limited the extent to which the weighting algorithms could be controlled to published counts of important segments of the Boston housing stock. In particular, comparisons between forward-looking estimates and counts published in the 1998 AHS report are much less accurate than similar comparisons between estimates based on the backward-looking weights and counts published in the 2007 AHS report. Additionally, these limitations resulted in particularly poor estimates involving the mobile home component of the housing stock.

### ***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 1998 housing stock by 2007. There are three basic dispositions of 1998 units: (1) units that continue to exist in 2007 with the same characteristics (or serving the same market); (2) units that continue to exist in 2007, but with different characteristics (or serving a different market); or (3) units that were lost to the stock.

The backward-looking tables are concerned with where the 2007 housing stock came from in reference to 1998. There are three basic sources of 2007 units: (1) units that existed in 1998 with the same characteristics (or serving the same market); (2) units that existed in 1998 but with different characteristics (or serving a different market); or (3) units that are additions to the housing stock.

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

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

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

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

- Column A specifies the characteristic that defines the subset of the stock that is being tracked forward or backward in a particular row. For example, row 2 of Forward-Looking Table 1 focuses on occupied units; row 15 focuses on units built in 1995 through 2000.
- 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 1998 AHS report for Boston counted 1,264,200 occupied units (row 2, column B, Forward-Looking Table 1); the 2007 AHS report counted 1,057,100 occupied units (row 2, column B, Backward-Looking Table 1).<sup>2</sup>
- 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 (1998 for the forward-looking tables and 2007 for the backward-looking tables), and (b) satisfying the condition in column A. CINCH uses different weights than those used in preparing the published AHS reports. Therefore, CINCH estimates can differ from AHS estimates for particular subsets of the housing stock. As explained in the appendix, the weights were created to match AHS published totals for rows 2 through 4 of Table 1 and rows 2 and 4 of Table 4. This perfect match will not be true of other rows.<sup>3</sup>
- 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 1,154,800 of the occupied units from 1998 were also occupied in 2007.
- 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 93,300 units that were occupied in 1998 are still part of the housing stock in 2007 but are no longer occupied. In some cases, the analysis will not allow a unit to change characteristics between the base year and the other year. Examples include type of structure, year built, and number of stories; these are characteristics that are considered impossible or unlikely to change.

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<sup>2</sup> The decline in the number of occupied units results from the change in the geography covered in the published reports.

<sup>3</sup> Columns B and C will also match, except for rounding, in row 1 of Table 1, because row 1 is defined as the sum of rows 2 through 4. Categories for which the CINCH weights seem to have trouble matching the published numbers for most of the seven metropolitan areas were: the number of mobile homes, units built after 2007, rental units that do not have a cash rent, and monthly housing costs less than \$350 for owners.

## Columns Unique to Forward-Looking Tables

In forward-looking tables, columns F through K track what happened to units that were lost from 1998 to 2007.

- Column F is the CINCH estimate of the number of units from column C that are not in the 2007 housing stock because they were merged with other units or converted into multiple units. In the Boston metropolitan area, no units were lost to mergers or conversions between 1998 and 2007.
- Column G is the CINCH estimate of the number of mobile homes or houses from column C that were moved out during the period. In the Boston metropolitan area, no houses or mobile homes were moved out between 1998 and 2007.
- 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.<sup>4</sup> Among occupied units, 2,200 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 2007. In this case, 6,500 units were demolished or destroyed from the total housing stock.
- Column J is the CINCH estimate of the number of units from column C that by 2007 were condemned or that were no longer usable for housing because of extensive damage. In the Boston metropolitan area, no units are recorded as having been temporarily lost because of damage or similar cause.<sup>5</sup>
- Column K is the CINCH estimate of the number of units from column C that were lost by 2007 for other reasons. Among occupied units, there were 8,200 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.<sup>6</sup>

## Columns Unique to Backward-Looking Tables

In backward-looking tables, Columns F through K track where units came from that are part of the housing stock in 2007 but were not part of the 1998 housing stock.

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<sup>4</sup> 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.

<sup>5</sup> The small sample sizes probably account for the absence of losses due to mergers or conversions, to mobile homes or houses being moved out, or to units being badly damaged or condemned.

<sup>6</sup> The weighted numbers are rounded to the nearest 100 to match practices used by the Census Bureau in the AHS publications.

- Column F is the CINCH estimate of the number of units created through mergers and conversions (splitting one unit into multiple units). Of the entire housing stock in the Boston metropolitan area, 33,700 units were created through mergers or splits.
- Column G is the CINCH estimate of the number of mobile homes included in the count in column C that were moved in during the period. None of the housing units in the 2007 housing stock were mobile homes moved in after 1998.<sup>7</sup>
- Column H is the CINCH estimate of the number of units from column C that had been nonresidential in 1998. Among occupied units, 2,400 had been nonresidential.
- Column I is the CINCH estimate of the number of units from column C that were newly constructed between 1998 and 2007. Among occupied units, 141,000 units were newly constructed.
- Column J is the CINCH estimate of the number of units from column C that were added by 2007 due to the recovery of units that had been temporarily lost to the housing stock because occupancy was prohibited in 1998, or the interior of the unit was exposed to the elements, or for reasons “not classified.” The 2007 occupied housing stock includes 1,700 recovered units.
- Column K includes units added by the Census Bureau for other reasons. Of the entire housing stock in the Boston metropolitan area, 72,700 were added for other reasons.

## 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 nonseasonal units equals the number of households. Because households are the basis for all the analyses in Tables 2 through 4, it is important to get a good starting point for these estimates. For this reason, the weights are designed to match published AHS totals for occupied units (by owner-occupied and renter-occupied), vacant units, and seasonal units.

Rows 5–12 divide the housing stock by type of structure to see what type of units account for losses. Column E is forced to be zero on the grounds that changes in structure types are extremely rare and that any observed changes are most likely data errors.

Rows 13–26 divide the housing stock by year built.<sup>8</sup> Column E is forced to be zero because units cannot change year built. The reader will note that in Backward-Looking Table 1 there is an apparent anomaly, namely units reported as newly constructed (Column I) that have year-built dates that are inconsistent with being newly constructed. Backward-Looking Table 1 calls a unit newly constructed if the unit was added to the sample in 2007 from a listing of new construction

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<sup>7</sup> There is a problem in the 2007 AHS public use file with the variable for “reason unit added” (REUAD), and therefore it is not possible to determine whether any houses were moved in during this period.

<sup>8</sup> Rows 13 and 14 are not included in Forward-Looking Table 1 because the 1998 housing stock cannot contain units built after 1998.

permits. The table bases year built on information provided by the surveyed household.<sup>9</sup> In some cases, the apparent anomaly is the result of an error—either the respondent answered the question incorrectly or the Census Bureau recorded the answer incorrectly. However, in many cases, the apparent anomaly is not really an anomaly. If an existing housing unit is remodeled to the extent that the local jurisdiction requires the contractor to draw a “new construction” permit, then the unit becomes eligible for inclusion in the AHS as a “newly constructed” unit. In these cases, when the Census Bureau questions the household about the age of the unit, the respondent may very well give the date of construction of the original unit and not the date of the remodeling. In recent years, there has been a substantial number of existing units that have been gutted and totally remodeled, often with a substantial increase in the area of the ground floor, the so-called unit “footprint.” Sometimes local jurisdictions base the decision on whether a “new construction” permit is required on changes in the footprint.

Rows 27–33 and 34–38 divide the housing stock by two different measures of interior space, the number of rooms and the number of bedrooms.<sup>10</sup>

Rows 39–44 focus on multi-unit structures only and divide them by number of stories. Column E is forced to be zero.

Rows 45–46 divide the housing stock between central cities units and suburban residences to see how the observed changes vary by location. Rows 47–48 divide the housing stock by whether or not the occupants have moved in within the last 2 calendar years, to see if certain units consistently have high turnover and to see if high turnover units are more susceptible to loss.

## Table 2

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

Rows 2–3 look at whether the units have complete kitchens, that is, an installed sink with piped water, a mechanical refrigerator, and built-in burners for the exclusive use of the occupants. Rows 4–5 look at whether the units have complete plumbing facilities, that is, hot-and-cold piped water, a flush toilet, and a bathtub or shower inside the structure for the exclusive use of the occupants. Rows 6–9 look at each of these requirements separately. Rows 2–3, 4–5, and 6–9 separate out good units from the least desirable units based on kitchen and bath equipment.

Rows 10–15 look at how units obtain water and dispose of sewage.<sup>11</sup>

Rows 16–20 look at units with severe physical problems. Rows 17–20 identify specific types of serious deficiencies. Row 16 counts the units having one or more of these deficiencies.<sup>12</sup> Rows

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<sup>9</sup> New construction is based on a value of “3” for the variable REUAD (reason unit added), whereas year built is based on answers to the variable BUILT.

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

<sup>11</sup> Row 15 (sewage disposal = other or none) is omitted in the backward-looking tables because the 2007 AHS publications report no housing units with this characteristic in any of the metropolitan areas.

21–25 look at units with moderate problems. Rows 22–25 identify specific types of deficiencies. Row 21 counts the units having one or more of these deficiencies.<sup>13</sup> These rows are in the analysis to answer two questions: (1) whether poor quality units in one year are also poor quality units in the other year; and (2) whether poorer quality units are more likely to be lost.

### **Table 3**

This table studies the characteristics of occupants. Row 1 repeats the analysis from row 2 in Table 1. All the subsequent rows are based on row 1. In all cases, the analysis seeks to find out how stable occupancy characteristics are over time and what part of the market was served by units that were lost or added between 1998 and 2007.

Rows 2–3 look at the age of the householder. Rows 4–5 look at whether or not the household includes children. Rows 6–11 look at the race or ethnicity of the householder.<sup>14</sup> Rows 12–14 look at three possible sources of household income.

### **Table 4**

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

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

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

Rows 11–15 track rental units by household income; rows 21–25 track owner-occupied units by household income.<sup>15</sup>

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<sup>12</sup> Row 19 (severe electrical problems) is omitted from the backward-looking tables because the 2007 AHS publications report no housing units with this characteristic in any of the metropolitan areas.

<sup>13</sup> For definitions of severe and moderate problems see pages 1042 and 1043 of the AHS Codebook, version 1.78, at [http://www.huduser.org/intercept.asp?loc=/Datasets/ahs/AHS\\_Codebook.pdf](http://www.huduser.org/intercept.asp?loc=/Datasets/ahs/AHS_Codebook.pdf).

<sup>14</sup> In compliance with new Federal guidelines, the 2007 AHS used different categories for recording race. For 2007, “white” was defined as “white only”; Black as “Black only”; and “other” as all other answers, including householders of more than one race.

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

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

	A Characteristics	B Published Numbers	C Present in 98	D 98 units present in 2007	E Changed in characteristics	F 98 units affected by conversion /merger	G 98 units moved out	H 98 units changed to nonresidential use	I 98 units lost through demolition or disaster	J 98 units badly damaged or condemned	K 98 units lost in other ways	
1	<b>Total</b>	1,345,900	1,345,900	1,328,100	0	0	0	3,000	6,500	0	8,200	1
	<b>Occupancy Status</b>											
2	Occupied	1,264,200	1,264,200	1,154,800	93,300	0	0	2,200	5,600	0	8,200	2
3	Vacant	72,700	72,700	12,700	58,200	0	0	800	900	0	0	3
4	Seasonal	9,000	9,000	5,600	3,400	0	0	0	0	0	0	4
	<b>Units in Structure</b>											
5	1, detached	738,400	704,300	697,900	0	0	0	800	2,100	0	3,500	5
6	1, attached	58,100	56,800	56,800	0	0	0	0	0	0	0	6
7	2 to 4	273,500	267,900	262,100	0	0	0	0	2,200	0	3,500	7
8	5 to 9	70,700	71,600	69,400	0	0	0	1,100	1,100	0	0	8
9	10 to 19	56,000	67,500	67,500	0	0	0	0	0	0	0	9
10	20 to 49	62,200	68,800	66,500	0	0	0	1,100	0	0	1,200	10
11	50 or more	73,100	69,800	68,700	0	0	0	0	1,100	0	0	11
12	Mobile Home/Trailer	13,700	39,100	39,100	0	0	0	0	0	0	0	12
	<b>Year Built</b>											
15	1995-2000	26,800	29,000	27,900	0	0	0	0	1,100	0	0	15
16	1990-1994	43,400	29,300	29,300	0	0	0	0	0	0	0	16
17	1985-1989	67,700	60,300	59,100	0	0	0	0	0	0	1,100	17
18	1980-1985	48,500	38,000	36,900	0	0	0	0	0	0	1,100	18
19	1975-1979	53,000	76,800	76,800	0	0	0	0	0	0	0	19
20	1970-1974	83,800	72,900	71,700	0	0	0	0	0	0	1,200	20
21	1960-1969	164,900	166,500	165,400	0	0	0	0	1,100	0	0	21
22	1950-1959	163,100	169,400	167,300	0	0	0	0	2,100	0	0	22
23	1940-1949	113,100	109,700	109,700	0	0	0	0	0	0	0	23
24	1930-1939	101,400	98,500	95,300	0	0	0	800	0	0	2,400	24
25	1920-1929	140,500	156,100	153,800	0	0	0	0	1,100	0	1,200	25
26	1919 or earlier	339,700	339,400	334,900	0	0	0	2,200	1,100	0	1,200	26

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

	A Characteristics	B Published Numbers	C Present in 98	D 98 units present in 2007	E Changed in characteristics	F 98 units affected by conversion /merger	G 98 units moved out	H 98 units changed to nonresidential use	I 98 units lost through demolition or disaster	J 98 units badly damaged or condemned	K 98 units lost in other ways	
	<b>Rooms</b>											
27	1 - 4 rooms	427,700	423,900	329,800	86,500	0	0	3,000	2,200	0	2,400	27
28	5 rooms	228,700	254,000	123,500	127,100	0	0	0	2,200	0	1,200	28
29	6 rooms	210,000	211,000	112,200	95,600	0	0	0	900	0	2,200	29
30	7 rooms	190,000	147,300	42,600	102,400	0	0	0	1,100	0	1,200	30
31	8 rooms	124,000	119,700	38,400	81,300	0	0	0	0	0	0	31
32	9 rooms	79,800	95,900	18,800	75,900	0	0	0	0	0	1,200	32
33	10 rooms or more	85,500	94,100	24,100	70,100	0	0	0	0	0	0	33
	<b>Bedrooms</b>											
34	None	8,800	10,700	4,900	5,800	0	0	0	0	0	0	34
35	1	251,600	265,300	198,000	63,900	0	0	1,100	1,100	0	1,200	35
36	2	380,100	391,400	274,500	113,400	0	0	0	1,100	0	2,400	36
37	3	427,200	388,400	264,800	116,000	0	0	1,900	2,200	0	3,400	37
38	4 or more	278,200	290,000	194,200	92,600	0	0	0	2,100	0	1,200	38
39	<b>Multiunit Structures</b>	535,500	545,600	534,200	0	0	0	2,200	4,500	0	4,700	39
	<b>Stories in Structures</b>											
40	1	NA	11,300	11,300	0	0	0	0	0	0	0	40
41	2	NA	83,000	79,600	0	0	0	0	2,200	0	1,200	41
42	3	NA	245,800	244,700	0	0	0	0	0	0	1,100	42
43	4 to 6	NA	152,200	146,400	0	0	0	2,200	1,100	0	2,400	43
44	7 or more	NA	53,300	52,200	0	0	0	0	1,100	0	0	44
	<b>Metropolitan status</b>											
45	In central cities	NA	319,300	312,500	0	0	0	2,200	3,400	0	1,200	45
46	In suburbs	NA	1,026,600	1,015,600	0	0	0	800	3,200	0	7,000	46
	<b>Mover status</b>											
47	Moved in last 2 years	NA	233,500	56,000	170,700	0	0	1,100	3,400	0	2,300	47
48	Not a Recent Mover	NA	1,030,700	811,400	210,000	0	0	1,100	2,200	0	5,900	48



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

	A Characteristics	B Published Numbers	C Present in 98	D 98 units present in 2007	E Changed in characteristics	F 98 units affected by conversion /merger	G 98 units moved out	H 98 units changed to nonresidential use	I 98 units lost through demolition or disaster	J 98 units badly damaged or condemned	K 98 units lost in other ways	
1	<b>Occupied Units</b>	1,264,200	1,264,200	1,154,800	93,300	0	0	2,200	5,600	0	8,200	1
	<b>Kitchen</b>											
2	Complete kitchen	1,237,400	1,237,800	1,080,100	141,600	0	0	2,200	5,600	0	8,200	2
3	Not complete kitchen	26,800	26,400	3,700	22,800	0	0	0	0	0	0	3
	<b>Plumbing</b>											
4	With all plumbing	1,252,500	1,249,600	1,129,500	104,000	0	0	2,200	5,600	0	8,200	4
5	Lack some plumbing	11,700	14,600	1,300	13,400	0	0	0	0	0	0	5
6	No hot piped water	1,000	1,100	0	1,100	0	0	0	0	0	0	6
7	No bathtub/shower	700	1,100	0	1,100	0	0	0	0	0	0	7
8	No flush toilet	700	1,100	0	1,100	0	0	0	0	0	0	8
9	No exclusive use	10,700	13,500	0	13,500	0	0	0	0	0	0	9
	<b>Water</b>											
10	Public/private water	1,231,800	1,236,800	1,124,800	95,900	0	0	2,200	5,600	0	8,200	10
11	Well	30,200	24,600	23,500	1,100	0	0	0	0	0	0	11
12	Other water source	2,200	2,700	0	2,700	0	0	0	0	0	0	12
	<b>Sewer</b>											
13	Public sewer	1,039,000	1,042,800	943,400	85,700	0	0	2,200	5,600	0	5,800	13
14	Septic tank/cesspool	225,200	221,400	176,700	42,300	0	0	0	0	0	2,400	14
15	Other or none	0	0	0	0	0	0	0	0	0	0	15
16	<b>Severe Problems</b>	26,100	27,700	1,300	26,400	0	0	0	0	0	0	16
17	Plumbing	11,700	14,600	1,300	13,400	0	0	0	0	0	0	17
18	Heating	13,100	11,800	0	11,800	0	0	0	0	0	0	18
19	Electric	400	1,300	0	1,300	0	0	0	0	0	0	19
20	Upkeep	1,000	0	0	0	0	0	0	0	0	0	20
21	<b>Moderate problems</b>	52,600	46,300	3,800	41,400	0	0	0	1,100	0	0	21
22	Plumbing	2,400	2,700	0	2,700	0	0	0	0	0	0	22
23	Heating	1,000	2,700	1,300	1,400	0	0	0	0	0	0	23
24	Kitchen	23,900	26,400	3,700	22,800	0	0	0	0	0	0	24
25	Upkeep	23,300	23,500	0	22,400	0	0	0	1,100	0	0	25

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

	A Characteristics	B Published Numbers	C Present in 98	D 98 units present in 2007	E Changed in characteristics	F 98 units affected by conversion /merger	G 98 units moved out	H 98 units changed to nonresidential use	I 98 units lost through demolition or disaster	J 98 units badly damaged or condemned	K 98 units lost in other ways	
1	<b>Occupied units</b>	1,264,200	1,264,200	1,154,800	93,300	0	0	2,200	5,600	0	8,200	1
	<b>Age of Householder</b>											
2	Under 65	1,002,400	981,600	779,100	188,700	0	0	1,100	5,600	0	7,000	2
3	65 or older	261,700	282,600	162,100	118,200	0	0	1,100	0	0	1,200	3
	<b>Children</b>											
4	Some	403,300	389,100	188,400	191,400	0	0	0	4,500	0	4,700	4
5	None	861,000	875,100	677,000	191,200	0	0	2,200	1,100	0	3,500	5
	<b>Race/Origin of Householder</b>											
6	White	1,103,900	1,066,900	921,300	131,800	0	0	1,100	4,500	0	8,200	6
7	Hispanic	32,100	23,400	6,600	15,600	0	0	0	1,100	0	0	7
8	NonHispanic	1,071,800	1,043,600	876,100	154,800	0	0	1,100	3,400	0	8,200	8
9	Black	83,200	96,700	45,100	51,600	0	0	0	0	0	0	9
10	Other	77,100	100,600	37,200	61,100	0	0	1,100	1,100	0	0	10
11	Total Hispanics	51,800	41,600	14,500	25,900	0	0	0	1,100	0	0	11
	<b>Income Source</b>											
12	Wages and salaries	1,013,300	906,800	681,600	210,200	0	0	1,100	5,600	0	8,200	12
13	Social security or pension	319,900	339,600	164,600	171,500	0	0	1,100	0	0	2,400	13
14	Welfare or SSI	63,000	59,200	7,700	51,400	0	0	0	0	0	0	14

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

	A Characteristics	B Published Numbers	C Present in 98	D 98 units present in 2007	E Changed in characteristics	F 98 units affected by conversion /merger	G 98 units moved out	H 98 units changed to nonresidential use	I 98 units lost through demolition or disaster	J 98 units badly damaged or condemned	K 98 units lost in other ways	
1	<b>Occupied units</b>	1,264,200	1,264,200	1,154,800	93,300	0	0	2,200	5,600	0	8,200	1
	<b>Tenure</b>											
2	Owner occupied	760,800	760,800	673,600	81,200	0	0	0	0	0	6,000	2
3	Pct owner-occupied	60.2%	60.2%									3
4	Renter occupied	503,400	503,400	375,400	117,900	0	0	2,200	5,600	0	2,200	4
	<b>Renter Monthly Housing Costs</b>											
5	No cash rent	15,800	7,500	0	6,400	0	0	1,100	0	0	0	5
6	Less than \$350	71,600	73,600	31,700	39,700	0	0	1,100	1,100	0	0	6
7	\$350 to \$599	84,200	82,000	9,000	73,100	0	0	0	0	0	0	7
8	\$600 to \$799	115,300	130,600	9,000	119,300	0	0	0	1,100	0	1,100	8
9	\$800 to \$1249	167,800	161,700	30,700	127,600	0	0	0	2,200	0	1,100	9
10	\$1,250 or more	48,600	48,000	24,000	22,800	0	0	0	1,100	0	0	10
	<b>Renter Hsd Income</b>											
11	Less than \$15,000	161,700	151,000	52,000	94,500	0	0	2,200	1,100	0	1,100	11
12	\$15,000 to \$29,999	112,500	120,200	11,500	108,600	0	0	0	0	0	0	12
13	\$30,000 to \$49,999	115,800	123,200	17,900	103,000	0	0	0	1,100	0	1,100	13
14	\$50,000 to \$99,999	97,100	89,100	21,500	64,300	0	0	0	3,400	0	0	14
15	\$100,000 or more	16,300	20,000	1,300	18,700	0	0	0	0	0	0	15
	<b>Owner Monthly Housing Costs</b>											
16	Less than \$350	77,500	47,700	0	47,700	0	0	0	0	0	0	16
17	\$350 to \$599	179,400	204,200	25,500	176,300	0	0	0	0	0	2,400	17
18	\$600 to \$799	77,000	74,500	5,500	66,600	0	0	0	0	0	2,400	18
19	\$800 to \$1249	159,400	167,600	36,600	129,900	0	0	0	0	0	1,200	19
20	\$1,250 or more	267,300	266,700	213,300	53,400	0	0	0	0	0	0	20
	<b>Owner Hsd Income</b>											
21	Less than \$15,000	85,200	80,900	8,200	71,500	0	0	0	0	0	1,200	21
22	\$15,000 to \$29,999	80,300	84,300	25,400	58,900	0	0	0	0	0	0	22
23	\$30,000 to \$49,999	121,200	128,800	26,800	102,100	0	0	0	0	0	0	23
24	\$50,000 to \$99,999	271,400	243,500	80,300	159,600	0	0	0	0	0	3,600	24
25	\$100,000 or more	202,700	223,200	129,200	92,800	0	0	0	0	0	1,200	25

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

	A Characteristics	B Published Numbers	C Present in 2007	D 2007 units present in 1998	E Changed in characteristics	F Units from mergers & splits	G Units moved in	H Units derived from nonresidential use	I Units added through new construction	J Units added from temporary losses	K Units added by other means	
1	<b>Total</b>	1,151,000	1,151,100	884,561	0	37,692	0	4,173	149,929	2,084	72,662	1
	<b>Occupancy Status</b>											
2	Occupied	1,057,100	1,057,200	768,959	49,020	28,620	0	2,427	140,954	1,651	65,569	2
3	Vacant	85,200	85,200	8,608	50,502	9,072	0	1,298	8,194	433	7,093	3
4	Occupancy Status :Seasonal	8,700	8,700	3,735	3,735	0	0	448	781	0	0	4
	<b>Units in Structure</b>											
5	1, detached	550,700	550,979	414,495	0	8,593	0	0	96,465	0	31,427	5
6	1, attached	56,400	52,478	35,395	0	1,097	0	546	10,318	983	4,139	6
7	2 to 4	270,400	265,989	213,625	0	17,575	0	979	15,112	1,101	17,597	7
8	5 to 9	69,900	76,200	56,700	0	4,789	0	881	5,195	0	8,635	8
9	10 to 19	65,600	61,351	51,530	0	2,517	0	433	4,734	0	2,138	9
10	20 to 49	61,000	60,950	47,140	0	983	0	856	8,862	0	3,108	10
11	50 or more	73,500	74,946	57,469	0	2,138	0	478	9,243	0	5,618	11
12	Mobile Home/Trailer	5,500	8,207	8,207	0	0	0	0	0	0	0	12
	<b>Year Built</b>											
13	2005-2007	9,500	8,257	803	0	0	0	0	7,454	0	0	13
14	2000-2005	30,000	24,065	0	0	1,097	0	0	22,422	0	546	14
15	1995-2000	35,000	36,540	19,359	0	306	0	0	15,228	0	1,647	15
16	1990-1994	31,600	28,184	19,211	0	0	0	0	8,973	0	0	16
17	1985-1989	60,600	56,969	39,983	0	2,622	0	0	9,452	0	4,913	17
18	1980-1985	44,900	37,620	26,839	0	2,080	0	448	6,418	0	1,835	18
19	1970-1979	110,600	115,227	87,827	0	550	0	478	15,750	0	10,621	19
21	1960-1969	123,300	131,763	107,241	0	1,097	0	0	16,162	0	7,264	21
22	1950-1959	140,900	141,431	114,066	0	4,234	0	546	15,315	0	7,270	22
23	1940-1949	74,100	86,166	71,656	0	2,486	0	433	7,929	0	3,663	23
24	1930-1939	77,000	77,705	66,280	0	1,890	0	0	4,190	433	4,912	24
25	1920-1929	124,900	130,224	106,249	0	4,637	0	1,171	7,500	1,651	9,016	25
26	1919 or earlier	288,800	276,947	225,047	0	16,694	0	1,097	13,135	0	20,975	26

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

	A Characteristics	B Published Numbers	C Present in 2007	D 2007 units present in 1998	E Changed in characteristics	F Units from mergers & splits	G Units moved in	H Units derived from nonresidential use	I Units added through new construction	J Units added from temporary losses	K Units added by other means	
	<b>Rooms</b>											
27	1 - 4 rooms	362,100	370,200	230,400	61,100	17,000	0	3,600	34,700	400	22,800	27
28	5 rooms	208,100	203,300	78,100	77,100	9,000	0	600	23,800	0	14,700	28
29	6 rooms	212,800	217,500	75,700	94,300	3,700	0	0	24,500	1,700	17,700	29
30	7 rooms	148,200	143,500	28,000	83,100	3,200	0	0	22,100	0	7,000	30
31	8 rooms	114,600	114,100	25,800	62,100	1,600	0	0	18,900	0	5,600	31
32	9 rooms	52,100	52,500	12,500	24,600	1,600	0	0	11,100	0	2,700	32
33	10 rooms or more	53,000	50,100	15,900	15,800	1,500	0	0	14,800	0	2,100	33
	<b>Bedrooms</b>											
34	None	14,600	14,200	3,700	6,200	1,300	0	300	1,500	0	1,200	34
35	1	207,000	211,800	138,000	27,900	9,100	0	3,300	19,200	0	14,300	35
36	2	327,100	332,000	176,400	76,600	17,500	0	600	39,100	400	21,400	36
37	3	351,300	339,900	178,500	88,100	4,500	0	0	44,000	0	24,800	37
38	4 or more	251,000	253,300	129,300	59,800	5,300	0	0	46,200	1,700	11,000	38
39	<b>Multiunit Structures</b>	540,400	539,400	426,500	0	28,000	0	3,600	43,100	1,100	37,100	39
	<b>Stories in Structures</b>											
40	1	NA	6,800	4,000	0	0	0	0	1,300	0	1,500	40
41	2	NA	95,200	76,300	0	6,100	0	0	6,800	0	6,000	41
42	3	NA	235,500	187,900	0	14,200	0	1,000	17,600	600	14,400	42
43	4 to 6	NA	151,000	117,700	0	6,200	0	2,600	11,800	600	12,100	43
44	7 or more	NA	50,900	40,500	0	1,500	0	0	5,700	0	3,100	44
	<b>Metropolitan status</b>											
45	In central cities	NA	253,000	216,400	0	8,700	0	1,900	8,900	2,100	15,000	45
46	In suburbs	NA	898,100	668,100	0	28,900	0	2,300	141,000	0	57,700	46
	<b>Mover status</b>											
47	Moved in last 2 years	NA	201,400	39,800	116,300	4,400	0	500	24,300	1,100	14,800	47
48	Not a Recent Mover	NA	855,800	529,500	132,300	24,200	0	1,900	116,600	600	50,800	48

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

	A Characteristics	B Published Numbers	C Present in 2007	D 2007 units present in 1998	E Changed in characteristics	F Units from mergers & splits	G Units moved in	H Units derived from nonresidential use	I Units added through new construction	J Units added from temporary losses	K Units added by other means	
1	<b>Occupied Units</b>	1,057,100	1,057,200	769,000	49,000	28,600	0	2,400	141,000	1,700	65,600	1
	<b>Kitchen</b>											
2	Complete	1,012,300	1,007,700	716,600	55,000	28,100	0	2,100	139,900	1,700	64,500	2
3	No complete	44,800	49,500	2,600	43,800	600	0	300	1,100	0	1,100	3
	<b>Plumbing</b>											
4	With all	1,043,300	1,043,000	751,800	54,300	28,600	0	1,600	139,400	1,700	65,600	4
5	Lack some	13,800	14,200	900	11,000	0	0	800	1,600	0	0	5
6	No hot piped	700	0	0	0	0	0	0	0	0	0	6
7	No	900	1,200	0	900	0	0	300	0	0	0	7
8	No flush toilet	600	900	0	900	0	0	0	0	0	0	8
9	No exclusive use	12,200	13,000	0	11,000	0	0	500	1,600	0	0	9
	<b>Water</b>											
10	Public/private	1,028,600	1,028,700	748,800	51,600	28,100	0	2,400	132,200	1,700	63,900	10
11	Well	27,200	26,600	15,700	0	500	0	0	8,800	0	1,600	11
12	Other water	1,300	1,800	0	1,800	0	0	0	0	0	0	12
	<b>Sewer</b>											
13	Public sewer	892,800	889,800	641,300	66,900	26,400	0	2,400	95,200	1,700	56,000	13
14	Septic	164,400	167,400	104,500	5,300	2,200	0	0	45,800	0	9,600	14
	<b>Severe</b>											
16	Severe	22,800	20,900	900	15,500	600	0	800	2,600	0	600	16
17	Plumbing	13,800	14,200	900	11,000	0	0	800	1,600	0	0	17
18	Heating	8,300	5,800	0	3,700	600	0	0	1,000	0	600	18
20	Upkeep	700	900	0	900	0	0	0	0	0	0	20
	<b>Moderate</b>											
21	Moderate	56,300	57,800	2,800	49,100	1,100	0	0	2,200	600	2,100	21
22	Plumbing	1,400	900	0	900	0	0	0	0	0	0	22
23	Heating	600	900	900	0	0	0	0	0	0	0	23
24	Kitchen	42,700	49,500	2,600	43,800	600	0	300	1,100	0	1,100	24
25	Upkeep	11,600	11,300	0	8,100	600	0	0	1,100	600	1,000	25

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

	A Characteristics	B Published Numbers	C Present in 2007	D 2007 units present in 1998	E Changed in characteristics	F Units from mergers & splits	G Units moved in	H Units derived from nonresidential use	I Units added through new construction	J Units added from temporary losses	K Units added by other means	
1	<b>Occupied units</b>	1,057,100	1,057,200	769,000	49,000	28,600	0	2,400	141,000	1,700	65,600	1
	<b>Age</b>											
2	Under 65	823,100	821,600	527,800	110,900	23,400	0	1,100	110,200	1,700	46,600	2
3	65 or older	233,900	235,600	96,300	82,900	5,300	0	1,300	30,800	0	19,000	3
	<b>Children</b>											
4	Some	309,800	303,300	127,700	99,800	8,200	0	0	49,100	1,100	17,300	4
5	None	747,300	753,900	443,300	147,100	20,500	0	2,400	91,800	600	48,200	5
	<b>Race/Origin</b>											
6	White	908,200	906,500	605,000	86,300	26,400	0	2,100	126,000	600	60,100	6
7	Hispanic	56,000	49,800	4,500	36,000	1,100	0	0	2,100	0	6,000	7
8	NonHispanic	852,200	856,700	573,700	77,100	25,300	0	2,100	123,900	600	54,000	8
9	Black	68,100	67,600	31,200	25,600	2,200	0	0	5,900	600	2,200	9
10	Other	80,800	83,100	26,500	43,400	0	0	300	9,100	600	3,300	10
11	Total Hispanics	69,400	61,800	10,000	41,500	1,100	0	0	2,100	600	6,600	11
	<b>Income Source</b>											
12	Wages and salaries	803,400	803,200	506,200	122,000	20,100	0	1,100	111,500	1,700	40,700	12
13	Social security or pension	256,900	255,700	98,400	93,800	5,800	0	1,900	35,500	0	20,400	13
14	Welfare or SSI	20,600	21,500	5,500	11,200	0	0	0	2,700	600	1,600	14

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

	A Characteristics	B Published Numbers	C Present in 2007	D 2007 units present in 1998	E Changed in characteristics	F Units from mergers & splits	G Units moved in	H Units derived from nonresidential use	I Units added through new construction	J Units added from temporary losses	K Units added by other means	
1	<b>Occupied units</b>	1,057,100	1,057,200	769,000	49,000	28,600	0	2,400	141,000	1,700	65,600	1
	<b>Tenure</b>											
2	Owner occupied	656,700	656,700	426,100	63,700	16,800	0	1,100	108,600	0	40,300	2
3	Percent owner-occupied	62.1%	62.1%									3
4	Renter occupied	400,500	400,500	269,800	58,400	11,800	0	1,300	32,300	1,700	25,300	4
	<b>Renter Monthly Housing Costs</b>											
5	No cash rent	16,000	12,600	0	10,100	0	0	300	500	0	1,700	5
6	Less than \$350	53,300	52,200	22,700	19,100	1,100	0	500	6,100	0	2,700	6
7	\$350 to \$599	47,300	47,800	6,400	33,900	2,200	0	0	1,700	600	3,000	7
8	\$600 to \$799	28,300	33,800	6,400	22,000	1,100	0	0	2,100	0	2,200	8
9	\$800 to \$1,249	120,600	117,500	22,000	72,700	4,900	0	600	9,200	600	7,700	9
10	\$1,250 or more	134,700	136,500	17,200	95,600	2,500	0	0	12,700	600	8,000	10
	<b>Renter Hsd Income</b>											
11	Less than \$15,000	99,300	97,200	37,200	39,900	3,100	0	800	9,000	600	6,700	11
12	\$15,000 to \$29,999	64,600	60,500	8,300	41,200	2,100	0	0	3,400	600	4,900	12
13	\$30,000 to \$49,999	78,500	72,900	12,800	46,800	2,200	0	0	8,400	0	2,700	13
14	\$50,000 to \$99,999	111,000	119,900	15,400	84,600	2,800	0	600	7,800	600	8,300	14
15	\$100,000 or more	47,000	50,000	900	41,000	1,700	0	0	3,700	0	2,800	15
	<b>Owner Monthly Housing Costs</b>											
16	Less than \$350	10,800	6,900	0	3,900	300	0	500	1,100	0	1,100	16
17	\$350 to \$599	58,600	51,300	16,900	27,600	2,000	0	0	2,200	0	2,700	17
18	\$600 to \$799	66,000	58,500	3,600	38,300	1,100	0	0	7,900	0	7,500	18
19	\$800 to \$1,249	108,700	112,700	24,200	56,200	4,200	0	500	20,600	0	6,900	19
20	\$1,250 or more	412,400	427,300	141,200	177,900	9,200	0	0	76,900	0	22,100	20
	<b>Owner Hsd Income</b>											
21	Less than \$15,000	38,300	35,000	5,500	14,200	1,600	0	1,100	7,200	0	5,400	21
22	\$15,000 to \$29,999	54,000	56,200	10,200	31,300	3,400	0	0	8,500	0	2,700	22
23	\$30,000 to \$49,999	75,500	78,900	11,100	52,700	2,500	0	0	8,200	0	4,400	23
24	\$50,000 to \$99,999	190,600	194,300	53,100	98,100	4,300	0	0	24,900	0	13,900	24
25	\$100,000 or more	298,300	292,400	85,500	128,200	4,900	0	0	59,900	0	13,900	25



## Changes in the Boston Housing Stock: 1998–2007

Forward-Looking Table 5 looks at how losses affected certain portions of the Boston housing stock. The rows were selected because of their inherent interest or because an examination of losses in all seven metropolitan areas showed that these categories typically had high loss rates or rates that varied substantially across the metropolitan areas. In most cases, if a category had a high loss rate, then a category with the opposite characteristic would have a low loss rate, e.g., units in central cities compared to units in the remainder of the metropolitan area.

**Forward-Looking Table 5: Selected Loss Rates**

Category	Based on columns in Tables 1-4		
	All losses 1998-2007 (F+G+H+I+J+K)/C	Permanent losses (I/C)	Potentially reversible losses (F+G+H+J+K)/C
<b>All units<sup>16</sup></b>	1.3%	0.5%	0.8%
Vacant units	2.4%	1.3%	1.1%
Units in structures with 2-4 units	2.1%	0.8%	1.3%
Units in structures with 5-9 units	3.1%	1.6%	1.6%
Units built 1930-1939	3.3%	0.0%	3.3%
Units built 1920-1929	1.5%	0.7%	0.8%
Units built in 1919 or earlier	1.3%	0.3%	1.0%
Units with 1-4 rooms	1.8%	0.5%	1.3%
Units with no bedrooms	0.0%	0.0%	0.0%
Units in central cities	2.1%	1.1%	1.1%
Units outside of central city	1.1%	0.3%	0.8%
<b>Occupied units<sup>17</sup></b>	1.3%	0.4%	0.8%
Units with severe problems	0.0%	0.0%	0.0%
Units with moderate problems	2.4%	2.4%	0.0%
Units with a white householder	1.3%	0.4%	0.9%
Units with a Black householder	0.0%	0.0%	0.0%
Units with Hispanic householder	2.7%	2.7%	0.0%
Household receives welfare/SSI	1.6%	0.6%	1.0%
Owner-occupied units	0.8%	0.0%	0.8%
Renter-occupied units	2.0%	1.1%	0.9%
Renter-occupied – monthly housing costs less than \$350	3.0%	1.5%	1.5%
Renter-occupied – household income less than \$15,000	3.0%	0.7%	2.2%

<sup>16</sup> All the rows above “Occupied units” refer to portions of the entire housing stock.

<sup>17</sup> All the rows below “Occupied units” refer to portions of the occupied housing stock.

By 2007, 1.3 percent of the units in the 1998 housing stock were no longer part of the housing stock; 0.5 percent were permanent losses—for example, the units had either been demolished or destroyed by fire or natural disasters—while 0.8 percent were lost in ways that could be reversed, such as nonresidential use.

Units that were vacant in 1998 had a higher loss rate, as did units in structures containing 2 to 4 units and buildings containing 5 to 9 units. Units built prior to 1940 had a mix of loss rates. Those built between 1930 and 1939 had a loss rate of 3.3 percent, while those built between 1920 and 1929 or in 1919 or earlier had loss rates close to the average. The central city loss rate was almost twice the loss rate in the rest of the metropolitan area.

Among units occupied in 1998, 1.3 percent were lost by 2007. The loss rate was higher for units with moderate physical problems; but, surprisingly, none of the units with severe physical problems were lost. Units with white householders had an average loss rate, while units with Hispanic householders had double the average loss rates. None of the units occupied by Black householders were lost. Units with households on welfare or Supplemental Security Income (SSI) had slightly high loss rates.

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

Permanent losses were particularly high among units with Hispanic householders, units with moderate physical problems, units in structures with 5 to 9 units, and low rent units. Potentially reversible losses were high among units built between 1930 and 1939, units in small structures, and low rent units.

Backward-Looking Table 5 presents addition rates for selected segments of the Boston housing stock. The rows were selected because of their inherent interest or because an examination of additions in all seven metropolitan areas showed that these categories typically had high addition rates or rates that varied substantially across the metropolitan areas. In most cases, if a category had a high addition rate, then a category with the opposite characteristic would have a low addition rate, e.g., units in central cities compared to units in the remainder of the metropolitan area.

Of all the units in the Boston housing stock in 2007, 23.2 percent were not in the 1998 housing stock. The majority of the new units came from new construction, but the return to the housing of units that were not available in 1998 accounted for over 10 percent of the total units in 2007.

Vacant units had higher than average rates of overall additions, particularly additions other than by new construction. Perhaps owners of units returning to the housing stock have had a difficult time finding tenants for these units in the slower housing market in 2007 and immediately preceding 2007. Single-units in attached structures had a higher than average addition rate, as well as units in structures containing 50 or more units. Surprisingly, both units with 10 or more rooms and units with no bedrooms had a higher than average rate. The addition rate in central cities was slightly more than one-half the addition rate in the rest of the metropolitan area. New

construction was much stronger outside of the central cities than in the central cities while other additions were slightly higher in central cities.

**Backward-Looking Table 5: Selected Addition Rates**

Category	Based on columns in Tables 1-4		
	All additions (F+G+H+I+J+K)/C	New construction I/C	Other additions (F+G+H+J+K)/C
<b>All units</b> <sup>18</sup>	23.2%	13.0%	10.1%
Vacant units	30.6%	9.6%	21.0%
Single-unit, attached structure	32.6%	19.7%	12.9%
Units in structures with 50 or more units	23.3%	12.3%	11.0%
Units with 10 or more rooms	36.7%	29.6%	7.1%
Units with no bedrooms	30.2%	10.7%	19.5%
Units in central cities	14.5%	3.5%	10.9%
Units outside of central city	25.6%	15.7%	9.9%
<b>Occupied units</b> <sup>19</sup>	22.6%	13.3%	9.3%
Owner-occupied units	25.4%	16.5%	8.9%
Renter-occupied units	18.1%	8.1%	10.0%
Renter-occupied - no cash rent	19.9%	4.4%	15.5%
Renter-occupied - monthly housing costs less than \$350	19.9%	11.7%	8.3%
Renter-occupied - monthly housing costs \$1,250 or more	17.4%	9.3%	8.1%
Owner-occupied - monthly housing costs \$1,250 or more	25.3%	18.0%	7.3%
Owner-occupied - household income \$100,000 or more	26.9%	20.5%	6.4%

The rate of all additions was higher for owner-occupied units than for renter-occupied units, with the rate of new construction more than twice as high for owner-occupied units than for renter-occupied units. Addition rates were high at both ends of the rental stock. For the no-cash rent group, other additions accounted for three-quarters of total additions. Total additions and new construction were also high for owner-occupied units with monthly housing costs greater than \$1,250 and owner-occupied units with households that had income of \$100,000 or more.

### **Rental Market Dynamics**

Tables A and B present the rental market dynamics analysis. Rental market dynamics differs in two ways from the analysis in rows 5–10 in Table 4 of both the forward-looking and backward-looking tables. First, rental market dynamics uses categories (rows) based on affordability instead of absolute dollar amount. Affordability is defined relative to local area median income, measured at the same time that monthly housing costs are measured. Tables A and B use the following eight categories:

<sup>18</sup> All the rows above “Occupied units” refer to portions of the entire housing stock.

<sup>19</sup> All the rows below “Occupied units” refer to portions of the occupied housing stock.

- non-market (either no cash rent or a subsidized rent)
- extremely low rent (monthly housing costs affordable to renters with incomes less than or equal to 30 percent of local area median income)
- very low rent (monthly housing costs affordable to renters with incomes greater than 30 percent but less than or equal to 50 percent of local area median income)
- low rent (monthly housing costs affordable to renters with incomes greater than 50 percent but less than or equal to 60 percent of local area median income)
- moderate rent (monthly housing costs affordable to renters with incomes greater than 60 percent but less than or equal to 80 percent of local area median income)
- high rent (monthly housing costs affordable to renters with incomes greater than 80 percent but less than or equal to 100 percent of local area median income)
- very high rent (monthly housing costs affordable to renters with incomes greater than 100 percent but less than or equal to 120 percent of local area median income)
- extremely high rent (monthly housing costs affordable to renters with incomes greater than 120 percent of local area median income)

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

Table A shows that there were 531,000 rental units in the Boston metropolitan area in 1998. In 2007, 111,600 of these units were no longer rental; 86,500 were owner-occupied; 15,000 were either vacant or being used seasonally; and 10,100 had been lost to the stock. Taken as a proportion of the units in 1998, movement into owner-occupancy was concentrated among units in the very high rent category and losses to the stock were concentrated among extremely low rent units, and, surprisingly, units with very high rents.

**Table A: Forward-Looking Rental Dynamics Analysis, Counts: 1998-2007**

Affordability groups	A Total in 1998	B Non- Market in 2007	C Extremely Low Rent in 2007	D Very Low Rent in 2007	E Low Rent in 2007	F Moderate Rent in 2007	G High Rent in 2007	H Very High Rent in 2007	I Extremely High Rent in 2007	J Owner Occupied in 2007	K Seasonal or Vacant in 2007	L Lost to Stock in 2007
<b>Non-market</b>	109,100	66,000	6,400	6,200	3,700	7,700	0	0	0	15,400	2,600	1,100
<b>Extremely Low Rent</b>	33,000	9,000	2,600	2,600	3,800	3,800	0	0	0	5,100	3,800	2,200
<b>Very Low Rent</b>	121,400	19,200	7,500	31,800	15,300	12,600	3,800	3,800	0	21,300	3,600	2,200
<b>Low Rent</b>	99,000	5,000	9,000	11,200	30,000	26,200	5,100	0	1,300	8,800	1,300	1,100
<b>Moderate Rent</b>	90,700	6,400	6,200	13,700	8,800	24,500	10,000	2,600	0	16,100	2,400	0
<b>High Rent</b>	62,800	2,600	3,800	3,600	4,900	15,800	7,700	2,600	3,500	13,600	1,300	3,400
<b>Very High Rent</b>	12,600	0	0	0	0	1,300	1,300	2,600	1,300	6,200	0	0
<b>Extremely High Rent</b>	2,600	0	0	0	1,300	0	0	1,300	0	0	0	0
<b>Total</b>	531,000	108,200	35,500	69,100	67,900	91,900	28,000	12,800	6,100	86,500	15,000	10,100

**Table B: Backward-Looking Rental Dynamics Analysis, Counts: 2007-1998**

Affordability groups	A Total in 2007	B Non- Market in 1998	C Extremely Low Rent in 1998	D Very Low Rent in 1998	E Low Rent in 1998	F Moderate Rent in 1998	G High Rent in 1998	H Very High Rent in 1998	I Extremely High Rent in 1998	J Owner Occupied in 1998	K Seasonal or Vacant in 1998	L New Construc- tion	M Other Additions
<b>Non-market</b>	105,000	47,400	6,200	13,800	3,600	4,600	3,000	0	0	6,100	0	8,400	12,000
<b>Extremely Low Rent</b>	38,500	4,200	1,800	5,100	6,200	4,200	2,600	0	0	2,600	3,300	2,600	5,800
<b>Very Low Rent</b>	72,600	4,400	1,800	22,900	8,100	9,800	3,300	0	0	5,100	1,600	5,700	9,800
<b>Low Rent</b>	71,500	2,400	2,800	11,000	20,900	6,100	3,500	0	900	10,300	1,400	4,000	8,200
<b>Moderate Rent</b>	96,200	5,100	3,500	9,000	18,400	18,200	11,500	900	0	12,400	0	10,200	7,000
<b>High Rent</b>	38,400	700	0	2,800	3,700	6,900	5,300	900	0	8,000	900	4,500	4,700
<b>Very High Rent</b>	10,000	0	0	2,800	0	1,600	1,800	1,800	900	0	0	1,000	0
<b>Extremely High Rent</b>	8,700	0	0	0	700	0	2,500	900	0	1,800	0	500	2,100
<b>Total</b>	440,900	64,300	16,100	67,300	61,600	51,400	33,500	4,600	1,800	46,300	7,300	36,900	49,800

Table B shows there were 440,900 rental units in the Boston metropolitan area in 2007, of which 140,300 were not rental units in 1998. The new units came from units that had been owner-occupied (46,300), units that had been vacant or in seasonal use (7,300), newly constructed units (36,900), and other additions (49,800). Most of the formerly owner-occupied units went to the moderate rent and low rent categories; most of the newly constructed rental units went to non-market and moderate rent categories.

Because of the change in geographical boundaries between the 1998 and 2007 AHS surveys, it is not possible to determine whether the number of rental units and the number of affordable rental units increased or decreased during this period. Table B shows where the 2007 rental stock came from. The extremely low rent units in 2007 came from a variety of sources; the five largest contributors accounted for 66 percent of the 2007 stock. In order of importance, they were low rent units in 1998 (16 percent), other additions (15 percent), very low rent units in 1998 (13 percent), and a tie between non-market and moderate rent units (11 percent each). The history of very low rent units is less diverse; the five largest contributors accounted for 79 percent of the 2007 stock. In order of importance, they were very low rent units in 1998 (32 percent), other additions and moderate rent units in 1998 (14 percent each), low rent units in 1998 (11 percent), and new construction (8 percent).

### ***Concluding Cautions***

Readers should use caution in interpreting the results of the CINCH and rental dynamics analysis for Boston over the period between 1998 and 2007. The forward-looking components can trace only what happened to units that are within the geographical boundaries common to both the 1998 AHS and the 2007 AHS surveys. The backward-looking components represent a mixed geography. Data on new construction and other additions apply to the full 2007 geography, while data on units that existed in 1998 apply only to the geography common to the 1998 and 2007 surveys. The change in geographical boundaries was substantial; the housing stock measured in the 2007 AHS survey is 14 percent smaller than the housing stock measured in 1998.

Small sample sizes reduce the reliability of estimates for a number of segments of the housing stocks, particularly for the forward-looking analyses. In particular, counts of mobile homes are substantially in error.

## ***Appendix A: Comparison between the Geography Used for the 1998 AHS Survey of Boston and the Geography Used for the 2007 AHS Survey***

### **1998 Geography:**

#### **BOSTON, MA-NH**

Bristol County, MA (Part)      Essex County, MA      Middlesex County, MA (Part)  
Norfolk County, MA (Part)      Plymouth County, MA (Part)      Suffolk County, MA  
Worcester County, MA (Part)      Rockingham County, NH (Part)

#### **Bristol County, MA (Part)**

Berkley town, Dighton town, Mansfield town, Norton town, Taunton city

#### **Middlesex County (Part)**

Acton town, Arlington town, Ashland town, Ayer town, Bedford town, Belmont town, Boxborough town, Burlington town, Cambridge city, Carlisle town, Concord town, Everett city, Framingham town, Holliston town, Hopkinton town, Hudson town, Lexington town, Lincoln town, Littleton town, Malden city, Marlborough city, Maynard town, Medford city, Melrose city, Natick town, Newton city, North Reading town, Reading town, Sherborn town, Shirley town, Somerville city, Stoneham town, Stow town, Sudbury town, Townsend town, Wakefield town, Waltham city, Watertown town, Wayland town, Weston town, Wilmington town, Winchester town, Woburn city

#### **Norfolk County (Part)**

Bellingham town, Braintree town, Brookline town, Canton town, Cohasset town, Dedham town, Dover town, Foxborough town, Franklin city, Holbrook town, Medfield town, Medway town, Millis town, Milton town, Needham town, Norfolk town, Norwood town, Plainville town, Quincy city, Randolph town, Sharon town, Stoughton town, Walpole town, Wellesley town, Westwood town, Weymouth town, Wrentham town

#### **Plymouth County (Part)**

Brockton city, Carver town, Duxbury town, Hanover town, Hingham town, Hull town, Kingston town, Marshfield town, Norwell town, Pembroke town, Plymouth town, Rockland town, Scituate town, Wareham town

#### **Worcester County (Part)**

Berlin town, Blackstone town, Bolton town, Harvard town, Hopedale town, Lancaster town, Mendon town, Milford town, Millville town, Southborough town, Upton town

#### **Rockingham County (Part)**

Atkinson town, Brentwood town, Danville town, Derry town, East Kingston town, Hampstead town, Kingston town, Newton town, Plaistow town, Salem town, Sandown town, Seabrook town, South Hampton town, Windham town

**2007 Geography:**

Boston, MA (NECTAD)

Bristol County (Part)	Essex County (Part)	Middlesex County (Part)
Norfolk County (Part)	Plymouth County (Part)	Suffolk County 5
Worcester County (Part)		

Bristol County (Part)  
Mansfield town

Essex County (Part)  
Andover town, Beverly city, Boxford town, Essex town, Gloucester city, Hamilton town, Ipswich town, Lynnfield town, Manchester-by-the-Sea town, Middleton town, Newbury town, Newburyport city, Rockport town, Rowley town, Saugus town, Topsfield town, Wenham town

Middlesex County (Part)  
Acton town, Arlington town, Ayer town, Bedford town, Belmont town, Boxborough town, Burlington town, Cambridge city, Carlisle town, Concord town, Everett city, Groton town, Lexington town, Lincoln town, Littleton town, Malden city, Maynard town, Medford city, Melrose city, Newton city, North Reading town, Reading town, Sherborn town, Shirley town, Somerville city, Stoneham town, Stow town, Sudbury town, Wakefield town, Waltham city, Watertown city, Wayland town, Weston town, Wilmington town, Winchester town, Woburn city

Norfolk County (Part)  
Braintree town, Brookline town, Canton town, Cohasset town, Dedham town, Dover town, Foxborough town, Franklin city, Holbrook town, Medfield town, Medway town, Millis town, Milton town, Needham town, Norfolk town, Norwood town, Quincy city, Randolph town, Sharon town, Stoughton town, Walpole town, Wellesley town, Westwood town, Weymouth town, Wrentham town

Plymouth County (Part)  
Carver town, Duxbury town, Hanover town, Hingham town, Hull town, Kingston town, Marshfield town, Norwell town, Pembroke town, Plymouth town, Rockland town, Scituate town

Worcester County (Part)  
Bolton town, Harvard town



## ***Appendix B: 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) equaled the number of units present in the base year (column C). In every case, exact equality was achieved prior to rounding.
- Throughout the tables, various sets of rows are related to each other. For example, the year-built rows (13-26) in Table 1 are a disaggregation of the total stock in row 1. Similarly, rows 6 (whites), 9 (Blacks), and 10 (other race) in Table 3 are a disaggregation of row 1 (occupied households). In these cases, there should be equality between the parent row and the sum of the break-out rows for all columns except D and E. The difference between column D in the parent row and the sum of column D for the break-out rows should equal the negative of the difference between column E in the parent row and the sum of column E for the break-out rows. In every case, exact equality was achieved prior to rounding.

Column B provides an external check of how well the CINCH weighting performed. As noted in the text, the backward-looking weights produced estimates closer to the published estimates.

## **Appendix C: Weighting**

CINCH separates the AHS samples in 1998 and 2007 into three pieces: (1) units that exist and are part of the housing stock in both years (SAMES); (2) units that are part of the 1998 housing stock but are not part of the 2007 housing stock (LOSSES); and (3) units that are not part of the 1998 housing stock but are part of the 2007 housing stock (ADDITIONS). ADDITIONS are split into NEW CONSTRUCTION and RECOVERIES (structures that existed in 1998 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 1998 and those ADDITIONS that were interviewed in 2007.

For the forward-looking analysis, we started with the AHS pure weights and used the AHS weighted count in 1998 of SAMES to create weights for the interviewed SAMES. We used the AHS weighted count in 1998 of LOSSES to create weights for interviewed LOSSES. We then adjusted the weights of SAMES and LOSSES to equal the AHS published totals for owner-occupied units, renter-occupied units, vacant units, and seasonal units in 1998.

For the backward-looking analysis, we started with the AHS pure weights and used the AHS weighted count in 2007 of SAMES to create weights for the interviewed SAMES. We used the AHS weighted counts in 2007 for NEW CONSTRUCTION and for RECOVERIES to create weights for interviewed NEW CONSTRUCTION and interviewed RECOVERIES. We then adjusted the weights for SAMES, NEW CONSTRUCTION, and RECOVERIES to equal AHS published totals for owner-occupied units, renter-occupied units, vacant units, and seasonal units in 2007.

The logic behind the weighting and the procedures used to create the weights are explained in *Weighting Strategy for 2007 Metropolitan CINCH and Rental Dynamics Analysis*.