RENTAL MARKET DYNAMICS: IS AFFORDABLE HOUSING FOR THE POOR AN ENDANGERED SPECIES?

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Introduction

Affordability and the Operation of Housing Markets

Congress has charged the U.S. Department of Housing and Urban Development (HUD) with advancing the goal of decent housing in a suitable living environment for all Americans. The housing needs of the poor particularly concern HUD. Using various programs, the Department provides subsidized housing to over 4.5 million poor households, but the combined funding for these programs falls short of what is needed to meet the needs of all poor households. The unassisted poor must depend on the "market" to provide adequate housing at an affordable price.

The market for housing differs from the market for other necessities such as food or clothing in that supply does not respond to demand quickly. The construction of new housing takes time and a variety of factors generally channels the supply of new housing into the high-priced end of the market. For one thing, building codes and zoning rules add to the cost of new housing. Also, it is impractical to build a "run-down" unit affordable to the poor in the same way that it is impractical to build a new "clunker" for the poor to drive. Just as the poor turn to the used car market for their cars, they turn to older units for their housing. The exceptions are if the housing was subsidized in its development.

As units age, housing units are said to "filter" down from serving higher income occupants to serving lower income occupants. But filtration takes time and is uncertain. Shifts in demand, such as higher income households being attracted back to the central city, can cause units to filter up. Rising land prices can push up rents even as the quality of a unit deteriorates. For these reasons, HUD pays particular attention to how well markets meet the housing needs of the poor.

Using American Housing Survey (AHS) data, HUD reports to Congress periodically on the number of poor households with severe housing needs. HUD classifies a household as experiencing severe housing problems if the household is a renter household, does not receive housing assistance, and has income less than 50 percent of area median income *and* if either of the following conditions holds: (a) the ratio of gross rent to household income is greater than 50 percent or (b) the unit contains severe physical problems as reported in the AHS. The most recent report to Congress found 4,860,000 poor renter households in 1999 with severe housing problems.[1] In 94 percent of these cases, the poor household was paying more than 50 percent of its income for housing. Eleven percent of the households that counted as worst case needs households failed the severe physical problems test.

The 1999 AHS data revealed the first decline in the absolute number of households with worst case needs in ten years. In large part, income growth shared by the lowest income households accounted for this decline. Better AHS procedures for eliciting income and rent from respondents also helped lower the count. In 1999, the 4.9 million worst case households represented 4.7 percent of U.S. households, the lowest

[1] *A Report on Worst Case Housing Needs in 1999:New Opportunity Amid Continuing Challenges*, U.S. Department of Housing and Urban Development, January 2001.

share of the U.S. population observed in the 21 years for which comparable worst case data are available.

Research into Housing Market Dynamics

HUD analysts have pioneered research into the dynamics of rental housing markets. In a 1996 paper, Kathryn P. Nelson and David A. Vandenbroucke used AHS data on 41 metropolitan areas to track the changing role of rental units over a four year period.[2, 3] Nelson-Vandenbroucke classified rental units as affordable to one of six classes of households. The household classes were defined by income, e.g., the very low-income class consisted of households with incomes between 36 percent and 50 percent of area median income. A unit was classified as affordable to a particular class if the gross rent of the unit was less than 30 percent of the highest income in that class, but greater than 30 percent of the highest income in the next lowest income class. Over the four-year period, Nelson-Vandenbroucke found considerable movement in the rental market. Typically more than half of units that were classified as affordable to one income class in the first year were either classified as affordable to a different income class in the second year or were no longer in the rental market. While most of the observed movement involved changes in the class for which a rental unit was affordable, a significant number of rental units became owner-occupant units, became non-residential units, were destroyed, or became non-market, that is, were subsidized or were provided without cash rent, for example, to family members.

Totaling all 41 metropolitan areas, Nelson-Vandenbroucke estimated that 9 percent of the rental stock in the first year was affordable to extremely low income households, i.e., households with incomes less than or equal to 35 percent of the local area median income. By the fourth year, only 6 percent of the rental stock was affordable to the extremely low income households, a loss of approximately 527,000 units in this affordability class. Tenure change accounted for 20,000 of the lost units; net losses from movement into the non-market category accounted for 16,000, the difference between newly constructed and destroyed units accounted for another 45,000 units, and the combined effects of mergers and splits and movements in and out of residential service accounted for 97,000. Rent changes that altered the affordability classification accounted for the remaining 348,000 loss.

In general, net changes were considerably smaller than the gross changes. For example, the 527,000 net loss was the difference between losses of 1,203,000 due to various causes and gains of 677,000 from various causes. The net loss of 348,000 from filtering was the difference between 878,000 units that filtered up in affordability and 514,000 units that filtered down. Nelson-Vandenbroucke's research uncovered vigorous undercurrents in rental housing markets.

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[2] Kathryn P. Nelson and David A. Vandenbroucke, "Affordable Rental Housing: Lost, Stolen, or Strayed?," paper presented at the 1996 Mid-Year meeting of he American Real Estate and Urban Economics Association, Washington, DC, May 28, 1996.

[3] Nelson-Vandenbroucke drew the 41 metropolitan areas from four successive annual waves of AHS surveys starting in 1985. The first four-year period studied was 1985-1989; the fourth and last four year period studied was 1988-1992.

The discovery of considerable movement within the aggregate data raises the question of whether the observed movement is similar across different housing markets or across submarkets within a single housing market. Nelson-Vandenbroucke split the 41 metropolitan areas into six groups based upon the level of new construction and the change in the number of units affordable to very low-income households. They found notable consistency in the loss of extremely low-rent units through filtering up across all six groups but substantial diversity in the net changes for other affordability classes across the six groups. Using AHS data on submarkets, Nelson-Vandenbroucke observed that the loss of extremely low-rent units was greatest in low poverty areas, and least in high poverty areas.[4] This result was consistent across the six groups of markets.

Building upon the work of Nelson-Vandenbroucke, Somerville and Holmes used multinomial logit to examine the causes of movement in and out of affordability.[5] Somerville and Holmes looked at three categories of variables: variables describing the unit, variables describing the neighborhood (AHS zone) to which the unit belonged, and variables describing the local housing market.[6] They found that the neighborhood variables had the most explanatory power. These variables included: share of rental units in the neighborhood, the affordable share of the total rental stock, and neighborhood income.

In an unfinished 1998 paper, Nelson, Burns, Khadduri, and Vandenbroucke expanded on the inter-metropolitan analysis in Nelson-Vandenbroucke to suggest rules for choosing among different housing policy tools.[7] This research found:

- Widespread growth in the stock of housing renting at or below fair market rents (FMRs) in most metropolitan markets across the country, suggesting that an adequate supply of moderately priced housing is available and can be made affordable to lower income families and individuals through the use of tenant-based assistance.
- Some metropolitan areas are so tight that few housing units are available for rent to poor households, even with additional rental assistance. In these markets, the limited supply of affordable housing units in good condition should be protected. In addition, production of new housing is needed to boost the overall stock of affordable rental housing units in tight markets.[8]

The primary policy concern of Nelson-Vandenbroucke was the loss of units affordable to extremely low-income renters, those renter households earning less than or equal to 35 percent of local area median income. HUD's Worst Case Housing Needs

[4] The submarkets were areas within each AHS metropolitan area, called zones, of at least 250,000 population.
[5] C. Tsuriel Somerville and Cynthia Holmes, "Dynamics of the Affordable Housing Stock: Microdata Analysis of Filtering," *Journal of Housing Research*, Vol. 12, Issue 1, Fannie Mae Foundation, 2001.
[6] Somerville and Holmes used data on four year changes for the same 41 metropolitan areas used by Nelson-Vandenbroucke. However, for 23 of the areas, they were able to observe changes over two successive four-year periods.
[7] Kathryn P. Nelson, Meg Burns, Jill Khadduri, and David Vandenbroucke, "Affordable Rental Housing: When to Build, When to Preserve, and When to Subsidize?" Office of Policy Development and Research, Department of Housing and Urban Development, May 1998 (unfinished).
[8] Ibid, pps. 1-2.

reports also focus on this problem. Despite the reduction in the number of households with severe housing problems, the most recent report called attention to the loss of 750,000 units affordable to this group nationally between 1997 and 1999.

Nelson-Vandenbroucke studied rental market dynamics over the period 1985 to 1992. Because there have been no recent studies of how the affordable rental housing stock changes, HUD commissioned ICF Consulting in conjunction with Econometrica, Inc., to update the Nelson-Vandenbroucke analysis. This paper reports the result of that effort.

Replicating Nelson-Vandenbroucke

This research has a narrower scope than Nelson-Vandenbroucke because HUD changed the design of the AHS metropolitan areas in the 1990s. Nelson-Vandenbroucke analyzed data from 41 metropolitan areas. This paper will study only 6 metropolitan areas. Of the 47 AHS metropolitan areas, 29 were surveyed only once during the 1992-1999 period. Eighteen areas were surveyed twice in the 1992-1999 period, but 12 surveys used different samples.[9] Beginning in 1995, HUD has used the national sample with supplements for the six largest metropolitan areas. This change results in substantially smaller sample sizes for these six areas.

This study will examine the dynamics of the rental markets between 1995 and 1999 within the six largest metropolitan areas or groups of metropolitan areas that the AHS surveys as part of the national AHS. These areas are: New York-Nassau-Suffolk-Orange, Los Angeles-Long Beach, Chicago, Philadelphia, Detroit, and Northern New Jersey. Although, having to restrict the study to these six areas limits our ability to replicate Nelson-Vandenbroucke's cross sectional, submarket, and individual market analyses.

Other than these differences, this paper adheres closely to the methodology used by Nelson-Vandenbroucke. We use the same affordability classes and the same definitions for those classes. Rental units are places in one of seven categories:[10]

[9] Before 1995, the metropolitan surveys used samples drawn from the 1970 census. Starting in 1995, most of the metropolitan area surveys, including these 12, used samples drawn from the 1990 census.

[10] We adjust rents for number of bedrooms in the same way as Nelson-Vandenbroucke and, like Nelson-Vandenbroucke, use an inflation adjusted 1995 HAMFI for 1999 HAMFI. See the appendix to Nelson-Vandenbroucke, and also the appendix of this paper.

Affordability Category	Definition
Non-market	Subsidized or no cash rent
Extremely low-rent	Rent equal to or less than 30 percent of 35 percent of HUD-adjusted area median family income (HAMFI)
Very low-rent	Rent greater than 30 percent of 35 percent of HAMFI, but less than or equal to 30 percent of 50 percent of HAMFI
Low rent	Rent greater than 30 percent of 50 percent of HAMFI, but less than or equal to 30 percent of 65 percent of HAMFI
Moderate rent	Rent greater than 30 percent of 65 percent of HAMFI, but less than or equal to 30 percent of 80 percent of HAMFI
High rent	Rent greater than 30 percent of 80 percent of HAMFI, but less than or equal to 30 percent of 100 percent of HAMFI
Very high rent	Rent greater than 30 percent of 100 percent of HAMFI

We also study movement of units in and out of the rental stock. Our non-rental stock options are similar, but not identical, to those of Nelson-Vandenbroucke.

Rental Units Are Lost To:	
Nelson-Vandenbroucke	**This Paper**
Owner-occupied	Owner-occupied
Conversion-merger	Conversion-merger
Temporary loss[11]	Non-residential
	Other Type B
Permanent loss	Permanent loss
Not comparable	Other
Not comparable	Vacant interview
Rental Units Are Gained from:	
Owner-occupied	Owner-occupied
Conversion-merger	*Not comparable*
Temporary loss	Non-residential
	Other Type B
New construction	Not in 1995 sample
Not comparable	Other
Not comparable	Vacant interview

The main differences involve our vacant interview and "other" categories. Nelson-Vandenbroucke used a hot-deck procedure to allocate vacant units to one of the six categories. We treat vacancies as another category. Our "other" category includes cases with missing variables, such as tenure or number of bedrooms.

We used 1995 pure weights for all cases except units constructed after 1995, for which we used 1999 pure weights. We adjusted the weights to match the 1995 rental stock totals for each metropolitan area. This is basically the same methodology used by Nelson-Vandenbroucke, but that approach was considerably more complicated because it had to adjust for various changes in the sample sizes of AHS metropolitan surveys in

[11] Type B AHS codes other than loss to conversion-merger.

the late 1980s and early 1990s.[12] In addition, Nelson-Vandenbroucke used a hot-deck procedure to deal with refusals. We used a similar but simpler procedure. The absence of zones was the main reason our procedure had to be simpler.

Appendix B contains a more detailed discussion of methodology.

Rental Dynamics

We present our empirical results in three installments. This section provides an overview of changes in the combined rental housing stock of the six metropolitan areas studied. We begin by looking at movements within the rental stock, that is, shifts in affordability among units that were rented in both 1995 and 1999. Then we look at movements into and out of the rental stock. We describe what happened to units that were part of the rental housing stock in 1995 but were no longer part of the rental housing stock in 1999. We also examine the origins of units that were part of the rental housing stock in 1999 but had not been part of the rental housing stock in 1995. We are interested not only in the overall size of movement into and out of the rental housing but also in how these movements affected the various affordability strata. As part of the analysis in this section, we assess how the Census Bureau's allocation process affects our measures of rental dynamics.

Building on this general overview of rental market activity, the next section focuses on two issues that Nelson-Vandenbroucke first called attention to, namely the extent of filtering within the rental market and the impact of these changes on the ability of extremely low income households to find affordable housing. Appendix A contains the third installment of our research, specifically tables on movements affecting the affordability of housing for each of the six metropolitan areas.

Overview of Trends

For the six metropolitan areas studied, the period from 1995 to 1999 appeared to be a time during which rental housing became more affordable. Table 1 presents both an unweighted distribution and a weighted distribution of the rental stock across in 1995 and 1999 by affordability strata for the six areas combined. Using either weighted or unweighted data reveals the same trends: the extremely low rent, very low rent, and low rent categories grow; the moderate rent and high rent categories decline, and the very high rent categories grows.

[12] To deal with potential budget overruns, HUD opted to drop portions of AHS metropolitan samples in certain years, and so less data is available now.

Table 1: Distribution of Rental Stock by Affordability Stratum

Affordability Category	Unweighted Distribution		Weighted Distribution	
	1995	1999	1995	1999
Non-Market	18.3%	14.2%	21.5%	20.3%
Extremely Low Rent	4.8%	6.4%	4.5%	4.5%
Very Low Rent	12.7%	15.3%	11.7%	11.9%
Low Rent	24.3%	26.4%	22.1%	22.4%
Moderate Rent	20.0%	17.9%	18.7%	18.9%
High Rent	12.6%	11.4%	13.1%	13.3%
Very High Rent	7.4%	8.5%	8.4%	8.6%
Total	100.0%	100.0%	100.0%	100.0%

Figure 1 shows these trends graphically for the weighted data.

Movements within the Rental Housing Stock

Using the pure weights for 1995 and adjusting the totals to match 1995 totals, we estimate that there were 3,833,266 housing units in the six metropolitan areas that were rental units in both 1995 and 1999. Table 2 shows how these units were distributed across the affordability strata in the two years.

Figure 1: Changes in Number of Units by Affordability Stratum

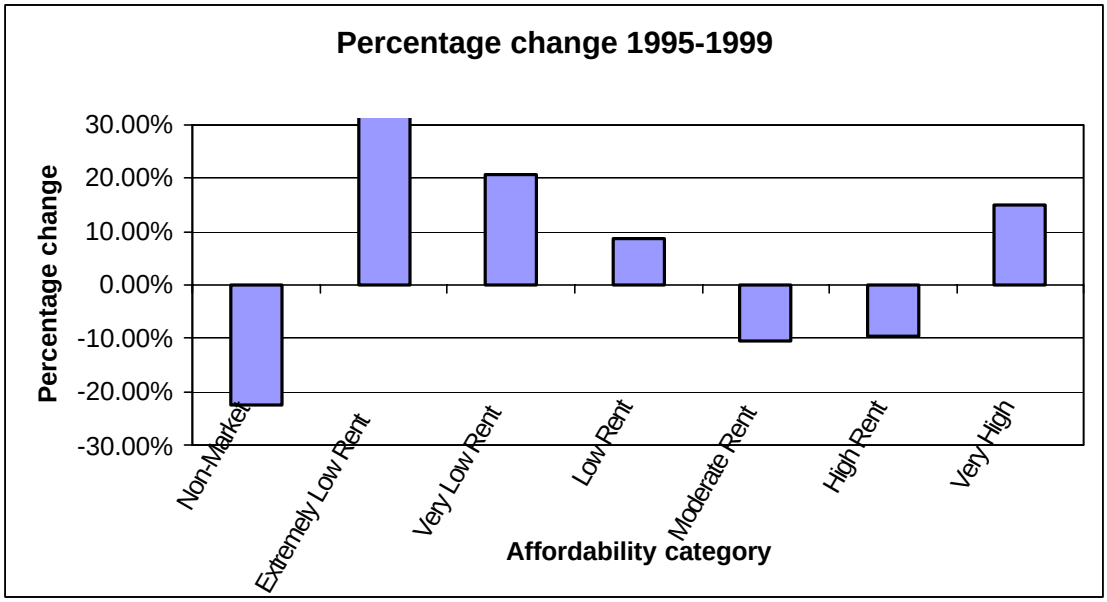

Table 2: Distribution across Affordability Strata of Units That Were Rental in Both 1995 and 1999

Rental in 1995		Rental in 1999						
Rent Level	**Number**	**Non-Market**	**Extremely Low Rent**	**Very Low Rent**	**Low Rent**	**Moderate Rent**	**High Rent**	**Very High Rent**
Non-Market	825,080	422,106	57,251	72,387	78,954	60,275	38,940	35,566
Extremely Low Rent	171,740	17,819	71,949	42,537	16,897	6,309	8,372	7,038
Very Low Rent	450,065	32,462	40,600	235,428	92,555	27,534	9,092	10,690
Low Rent	845,255	42,030	21,881	136,424	471,297	108,991	41,253	19,104
Moderate Rent	716,731	33,967	17,519	30,169	201,059	323,987	82,502	23,698
High Rent	502,554	25,677	6,864	11,531	53,258	119,635	213,454	71,250
Very High Rent	321,841	13,693	5,580	11,092	11,401	18,814	69,750	191,511
Total Units	3,833,266	587,754	221,664	539,568	925,421	665,545	463,362	358,857

The number of non-market units declined by 237,326 between 1995 and 1999. This category consists of units whose households benefit from rent subsidies and units that landlord provide for no cash rent; this latter category contains units rented to family members and units provided to apartment managers. In 1997, the Census Bureau revised the AHS questionnaire and also shifted from a paper questionnaire to a computer assisted personal interview (CAPI) format. Of immediate relevance, the Census Bureau revised the questions related to subsidized rent. These questionnaire changes may account for a large part of the decrease in the number of non-market units.

Each income group can afford all the rental units affordable to its rent stratum and all lower rent strata. For example, very low income renters can afford extremely low rent units and very low rent units. Table 3 shows how the number of units affordable to each group changed between 1995 and 1999. Every income group had more units available to it at affordable rents in 1999 than in 1995. For each group, except the very high rent group, two sources provide the increase in the number of affordable units, a net filtering down of units affordable only at high income levels or the availability of formerly non-market units at affordable rents. Since, by definition, the very high income group can afford all units, a shift of units from non-market to market status is the only source of change for this group. As expected, the increase in the number of units affordable to very high income households exactly matches the decline in the number on non-market units.

Caution must be exercised in all analyses involving non-market units due to changes in the questions on housing subsidy status from the 1995 survey to the 1999 survey, as well as research evidence that respondents are often unable to answer the questions about subsidy status accurately.

Table 3: Number of Units Affordable to Each Income Group in 1995 and 1999

Income Group	Affordable in 1995	Affordable in 1999	Change	Net Gain from Non-Market	Net Gain from Filtering Down
Extremely Low Income	171,740	221,664	49,924	39,432	11,291
Very Low Income	621,805	761,232	139,427	79,357	49,345
Low Income	1,467,060	1,686,653	219,593	116,281	96,370
Moderate Income	2,183,791	2,352,198	168,407	142,589	32,249
High Income	2,686,345	2,815,560	129,215	155,852	-1,500
Very High Income	3,008,186	3,174,417	166,231	177,725	0

While extremely low income household benefited mainly from the availability of formerly non-market units, approximately 20 percent of their gain came from net filtering down. Low income households had the largest increase in the number of affordable units and they benefited roughly equally from the availability of formerly non-market units and net filtering down. Net filtering was negative for the high income stratum.

Table 4 examines what happened, in terms of affordability, to the units that were rental in 1995 and remained rental in 1999. In every case, the most frequent occurrence was for rental units to remain in the same affordability stratum. In fact, 40 percent or more the units remained in the same affordability stratum. The next most common occurrence was for units to filter up or filter down one stratum. For example, 56 percent of the rental units that were affordable at the low rent level in 1995 were still affordable at that level in 1999, 13 percent had filtered up to the moderate rent level, and 16 percent had filtered down to the very low rent level. The AHS data suggest wide dispersion of units over just four years at all rent levels. For example, 5 percent of the low rent units had filtered up to the high rent level and 2 percent had filter all the way up to the very high rent level.

Table 4: Percentage Distribution across 1999 Affordability Strata of Units That Were Rental in 1995, All Data

Rental in 1995		Percentage Rental in 1999						
Rent Level	Row Sums	Non-Market	Extremely Low Rent	Very Low Rent	Low Rent	Moderate Rent	High Rent	Very High Rent
Non-Market	100%	51%	7%	9%	10%	7%	5%	4%
Extremely Low Rent	100%	10%	42%	25%	10%	4%	5%	4%
Very Low Rent	100%	7%	9%	52%	21%	6%	2%	2%
Low Rent	100%	5%	3%	16%	56%	13%	5%	2%
Moderate Rent	100%	5%	2%	4%	28%	45%	12%	3%
High Rent	100%	5%	1%	2%	11%	24%	42%	14%
Very High Rent	100%	4%	2%	3%	4%	6%	22%	60%

The American Housing Survey allocates values to some variables if the respondent fails to answer the question. In particular, the AHS allocates housing cost and tenure. This allocation procedure could have an effect on the apparent dispersion of

units among rent strata. For this reason, we repeated the analysis in Table 4 eliminating all the observations with allocated values for housing cost. Values which have been "topcoded" to preserve confidentiality have been left in this analysis. Table 5 presents the results.

Table 5: Percentage Distribution across 1999 Affordability Strata of Units That Were Rental in 1995, Unallocated Data Only

Rental in 1995		Rental in 1999						
Rent Level	Row Sums	Non-Market	Extremely Low Rent	Very Low Rent	Low Rent	Moderate Rent	High Rent	Very High Rent
Non-Market	100%	53%	8%	9%	8%	7%	9%	6%
Extremely Low Rent	100%	10%	49%	24%	8%	2%	4%	3%
Very Low Rent	100%	4%	8%	59%	22%	4%	3%	1%
Low Rent	100%	6%	4%	15%	60%	11%	3%	1%
Moderate Rent	100%	4%	1%	2%	27%	30%	35%	2%
High Rent	100%	4%	1%	0%	6%	24%	48%	13%
Very High Rent	100%	2%	0%	1%	1%	2%	23%	69%

Eliminating observations with allocated data reduced the count of units that were rental in both 1995 and 1999 by 705,282 units. Table 5 resembles Table 4 but shows less dispersion. The proportion of rental units that remain in the same stratum increases for all strata except non-market where the proportion decreases slightly. There also appears to less movement of more than one stratum.

Table 6 contains the difference when the percentages in Table 4 are subtracted from the percentages in Table 5. Except for the non-market category, Table 6 show substantial increases along the diagonal, that is, in units that remain in the same stratum. There are small changes, both positive and negative, on either side of the diagonal. But, as one move further away from the diagonal, the changes become more negative. Allocations appear to intensify the appearance of dispersion.

Table 6: Impact of Allocations on Dispersion of Units across Strata (Percentages in Table 4 Subtracted from Percentages in Table 5)

Rental in 1995	Rental in 1999						
Rent Level	Non-Market	Extremely Low Rent	Very Low Rent	Low Rent	Moderate Rent	High Rent	Very High Rent
Non-Market	2%	1%	0%	-2%	0%	4%	2%
Extremely Low Rent	0%	7%	-1%	-2%	-2%	-1%	-1%
Very Low Rent	-3%	-1%	7%	1%	-2%	1%	-1%
Low Rent	1%	1%	-1%	4%	-2%	-2%	-1%
Moderate Rent	-1%	-1%	-2%	-1%	-15%	23%	-1%
High Rent	-1%	0%	-2%	-5%	0%	6%	-1%
Very High Rent	-2%	-2%	-2%	-3%	-4%	1%	9%

Even after adjusting for allocation, Table 5 displays a substantial amount of dispersion. For example, only 60 percent of the units that were low rent in 1995 were still low rent in 1999, 1 percent of the units had filtered up to very high rent, and 4 percent had filtered down to extremely low rent.

Movements in and out of the Rental Stock

Table 2 tells only part of the rental dynamics story. The 3,833,266 units that were rental in both 1995 and 1999 represent only 81 percent of the 4,706,269 rental units in 1995 and only 80 percent of the 4,733,257 rental units in 1999. A fifth of the units that were rental in 1995 could not be used in our analysis in 1999 and a fifth of the units that were rental in 1999 were not rental in 1995. Table 7 provides a complete history of what happened to the rental units that existed in 1995 and where the rental units that existed in 1999 came from.[13]

Between 1995 and 1999, something happened to 926,390 rental units to cause them to be unavailable for our analysis. Limitations of the AHS survey are responsible for the "disappearance" of 413,678 units, 378,780 because the units were vacant and the survey could not determine what rental class they belonged to and 34,898 for other reasons. The remaining 530,442 units represent true losses to the rental stock -- 401,961 units became owner-occupied; 16,396 units were lost in the merger of two or more units, 21,505 units were converted to non-residential uses, 38,894 were classified as other non-permanent losses;[14] and 51,686 were considered to be permanent losses.

[13] The shaded areas in Table 7 represent units that were not rental units in either 1995 or in 1999.
[14] In AHS parlance, a 'Type-B" loss occurs when a unit is unoccupiable in a way that could be reversed. Losses due to mergers and conversions and conversions to non-residential use are categories of "Type-B losses. Other categories include unit being exposed to the elements and a unit being listed by a local government as uninhabitable.

TABLE 7: HISTORY OF UNITS THAT WERE RENTAL IN EITHER 1995 OR 1999, Weighted Counts Using All Data																
Status in 1995		**Status in 1999**														
Rental in 1995		**Rental in 1999**							**Other**							
Rent Level	**Classifiable by Rent Strata in 1999**	Non-Market	Extremely Low Rent	Very Low Rent	Low Rent	Moderate Rent	High Rent	Very High Rent	Owner Occupied	Loss to Conversion/ Merger	Loss to Non-Residential	Perm Loss	Other Type B	Other	Vacant Inter-view	All
Non-Market	825,080	422,106	57,251	72,387	78,954	60,275	38,940	35,566	66,456	2,827	2,855	17,164	11,152	.	69,966	935,898
Extremely Low Rent	171,740	17,819	71,949	42,537	16,897	6,309	8,372	7,038	32,695	3,001	1,910	5,746	3,855	.	24,870	242,998
Very Low Rent	450,065	32,462	40,600	235,428	92,555	27,534	9,092	10,690	44,825	3,338	634	9,159	9,606	3,826	52,954	572,703
Low Rent	845,255	42,030	21,881	136,424	471,297	108,991	41,253	19,104	80,410	3,788	2,741	11,756	5,168	2,609	101,741	1,049,193
Moderate Rent	716,731	33,967	17,519	30,169	201,059	323,987	82,502	23,698	65,523	2,808	4,313	905	3,807	11,952	75,731	877,942
High Rent	502,554	25,677	6,864	11,531	53,258	119,635	213,454	71,250	74,221	634	4,492	6,751	4,487	6,241	33,745	632,238
Very High Rent	321,841	13,693	5,580	11,092	11,401	18,814	69,750	191,511	37,830	.	4,560	205	819	10,270	19,773	395,297
Subtotal A	3,833,266	587,754	221,664	539,568	925,421	665,545	463,362	358,857	401,961	16,396	21,505	51,686	38,894	34,898	378,780	4,706,269
Other																
Owner Occupied		35,806	40,061	53,778	70,463	49,305	44,716	54,524								348,652
Non-Residential		3,689	.	2,730	4,511	1,911	2,103	4,918								19,862
Other Type B		10,341	3,597	3,762	7,383	9,133	4,708	4,567								43,490
Other		.	905	2,685	3,711	3,854	5,405	3,501								20,061
New Construction		7,040	9,943	12,189	13,006	8,433	11,496	4,296								66,402
Vacant Interview		52,900	33,729	81,466	128,878	91,095	49,817	41,002								478,887
Subtotal B		109,776	88,235	156,610	227,952	163,731	118,244	112,538								977,353
Total		697,530	309,899	696,178	1,153,373	829,276	581,606	471,395	401,961	16,396	21,505	51,686	38,894	34,899	378,780	5,683,622

Table 8 facilitates an examination of what happened to the units that were rental in 1995 by converting the numbers in Table 7 into percentages by dividing each cell by the sum of all the cells in each row. This transformation highlights the relative importance of the possible outcomes and allows us to compare the pattern of outcomes by rent stratum.

The first column in Table 8 tells us that 81.5 percent of the units that were rental in 1995 were classifiable by rent strata in 1999. Technical reasons – vacant for interview or other – account for another 8.7 percent. The remaining 9.8 percent were lost to the rental stock. Homeownership was the largest cause, accounting for 8.5 percent; another 1.1 percent were permanently lost to the housing stock. Mergers, conversions to non-residential use, and other Type-B losses account for the final 1.6 percent.[15]

Extremely low rent units were the most likely to be either lost from the stock or otherwise unavailable for analysis. Only 70.3 percent of these units were classifiable by rent stratum in 1999. Approximately a third of the "missing" units were unavailable for analysis because they were vacant in 1999. The remaining units, approximately one-fifth of the total affordable to extremely low income rents in 1995, were lost to the rental stock. Among all the rent strata, extremely low income units were the most likely to become owner-occupied (13.5 percent), to undergo mergers (1.2 percent), or to become permanently lost (2.4 percent).

Shifts to homeownership were also higher than average among high rent and very high rent units. Very high rent units were more than twice as likely than average to be converted to non-residential use. Other Type B losses and permanent losses were particularly high among non-market, extremely low rent, and very low rent units.

Allocations may also affect these results. The Census Bureau allocated total housing costs and tenure when respondents fail to answer these questions. To investigate this possible, we recalculated Table 8 using only those observations with unallocated data. Table 9 presents the results.

Eliminating observations with allocated data reduces the weighted count of rental units in 1995 by 960,000 and reduces the weighted count of units in 1999 by 920,000. Comparing Tables 8 and 9 reveals no major changes in patterns except those already noted in the discussion of Tables 4 and 5. The percentage of units shifting to owner-occupied status declined slightly from 8.5 percent to 8.0 percent. We were somewhat surprised that eliminating allocation of tenure resulted in such a small effect. The Census Bureau allocates tenure without regard to previous tenure status. Two-thirds of the non-responses are randomly assigned as owner-occupied and one-third as renter occupied. One might have expected the conditional probability that a rental unit in 1995 would be a rental unit in 1999 to be substantially higher than one-third.

[15] These numbers do not sum to 100 percent due to rounding.

Table 8: HISTORY OF UNITS THAT WERE RENTAL IN EITHER 1995 OR 1999, Row Percentages Using All Data																
Status in 1995 Rental in 1995		**Status in 1999**														
		Rental in 1999							**Other**							
Rent Level	**Classifiable by Rent Strata in 1999**	Non-Market	Extremely Low Rent	Very Low Rent	Low Rent	Moderate Rent	High Rent	Very High Rent	Owner Occupied	Loss to Conversion/ Merger	Loss to Non-Residential	Perm Loss	Other Type B	Other	Vacant Inter-view	All
Non-Market	88.2%	45.1%	6.1%	7.7%	8.4%	6.4%	4.2%	3.8%	7.1%	0.3%	0.3%	1.8%	1.2%	.	7.5%	100.0%
Extremely Low Rent	70.7%	7.3%	29.6%	17.5%	7.0%	2.6%	3.4%	2.9%	13.5%	1.2%	0.8%	2.4%	1.6%	.	10.2%	100.0%
Very Low Rent	78.6%	5.7%	7.1%	41.1%	16.2%	4.8%	1.6%	1.9%	7.8%	0.6%	0.1%	1.6%	1.7%	0.7%	9.2%	100.0%
Low Rent	80.6%	4.0%	2.1%	13.0%	44.9%	10.4%	3.9%	1.8%	7.7%	0.4%	0.3%	1.1%	0.5%	0.2%	9.7%	100.0%
Moderate Rent	81.6%	3.9%	2.0%	3.4%	22.9%	36.9%	9.4%	2.7%	7.5%	0.3%	0.5%	0.1%	0.4%	1.4%	8.6%	100.0%
High Rent	79.5%	4.1%	1.1%	1.8%	8.4%	18.9%	33.8%	11.3%	11.7%	0.1%	0.7%	1.1%	0.7%	1.0%	5.3%	100.0%
Very High Rent	81.4%	3.5%	1.4%	2.8%	2.9%	4.8%	17.6%	48.4%	9.6%	.	1.2%	0.1%	0.2%	2.6%	5.0%	100.0%
Total	81.5%	12.5%	4.7%	11.5%	19.7%	14.1%	9.8%	7.6%	8.5%	0.3%	0.5%	1.1%	0.8%	0.7%	8.0%	100.0%

Table 9: HISTORY OF UNITS THAT WERE RENTAL IN EITHER 1995 OR 1999, Row Percentages Using Only Unallocated Data																
Status in 1995 Rental in 1995		**Status in 1999**														
		Rental in 1999							**Other**							
Rent Level	**Classifiable by Rent Strata in 1999**	**Non-Market**	**Extremely Low Rent**	**Very Low Rent**	**Low Rent**	**Moderate Rent**	**High Rent**	**Very High Rent**	**Owner Occupied**	**Loss to Conversion/ Merger**	Loss to Non-Residential	Perm Loss	Other Type B	Other	Vacant Inter-view	All
Non-Market	86.7%	47.6%	7.2%	9.0%	8.8%	7.2%	4.7%	2.1%	3.7%	0.5%	0.1%	2.1%	1.3%	.	5.6%	100.0%
Extremely Low Rent	72.5%	7.5%	35.5%	16.9%	5.8%	1.8%	2.8%	2.2%	12.3%	1.5%	1.0%	2.4%	1.9%	.	8.3%	100.0%
Very Low Rent	78.7%	3.5%	7.7%	46.5%	16.1%	3.7%	0.4%	0.8%	7.6%	0.7%	0.1%	2.0%	1.5%	0.8%	8.5%	100.0%
Low Rent	81.5%	3.7%	1.4%	13.0%	49.8%	9.7%	2.7%	1.3%	7.5%	0.4%	0.3%	1.1%	0.6%	0.3%	8.3%	100.0%
Moderate Rent	81.7%	3.5%	1.2%	1.6%	25.2%	38.9%	9.5%	1.8%	7.8%	0.4%	0.6%	0.1%	0.5%	1.2%	7.8%	100.0%
High Rent	78.6%	3.3%	1.2%	0.2%	4.8%	19.1%	37.9%	12.2%	13.5%	0.1%	0.3%	1.3%	0.9%	0.8%	4.4%	100.0%
Very High Rent	82.8%	2.4%	0.3%	0.6%	1.2%	1.7%	19.8%	56.8%	7.7%	.	1.5%	0.1%	0.3%	2.4%	5.2%	100.0%
Total	81.3%	10.8%	4.7%	11.6%	21.5%	14.7%	10.4%	7.6%	8.0%	0.4%	0.4%	1.2%	0.9%	0.7%	7.0%	100.0%

One can also use Table 7 to study where the 1999 rental stock came from by rent stratum. Table 10 facilitates this analysis by dividing each cell in a column by the sum of all the cells in the column. This transformation highlights the relative importance of the different sources of units and allows us to compare the pattern of sources by rent stratum.

Table 10: HISTORY OF UNITS THAT WERE RENTAL IN EITHER 1995 OR 1999, Column Percentages Using All Data

	Rental in 1999							
Rent Level in 1995	**Non-Market**	**Extremely Low Rent**	**Very Low Rent**	**Low Rent**	**Moderate Rent**	**High Rent**	**Very High Rent**	**All Strata**
Non-Market	60.5%	18.5%	10.4%	6.8%	7.3%	6.7%	7.5%	16.2%
Extremely Low Rent	2.6%	23.2%	6.1%	1.5%	0.8%	1.4%	1.5%	3.6%
Very Low Rent	4.7%	13.1%	33.8%	8.0%	3.3%	1.6%	2.3%	9.4%
Low Rent	6.0%	7.1%	19.6%	40.9%	13.1%	7.1%	4.1%	17.7%
Moderate Rent	4.9%	5.7%	4.3%	17.4%	39.1%	14.2%	5.0%	15.0%
High Rent	3.7%	2.2%	1.7%	4.6%	14.4%	36.7%	15.1%	10.5%
Very High Rent	2.0%	1.8%	1.6%	1.0%	2.3%	12.0%	40.6%	6.8%
Subtotal A	84.3%	71.5%	77.5%	80.2%	80.3%	79.7%	76.1%	79.4%
Other								
Owner Occupied	5.1%	12.9%	7.7%	6.1%	5.9%	7.7%	11.6%	7.4%
Non-Residential	0.5%	.	0.4%	0.4%	0.2%	0.4%	1.0%	0.4%
Other Type B	1.5%	1.2%	0.5%	0.6%	1.1%	0.8%	1.0%	0.9%
Other		0.3%	0.4%	0.3%	0.5%	0.9%	0.7%	0.4%
New Construction	1.0%	3.2%	1.8%	1.1%	1.0%	2.0%	0.9%	1.4%
Vacant Interview	7.6%	10.9%	11.7%	11.2%	11.0%	8.6%	8.7%	10.1%
Subtotal B	15.7%	28.5%	22.5%	19.8%	19.7%	20.3%	23.9%	20.6%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

The last column tells us that 79.4 percent of the rental units in 1999 were also rental units in 1995 for which we had information about affordability. Another 10.1 percent were vacant in 1995 and therefore could not be classified by rent stratum in that year. 7.4 percent were owner-occupied in 1995. New construction accounted for 1.4 percent of the 1999 rental stock. The remaining sources – conversions from non-residential to residential, other Type-B, and other – combine to provide only 1.7 percent of the 1999 rental stock.

Change in tenure from owner occupied to rental was most important at the two ends of the rent classification, extremely low rent units and very high rent units. Surprisingly new construction was most important, on a percentage basis, for the extremely low rent stock. From Table 7, we see that the number of newly constructed units in the extremely low rent strata was fewer than the number in the low rent, very low rent, and high rent strata.

Filtering and Changes in the Extremely Low Rent Stock

Nelson-Vandenbroucke discovered a substantial amount of movement between rent strata with both downward and upward filtering taking place. Table 11 measures flows in and out of each rent stratum between 1995 and 1999. The sum of units filtering into and filtering out of each category ranges from 73.0 percent to 125.4 percent of the size of the category in 1995. For example, the number of units filtering into or filtering out of the extremely low rent stratum was almost one-half again as large as the number of units in the stratum in 1995. These numbers are actually higher than those found by Nelson-Vandenbroucke for the 41 metropolitan areas they studied.[16]

Table 11: Amount of Filtering from 1995 to 1999 by Rent Stratum, Using All Data

Components of Filtering					Total Two-Way Flow
Affordability Category	In From:		Out to:		
	Higher	Lower	Higher	Lower	
Non-Market	28.2%	NA	44.9%	NA	73.0%
Extremely Low Rent	41.7%	25.8%	47.5%	10.4%	125.4%
Very Low Rent	35.1%	21.3%	31.2%	16.3%	103.9%
Low Rent	28.7%	20.4%	20.1%	23.8%	93.0%
Moderate Rent	20.8%	30.5%	14.9%	39.7%	105.9%
High Rent	15.1%	38.9%	14.2%	43.2%	111.4%
Very High Rent	NA	46.6%	NA	40.5%	87.1%

Table 12 reports the same flows based on only those AHS observations that did not have allocated values for the tenure or total housing cost variables. As expected, the elimination of allocations substantially reduces the amount of filtering measured. Now the total two-way flows range from 69.7 percent to 111.7 percent of the number of units in a stratum in 1995. The maximum two-way flow is 200% -- 100% of the units moving out of the category and 100% of the units moving into the category. Using allocated data, our estimates of gross flows are similar to those of Nelson-Vandenbroucke.

Table 12: Amount of Filtering from 1995 to 1999 by Rent Stratum, Using Unallocated Data

Components of Filtering					Total Two-Way Flow
Affordability Category	In From:		Out to:		
	Higher	Lower	Higher	Lower	
Non-Market	28.6%	NA	45.1%	NA	73.7%
Extremely Low Rent	36.0%	24.6%	40.8%	10.3%	111.7%
Very Low Rent	30.1%	20.2%	26.7%	14.2%	91.1%
Low Rent	27.2%	17.4%	16.8%	22.2%	83.5%
Moderate Rent	18.9%	27.6%	13.9%	38.6%	98.8%
High Rent	15.7%	34.0%	15.5%	36.3%	101.6%
Very High Rent	NA	38.4%	NA	31.4%	69.7%

[16] The 1997 change in questions related to subsidized rent probably accounts for a considerable amount of the filtering in and out of non-market and, in turn, affects the magnitude of flows in and out of other strata.

The differences in measurement between the two approaches are substantial for several strata. Gross filtering was 87.1 percent of the very high rent stratum using all data but 69.7 percent using unallocated data. Under both approaches, filtering appears to have the largest effects on the extremely low rent and the very low rent strata.

Nelson-Vandenbroucke were particular concerned about the fate of units affordable to extremely low income households. Summing across all 41 metropolitan areas, they estimated that 9 percent of the rental stock in the first year was affordable to extremely low income households but, by the fourth year, only 6 percent of the rental stock was affordable to these households. Our study involved both different metropolitan areas and a different time period. We found that, for our six metropolitan areas, the extremely low rent stock increased by 49,924 units. In 1995, the extremely low rent stock was 4.5 percent of the rental stock; by 1999 it grew to 5.9 percent. Once again we must point out that the change in the part of the AHS questionnaire dealing with rent subsidies may have contributed to the change in the extremely low rent stratum.

Table 13 shows how the extremely low rent stock grew between 1995 and 1999. The extremely low rent stock grew by 75,919 between 1995 and 1999, an increase of 31.2 percent. Filtering accounted for 20.9 percentage points of the growth, most of that contribution was attributable to units gained from the non-market stratum. The next largest contributor (3.0 percentage points) was shifts out of homeownership. New construction minus permanent losses contributed 1.7 percentage points. Temporary physical losses subtracted 2.1 percentage points from the growth rate.

Table 13: Changes in the Extremely Low Rent Stock Using All Data[17]

	Gross Losses		**Gross Gains**		**Net Changes**	
Causes	Units	Pct.	Units	Pct.	Units	Pct.
Non-Market	17,819	7.3%	57,251	23.6%	39,432	16.2%
Market	81,153	33.4%	92,444	38.0%	11,291	4.6%
Total Filtering	**98,972**	**40.7%**	**149,695**	**61.6%**	**50,723**	**20.9%**
Conv'n/Merge	3,001	1.2%	NA		-3,001	-1.2%
Non-residential	1,910	0.8%	0	0.0%	-1910	-0.8%
Other Type B	3,855	1.6%	3,597	1.5%	-258	-0.1%
Temporary Physical	**8,766**	**3.6%**	**3597**	**1.5%**	**-5169**	**-2.1%**
New Construction	NA		9,943	4.1%	9,943	4.1%
Permanent Loss	5,746	2.4%	NA		-5,746	-2.4%
Permanent Physical	**5,746**	**2.4%**	**9,943**	**4.1%**	**4,197**	**1.7%**
Tenure Change	**32,695**	**13.5%**	**40,061**	**16.5%**	**7,366**	**3.0%**
Vacant & Other	**24,870**	**10.2%**	**43,672**	**18.0%**	**18,802**	**7.7%**
Grand Total	**171,049**	**70.4%**	**246,968**	**101.6%**	**75,919**	**31.2%**

[17] The percentages are taken with respect to the total number of rental units in 1995.

Table 14 presents the same information using only observations that were reported – in other words, no allocated values for key variables. . The results are very similar except, as expected, the amount of filtering is less. Because we have eliminated some units, the size of the rental stock in both years and the absolute growth between 1995 and 1999 is smaller.

Summary of Findings

Our analysis shows that the methodology developed in Nelson-Vandenbroucke still provides a useful framework for studying the dynamics of the housing market. Unfortunately, the redesign of the AHS metropolitan survey to take advantage of the 1990 census limited our ability to fully replicate Nelson-Vandenbroucke. We were able to study only six metropolitan areas (or groups of metropolitan areas). Because the Census Bureau uses the national AHS with supplement samples to track these housing markets, we were further constrained by the lack of submarket (AHS zone) data.

Table 14: Changes in the Extremely Low Rent Stock Using Unallocated Data[18]

	Gross Losses		Gross Gains		Net Changes	
Causes	Units	Pct.	Units	Pct.	Units	Pct.
Non-Market	14,845	7.5%	43,984	22.2%	29,139	14.7%
Market	58,654	29.6%	64,258	32.4%	5,604	2.8%
Total Filtering	**73,499**	**37.1%**	**108,242**	**54.6%**	**34,743**	**17.5%**
Conv'n/Merge	3,001	1.5%	NA		-3001	-1.5%
Non-residential	1,910	1.0%	0	0.0%	-1910	-1.0%
Other Type B	3,855	1.9%	2,775	1.4%	-1,080	-0.5%
Temporary Physical	**8,766**	**4.4%**	**2775**	**1.4%**	**-5,991**	**-3.0%**
New Construction	NA		9,943	5.0%	9,943	5.0%
Permanent Loss	4,841	2.4%	NA		-4841	-2.4%
Permanent Physical	**4,841**	**2.4%**	**9,943**	**5.0%**	**5,102**	**2.6%**
Tenure Change	**24,350**	**12.3%**	**37,526**	**18.9%**	**13,176**	**6.6%**
Vacant & Other	**16,501**	**8.3%**	**26,703**	**13.5%**	**10,201**	**5.1%**
Grand Total	**127,957**	**64.5%**	**185,188**	**93.4%**	**57,231**	**28.9%**

Like Nelson-Vandenbroucke, we found considerable movement within the rental market and in and out of the rental market. We discovered that the allocation process used by the Census Bureau to provide values to variables with missing data magnifies the sense of movement, particular the sense of downward and upward filtration. But, even after eliminating the effects of allocations, we found substantial downward and upward filtration.

[18] The percentages are taken with respect to the total number of rental units in 1995.

Nelson-Vandenbroucke were particularly concerned about the loss of units affordable to extremely low income households. Our choice of metropolitan areas and time period reveals an increase in the number of units affordable to this group. However, the impact of the changes in the approach used in the AHS to identify subsidized units might have contributed to this apparent growth.

Appendix A: Site Specific Analysis

Introduction

The previous analysis focused on examining all of the metropolitan areas in aggregate. However, there are potentially differences between the metropolitan areas and their characteristics, so this section provides some comparable analysis to the earlier sections but on an MSA level basis.

Caution must be exercised in analyzing data at the MSA level due to potential statistical issues related to small sample sizes. Unfortunately, there are small numbers of observations, and as a result, it is possible that some of the changes, especially those involving small numbers of units, may be the result of one or two sample units as opposed to a group. For each of the MSA results presented, we present the estimated numbers as well as the numbers in percentage terms.

There are some site specific issues which make the analysis across metropolitan areas interesting. In the time period, the places have experienced different local economic factors and also have different rules. For example, New York City has a much greater prevalence of rent control than the other areas which affects its rental housing market significantly.

Other factors that are likely to vary across the MSAs include:

- Vacancy rates
- 1999 Fair Market Rent (FMR) as a percentage of median income
- New housing construction between 1995 and 1999
- Growth in total population
- Growth in renter population

All of these have impacts on the number of units and then also on the demand for units and affordability.

In this section are tables about the characteristics and flow of units for each of the six metropolitan areas included in the analysis.

The analysis is not limited to cases which are not allocated, but rather includes all. This decision was made due to expected small sample sizes in different cells, and wanting to take advantage of as much data as appropriate and possible. However, significant caution must be used in analyzing and inferring based on these results due to the potentially small sample size. Please refer to the section on weights for more discussion of this.

For each MSA there are three tables:

- The estimated number of units
- Column percentages which reports where the 1999 units are coming from
- Row percentages which reports where the 1995 units are going.

Chicago

In the 1995 to 1999 period, there were the following changes in the Chicago MSA.

- Owner-occupied. More units changed tenure from rental to owner-occupied than changed tenure from owner-occupied to rental. More than 10,000 more units became owner occupied than became rental. Note that a change in tenure does not necessarily require a sale of the property, but could just be because of a change in occupant.
- In every affordability category, the majority of units changed housing affordability level. When changing affordability category, units tended to shift towards a higher affordability category.
- In nearly every case, more units are lost in some way, such as becoming a Type B non-permanently housing loss, than "recovered" from a non housing state.

Chicago -- Estimated counts

HISTORY OF UNITS THAT WERE RENTAL IN EITHER 1995 OR 1999																
Status in 1995		Status in 1999														
Rental in 1995		Rental in 1999							Other							
Rent Level		Non-Market	Extremely Low	Very Low	Low	Moderate	High	Very High	Owner-Occupied	Loss to Conversion / Merger	Loss to Non-Residential	Other Permanent Loss	Other Type B	Other	Vacant Interview	All
Non-Market		38,460	4,906	9,811	4,145	1,638	819	-	11,422	815	-	7,366	1,638	-	9,000	90,018
Extremely Low		2,457	16,514	12,279	3,272	819	-	819	8,177	819	1,910	2,047	819	-	7,370	57,301
Very Low		4,091	13,098	50,617	21,700	4,094	819	2,457	9,815	2,453	-	2,457	2,457	-	14,740	128,796
Low		2,511	5,732	24,620	77,085	13,920	8,598	1,638	16,350	819	-	1,638	819	-	20,464	174,195
Moderate		-	819	4,913	12,279	15,558	4,913	819	9,004	-	819	-	-	4,523	9,823	63,470
High		-	409	3,276	3,276	6,137	13,098	4,091	4,075	-	-	1,634	-	819	5,728	42,543
Very High		819	-	-	-	.	819	4,913	2,465	-	819	-	819	-	3,276	13,929
Subtotal A		48,338	41,478	105,516	121,757	42,166	29,066	14,737	61,308	4,906	3,548	15,142	6,552	5,342	70,401	570,252
Other																
Owner-Occupied		4,167	5,705	10,688	10,149	4,107	5,072	7,488								47,376
From Non-Residential		822	-	-	822	-	-	822								2,466
From Other Type B		-	822	-	-	-	-	-								822
Other						815										
Not in 95 sample		915	1,829	4,573	3,063	-	2,148	-								12,527
Vacant Interview		7,355	5,796	20,512	10,595	8,241	2,536	1,630								56,646
Subtotal B		13,259	14,152	35,773	24,629	13,163	9,756	9,940	0	0	0	0	0	0	0	120,672
All		61,597	55,630	141,289	146,386	55,330	38,822	2,467	61,308	4,906	3,548	15,142	6,552	5,342	70,401	690,929

Chicago -- Column Percentages

HISTORY OF UNITS THAT WERE RENTAL IN EITHER 1995 OR 1999								
Status in 1995	Rental in 1999							
Rental in 1995								
Rent Level	Non-Market	Extremely Low	Very Low	Low	Moderate	High	Very High	All
Non-Market	62	9	7	3	3	2	-	13
Extremely Low	4	30	9	2	1	-	4	8
Very Low	7	24	36	15	7	2	11	19
Low	4	10	17	53	25	22	7	25
Moderate	-	1	3	8	28	13	4	9
High	-	1	2	2	1	34	18	6
Very High	1	-	-	-	-	2	21	2
Subtotal A	78	75	75	83	55	75	64	82
Other								
Owner-Occupied	7	10	8	7	7	13	32	7
From Non-Residential	1	-	-	1	-	-	4	0
From Other Type B	-	1	-	-	-	-	-	0
Not in 95 sample	1	3	3	2	6	6	-	2
Vacant Interview	12	10	15	7	7	7	7	8
Subtotal B	22	25	25	17	22	25	36	18
All	100	100	100	100	100	100	100	100

Chicago -- Row Percentage

HISTORY OF UNITS THAT WERE RENTAL IN EITHER 1995 OR 1999															
Status in 1995		Status in 1999													
Rental in 1995		Rental in 1999							Other						
Rent Level		Non-Market	Extremely Low	Very Low	Low	Moderate	High	Very High	Owner-Occupied	Loss to Conversion/ Merger	Loss to Non-Residential	Other Permanent Loss	Other Type B	Other	Vacant Interview	All
Market		43	5	11	5	2	1	-	13	1	-	8	2	-	10	100
Extremely Low		4	29	21	6	1	-	1	14	1	3	4	1	-	13	100
Very Low		3	10	39	17	3	1	2	8	2	-	2	2	-	11	100
Low		1	3	14	44	8	5	1	9	0	-	1	0	-	12	100
Moderate		-	1	8	19	25	8	1	14	-	1	-	-	7	15	100
High		-	1	8	8	14	31	10	10	-	-	4	-	2	13	100
Very High		6	-	-	-	.	6	35	18	-	6	-	6	-	24	100
Total		8	7	19	21	7	5	3	11	1	1	3	1	1	12	100

Detroit

The following shifts occurred from 1995 to 1999 in Detroit.

- Detroit had no units lost to conversion/merger. However, this may be a result of relatively small sample sizes as opposed to shifts in the housing stock.
- No housing units that were below "Moderate" affordability in 1995 shifted to "Very High affordability".
- Among the Very High affordability level, units only shifted to High or non-market affordability. No Very High units shifted to another affordability level.
- Units that were added to the sample went to only the following affordability categories: Very low, low, and Moderate. This may be an artifact of the small number of sample observations added to the sample.

Detroit
Estimated Numbers

HISTORY OF UNITS THAT WERE RENTAL IN EITHER 1995 OR 1999																
Status in 1995		Status in 1999														
Rental in 1995		Rental in 1999							Other							
Rent Level		Non-Market	Extremely Low	Very Low	Low	Moderate	High	Very High	Owner-Occupied	Loss to Conversion / Merger	Loss to Non-Residential	Other Permanent Loss	Other Type B	Other	Vacant Interview	All
Non-Market		35,306	9,958	9,958	3,621	905	1,811	.	9,053	.	.	3,621	-	.	1,337	75,569
Extremely Low		1,811	12,674	10,274	2,716	1,811	.	.	4,526	.	.	1,811	905	.	6,427	42,954
Very Low		3,621	7,544	42,260	9,958	2,716	1,811	.	14,484	.	.	905	1,811	.	10,863	95,972
Low		2,716	3,621	15,390	41,958	7,242	.	.	12,674	.	.	.	.	905	14,484	98,990
Moderate		2,126	.	905	10,863	17,200	1,811	905	2,716	.	905	905	.	1,811	4,842	44,989
High		.	.	905	1,811	3,621	5,432	1,811	4,842	.	.	.	.	905	905	20,232
Very High		905	.	.	.	.	3,621	3,621	905	.	.	.	.	.	905	9,958
Subtotal A		46,485	33,797	79,692	70,927	33,495	14,484	6,337	49,200	0	905	7,242	3,621	3,621	39,763	389,569
Other																
Owner-Occupied		9,958	9,053	9,053	8,305	4,526	2,716	.								43,611
From Other Type B		.	905	905	905	.	.	.								2,716
Not in 95 sample		.	.	537	3,063	2,148	.	.								5,748
Vacant Interview		5,432	905	9,053	12,674	3,621	1,811	2,126								30,779
Subtotal B		15,390	10,863	19,548	24,947	10,296	4,526	2,126	0	0	0	0	0	0	0	82,854
All		61,875	44,660	99,240	95,874	43,791	19,011	8,463	49,200	.	905	7,242	3,621	3,621	39,763	479,392

Detroit -- Column Percentages

HISTORY OF UNITS THAT WERE RENTAL IN EITHER 1995 OR 1999									
Status in 1995		Rental in 1999							
Rental in 1995									
Rent Level		Non-Market	Extremely Low	Very Low	Low	Moderate	High	Very High	All
Non-Market		57	22	10	4	2	10	.	18
Extremely Low		3	28	10	3	4	.	.	9
Very Low		6	17	42	10	6	10	.	20
Low		4	8	15	44	17	.	.	21
Moderate		3	.	1	11	39	10	11	9
High		.	.	1	2	8	29	21	4
Very High		1	.	.	.	.	19	43	2
Subtotal A		75	74	80	74	76	76	75	83
Other									
Owner-Occupied		16	20	9	9	10	14	.	9
From Other Type B		.	2	1	1	.	.	.	1
Not in 95 sample		.	.	1	3	5	.	.	1
Vacant Interview		9	2	9	13	8	10	25	6
Subtotal B		25	24	20	26	24	24	25	17
All		100	100	100	100	100	100	100	100

Detroit --Row Percentage

Status in 1995		Status in 1999													
Rental in 1995		Rental in 1999							Other						
Rent Level	Number	Non-Market	Extremely Low	Very Low	Low	Moderate	High	Very High	Owner-Occupied	Loss to Conversion/ Merger	Loss to Non-Residential	Other Permanent Loss	Other Type B	Other	Vacant Interview	All
Non-Market		47	13	13	5	1	2	.	12	.	.	5	.	.	2	100
Extremely Low		4	30	24	6	4	.	.	11	.	.	4	2	.	15	100
Very Low		4	8	44	10	3	2	.	15	.	.	1	2	.	11	100
Low		3	4	16	42	7	.	.	13	.	.	.	.	1	15	100
Moderate		5	.	2	25	40	4	2	6	.	2	2	.	4	11	100
High		.	.	5	9	18	27	9	24	.	.	.	.	4	4	100
Very High		9	.	.	.	.	36	36	9	.	.	.	.	.	9	100
Total		12	9	14	18	8	4	2	12	0	0	2	1	1	10	100
All		13	10	20	20	9	4	2	10	.	0	2	1	1	9	100

Los Angeles

The following are observations about the changing stock dynamics from 1995 to 1999 in Los Angeles.

- Units shifted among all affordability categories.
- Very few units shifted from non-residential back to residential. An estimated 885 units, which represents one singe observation in the dataset, and so may be an issue related to small sample sizes.
- An estimated 110,000 units switched from being rental to owner-occupied while less than 60,000 owner-occupied units switched to rental housing. This means there was a net loss in rental units in Los Angeles.

Los Angeles -- Estimated Numbers

HISTORY OF UNITS THAT WERE RENTAL IN EITHER 1995 OR 1999																
Status in 1995		Status in 1999														
Rental in 1995		Rental in 1999							Other							
Rent Level		Non-Market	Extremely Low	Very Low	Low	Moderate	High	Very High	Owner-Occupied	Loss to Conversion/ Merger	Loss to Non-Residential	Other Permanent Loss	Other Type B	Other	Vacant Interview	All
Non-Market		59,310	6,201	8,856	23,970	14,172	3,546	4,431	7,968	.	885	1,770	1,770	.	11,066	143,946
Extremely Low		1,770	6,207	1,773	3,617	1,776	2,661	2,658	4,434	.	.	.	.	.	2,655	27,550
Very Low		7,527	4,694	29,340	13,290	8,856	2,655	885	8,873	885	.	885	885	.	10,626	89,402
Low		14,258	7,092	38,892	159,274	36,313	6,207	2,835	14,184	885	.	2,951	2,655	885	26,568	312,999
Moderate		16,830	8,856	10,635	98,961	130,401	27,748	3,543	25,718	.	1,770	.	.	885	25,686	351,034
High		9,165	3,540	3,543	13,892	41,061	73,722	28,344	30,157	.	1,770	2,661	1,773	3,698	9,828	223,154
Very High		3,543	1,773	2,658	2,658	4,431	15,948	45,623	19,505	.	885	.	.	2,655	4,437	104,116
Subtotal A		112,403	38,363	95,697	315,662	237,010	132,487	88,319	110,839	1,770	5,310	8,267	7,083	8,123	90,866	1,252,201
Other																
Owner-Occupied		2,661	3,546	6,203	12,493	10,636	16,271	12,410								64,221
From Non-Residential		.	.	.	885	.	.	.								885
From Other Type B		885	885	.	2,655	5,310	885	2,655								13,276
Not in 95 sample		5,211	915	.	915	915	915	.								8,869
Vacant Interview		8,939	12,251	25,334	51,901	35,054	22,331	12,558								168,367
Subtotal B		17,696	17,597	31,537	68,849	51,915	40,402	27,623	0	0	0	0	0	0	0	255,618
All		133,639	55,959	127,234	382,723	287,139	172,889	115,048	110,839	1,770	5,310	8,267	7,083	8,123	90,866	1,507,819

Los Angeles -- Column Percentages

HISTORY OF UNITS THAT WERE RENTAL IN EITHER 1995 OR 1999								
Status in 1995	Rental in 1999							
Rental in 1995								
Rent Level	Non-Market	Extremely Low	Very Low	Low	Moderate	High	Very High	All
Non-Market	44	11	7	6	5	2	4	7
Extremely Low	1	11	1	1	1	2	2	2
Very Low	6	8	23	3	3	2	1	6
Low	11	13	31	42	13	4	2	21
Moderate	13	16	8	26	45	16	3	23
High	7	6	3	4	14	42	25	15
Very High	3	3	2	1	2	9	40	7
Subtotal A	84	69	75	82	83	75	77	84
Other								
Owner-Occupied	2	6	5	3	4	9	11	4
From Non-Residential	.	.	.	0	.	.	.	0
From Other Type B	1	2	.	1	2	1	2	1
Not in 95 sample	4	2	.	0	0	1	.	1
Vacant Interview	7	22	20	14	12	13	11	11
Subtotal B	13	31	25	18	17	23	23	17
All	100	100	100	100	100	100	100	100

Los Angeles -- Row Percentages

HISTORY OF UNITS THAT WERE RENTAL IN EITHER 1995 OR 1999															
Status in 1995		Status in 1999													
Rental in 1995		Rental in 1999							Other						
Rent Level	Number	Non-Market	Extremely Low	Very Low	Low	Moderate	High	Very High	Owner-Occupied	Loss to Conversion/ Merger	Loss to Non-Residential	Other Permanent Loss	Other Type B	Other	Vacant Interview	All
Non-Market		41	4	6	17	10	2	3	6	.	1	1	1	.	8	100
Extremely Low		6	23	6	13	6	10	10	16	.	.	.	.	.	10	100
Very Low		8	5	33	15	10	3	1	10	1	.	1	1	0	12	100
Low		5	2	12	51	12	2	1	5	0	.	1	1	0	8	100
Moderate		5	3	3	28	37	8	1	7	.	1	.	.	0	7	100
High		4	2	2	6	18	33	13	14	.	1	1	1	2	4	100
Very High		3	2	3	3	4	15	44	19	.	1	.	.	3	4	100
Total		9	3	8	25	19	11	7	9	0	0	1	1	1	7	100

New York

The following are observations about the results for New York for the period for 1995 to 1999.

- New York has a much higher proportion of non-market units than other areas due to the strength and prevalence of the rent control laws in New York City.
- Aside from non-market rate units, there was still a large degree of variability switching among levels of affordability.
- More units switched from being owner-occupied to be renter-occupied than switched from renter-occupied to being owner-occupied.
- Comparatively few units were lost compared to other metropolitan areas.

New York -- Estimated Numbers

HISTORY OF UNITS THAT WERE RENTAL IN EITHER 1995 OR 1999																
Status in 1995		Status in 1999														
Rental in 1995		Rental in 1999							Other							
Rent Level	Number	Non-Market	Extremely Low	Very Low	Low	Moderate	High	Very High	Owner-Occupied	Loss to Conversion/ Merger	Loss to Non-Residential	Other Permanent Loss	Other Type B	Other	Vacant Interview	All
Non-Market		210,214	24,183	26,273	35,888	39,933	29,084	28,273	12,233	.	.	.	4,441	.	24,369	434,890
Extremely Low		9,519	15,230	6,187	1,904	1,904	5,711	2,714	6,998	.	.	.	.	.	1,904	52,069
Very Low		7,615	3,807	28,936	21,751	5,711	3,807	5,711	1,904	.	634	.	.	1,904	6,522	88,303
Low		15,230	4,618	16,175	59,906	26,369	19,037	6,522	11,695	.	.	1,904	.	.	15,230	176,685
Moderate		13,043	4,890	5,711	42,692	97,465	32,745	10,464	13,326	.	.	.	3,807	1,904	19,706	245,755
High		17,397	.	3,807	28,942	58,744	93,009	24,748	17,133	634	1,904	.	2,714	.	7,520	256,554
Very High		8,425	3,807	7,615	8,743	12,902	46,500	129,326	14,137	.	2,856	.	.	7,615	9,519	251,444
Subtotal A		281,443	56,536	94,705	199,827	243,029	229,893	207,758	77,425	634	5,393	1,904	10,963	11,422	84,739	1,505,700
Other																
Owner-Occupied		5,711	3,807	13,664	25,462	10,329	13,043	29,774								101,791
From Non-Residential		2,867	.	1,911	.	1,911	2,103	4,096								12,888
From Other Type B		6,553	.	2,010	3,823	3,823	3,823	1,911								21,942
Not in 95 sample		.	3,063	.	2,148	2,148	4,296	2,148								13,803
Vacant Interview		21,140	11,422	2,458	14,476	23,655	16,198	16,500								105,848
Subtotal B		36,271	18,292	20,043	45,909	41,866	39,463	54,429	0	0	0	0	0	0	0	256,272
All		317,714	74,828	114,748	245,735	284,895	269,356	262,188	77,425	634	5,393	1,904	10,963	11,422	79,340	1,761,972

New York -- Column Percentages

HISTORY OF UNITS THAT WERE RENTAL IN EITHER 1995 OR 1999								
Status in 1995	Rental in 1999							
Rental in 1995								
Rent Level	Non-Market	Extremely Low	Very Low	Low	Moderate	High	Very High	All
Non-Market	66	32	23	15	14	11	11	25
Extremely Low	3	20	5	1	1	2	1	3
Very Low	2	5	25	9	2	1	2	5
Low	5	6	14	24	9	7	2	10
Moderate	4	7	5	17	34	12	4	14
High	5	.	3	12	21	34	9	15
Very High	3	5	7	4	5	17	49	14
Subtotal A	89	76	83	81	85	85	79	86
Other								
Owner-Occupied	2	5	12	10	4	5	11	6
From Non-Residential	1	.	2	.	1	1	2	1
From Other Type B	2	.	2	2	1	1	1	1
Not in 95 sample	.	4	.	1	1	2	1	1
Vacant Interview	7	15	2	6	8	6	6	6
Subotal B	11	24	17	18	15	15	21	15
All	100	100	100	100	100	100	100	100

New York -- Row Percentages

HISTORY OF UNITS THAT WERE RENTAL IN EITHER 1995 OR 1999															
Status in 1995		Status in 1999													
Rental in 1995		Rental in 1999							Other						
Rent Level	Number	Non-Market	Extremely Low	Very Low	Low	Moderate	High	Very High	Owner-Occupied	Loss to Conversion/ Merger	Loss to Non-Residential	Other Permanent Loss	Other Type B	Other	Vacant Interview	All
Non-Market		48	6	6	8	9	7	7	3	.	.	.	1	.	6	100
Extremely Low		18	29	12	4	4	11	5	13	.	.	.	.	.	4	100
Very Low		9	4	33	25	6	4	6	2	.	1	.	.	2	7	100
Low		9	3	9	34	15	11	4	7	.	.	1	.	.	9	100
Moderate		5	2	2	17	40	13	4	5	.	.	.	2	1	8	100
High		7	.	1	11	23	36	10	7	0	1	.	1	.	3	100
Very High		3	2	3	3	5	18	51	6	.	1	.	.	3	4	100
Total		18	4	6	13	16	15	14	5	0	0	0	1	1	5	100

Philadelphia

The following are some observations about the Philadelphia MSA in the period 1995 to 1999:

- There is not the "spread" of variability for switching among the affordability levels that there is in some of the other MSAs. In other words, there was more stability across affordability characteristics.
- 40% of the Extremely Low Income affordable units in 1999 came from units that were owner-occupied in 1995. This is a surprising result, and may be a result of using all of the data as opposed to the unallocated data only. See the Appendix on allocations for a further discussion of this issue.

Philadelphia
Estimated Numbers

HISTORY OF UNITS THAT WERE RENTAL IN EITHER 1995 OR 1999																
Status in 1995		Status in 1999														
Rental in 1995		Rental in 1999							Other							
Rent Level		Non-Market	Extremely Low	Very Low	Low	Moderate	High	Very High	Owner-Occupied	Loss to Conversion/ Merger	Loss to Non-Residential	Other Permanent Loss	Other Type B	Other	Vacant Interview	All
Non-Market		20,217	4,093	2,456	2,456	1,637	1,637	819	10,927	-	.	3,560	2,456	.	7,367	57,625
Extremely Low		.	4,093	4,093	1,637	.	.	.	6,549	2,182	.	1,637	.	.	4,912	25,103
Very Low		1,637	4,912	19,370	13,916	3,274	.	1,637	4,912	.	.	4,912	1,637	1,923	7,367	65,497
Low		2,456	819	18,009	41,253	9,005	1,637	.	7,653	.	2,741	3,274	.	819	8,472	96,138
Moderate		819	.	6,016	9,823	28,651	4,912	1,637	7,405	819	819	.	.	819	6,016	67,734
High		.	.	.	2,456	3,274	13,669	3,274	10,109	.	819	2,456	.	819	4,093	40,968
Very High		.	.	819	.	819	819	6,016	819	.	.	205	.	.	1,637	11,132
Subtotal A		25,129	13,916	50,762	71,541	46,660	22,673	13,383	48,373	3,001	4,379	16,044	4,093	4,379	39,864	364,198
Other																
Owner-Occupied		10,394	11,892	7,367	6,301	7,653	3,560	819								47,987
From Non-Residential		.	.	819	2,804	.	.	.								3,623
From Other Type B		819	.	.	.	.	.	.								819
Not in 95 sample		915	1,989	7,079	3,818	3,222	4,137	2,148								23,307
Vacant Interview		4,379	1,637	8,186	15,306	9,290	4,093	4,093								46,983
Subtotal B		16,507	15,518	23,451	28,229	20,165	11,790	7,060	0	0	0	0	0	0	0	122,719
All		41,636	29,434	74,213	101,693	66,825	35,281	21,261	48,373	3,001	4,379	16,044	4,093	4,379	39,864	487,734

Philadelphia
Column Percentages

HISTORY OF UNITS THAT WERE RENTAL IN EITHER 1995 OR 1999								
Statuis in 1995	Rental in 1999							
Rental in 1995								
Rent Level	Non-Market	Extremely Low	Very Low	Low	Moderate	High	Very High	All
Non-Market	49	14	3	2	2	5	4	9
Extremely Low	.	14	6	2	.	.	.	3
Very Low	4	17	26	14	5	.	8	12
Low	6	3	24	41	13	5	.	20
Moderate	2	.	8	10	43	14	8	14
High	.	.	.	2	5	39	15	6
Very High	.	.	1	.	1	2	28	2
Subtotal A	60	47	68	70	70	64	63	66
Other								
Owner-Occupied	25	40	10	6	11	10	4	13
From Non-Residential	.	.	1	3	.	.	.	1
From Other Type B	2	.	.	.	.	.	.	0
Not in 95 sample	2	7	10	4	5	12	10	6
Vacant Interview	11	6	11	15	14	12	19	13
Subtotal B	40	53	32	28	30	33	33	33
All	100	100	100	100	100	100	100	100

Philadelphia -- Row Percentages

HISTORY OF UNITS THAT WERE RENTAL IN EITHER 1995 OR 1999																
Status in 1995		Status in 1999														
Rental in 1995		Rental in 1999							Other							
Rent Level		Non-Market	Extremely Low	Very Low	Low	Moderate	High	Very High	Owner-Occupied	Loss to Conversion/ Merger	Loss to Non-Residential	Other Permanent Loss	Other Type B	Other	Vacant Interview	All
Non-Market		35	7	4	4	3	3	1	19	-	.	6	4	.	13	100
Extremely Low		.	16	16	7	.	.	.	26	9	.	7	.	.	20	100
Very Low		2	7	30	21	5	.	2	7	.	.	7	2	3	11	100
Low		3	1	19	43	9	2	.	8	.	3	3	.	1	9	100
Moderate		2	.	9	15	42	7	2	11	1	1	.	.	1	9	100
High		.	.	.	6	8	33	8	25	.	2	6	.	2	10	100
Very High		.	.	7	.	7	7	54	7	.	.	2	.	.	15	100
Total		7	4	14	20	13	6	4	13	1	1	4	1	1	11	100

Northern New Jersey

The following are observations about the data for the Northern New Jersey MSA in the period 1995 to 1999:

- Compared to other MSAs and also relative to the other data present for Northern New Jersey, very few housing units were due to new construction. Just over 2,000 estimated units were not present in the 1995 but present in 1999 and so are likely due to new construction. This is less than 0.5% growth over four years due to new construction.
- There was a dramatic increase in units at the Very High level of affordability. In 1995, there were only an estimated 4,700 units at Very High. But by 1999, there were an estimated 28,300 units at the Very High level

Northern NJ -- Estimated Numbers

HISTORY OF UNITS THAT WERE RENTAL IN EITHER 1995 OR 1999																
Status in 1995		Status in 1999														
Rental in 1995		Rental in 1999							Other							
Rent Level	Number	Non-Market	Extremely Low	Very Low	Low	Moderate	High	Very High	Owner-Occupied	Loss to Conversion/ Merger	Loss to Non-Residential	Other Permanent Loss	Other Type B	Other	Vacant Interview	All
Non-Market		58,600	7,910	15,033	8,875	1,989	2,044	2,044	14,853	2,012	1,970	847	847	.	6,827	123,850
Extremely Low		2,263	17,232	7,931	3,752	.	.	847	2,012	.	.	252	2,131	.	1,603	38,021
Very Low		7,971	6,546	64,904	11,939	2,882	.	.	4,838	.	.	.	2,817	.	2,836	104,733
Low		4,860	.	23,338	91,820	16,142	5,773	8,110	17,855	2,084	.	1,989	1,694	.	15,705	189,369
Moderate		4,160	2,954	1,989	26,441	34,711	10,374	6,329	7,354	1,989	.	.	.	2,012	8,773	107,086
High		.	2,914	.	2,882	6,796	14,525	8,981	7,904	.	.	.	.	.	4,786	48,788
Very High		.	.	.	.	662	2,044	2,012	.	.	.	.	.	.	.	4,718
Subtotal A		77,854	37,556	113,195	145,709	63,183	34,759	28,323	54,816	6,085	1,970	3,088	7,488	2,012	40,530	616,565
Other																
Owner-Occupied		2,914	6,057	6,804	7,752	12,054	4,053	4,033								43,667
From Other Type B		2,084	985	847	.	.	.	.								3,915
Not in 95 sample		.	2,148	.	.	.	.	.								2,148
Vacant Interview		5,676	1,717	15,924	23,926	11,234	2,848	4,096								65,421
Subtotal B		10,674	10,907	23,575	31,679	23,288	6,902	8,129	0	0	0	0	0	0	0	115,151
All		88,528	48,463	136,770	177,387	86,471	41,661	36,451	54,816	6,085	1,970	3,088	7,488	2,012	40,530	731,716

Northern NJ
Column Percentages

HISTORY OF UNITS THAT WERE RENTAL IN EITHER 1995 OR 1999								
Status in 1995	Rental in 1999							
Rental in 1995								
Rent Level	Non-Market	Extremely Low	Very Low	Low	Moderate	High	Very High	All
Non-Market	66	16	11	5	2	5	6	16
Extremely Low	3	36	6	2	.	.	2	5
Very Low	9	14	47	7	3	.	.	15
Low	5	.	17	52	18	14	22	24
Moderate	5	6	1	15	40	25	17	14
High	.	6	.	2	8	35	25	6
Very High	.	.	.	.	1	5	6	1
Subtotal A	88	77	83	82	73	83	78	81
Other								
Owner-Occupied	3	12	5	4	14	10	11	7
From Other Type B	2	2	1	.	.	.	.	1
Not in 95 sample	.	4	.	.	.	.	.	0
Vacant Interview	6	4	12	13	13	7	11	11
Subtotal B	12	23	17	18	27	17	22	19
All	100	100	100	100	100	100	100	100

Northern NJ -- Row Percentages

HISTORY OF UNITS THAT WERE RENTAL IN EITHER 1995 OR 1999																
Status in 1995		Status in 1999														
Rental in 1995		Rental in 1999							Other							
Rent Level		Non-Market	Extremely Low	Very Low	Low	Moderate	High	Very High	Owner-Occupied	Loss to Conversion/ Merger	Loss to Non-Residential	Other Permanent Loss	Other Type B	Other	Vacant Interview	All
Non-Market		47	6	12	7	2	2	2	12	2	2	1	1	.	6	100
Extremely Low		6	45	21	10	.	.	2	5	.	.	1	6	.	4	100
Very Low		8	6	62	11	3	.	.	5	.	.	.	3	.	3	100
Low		3	.	12	48	9	3	4	9	1	.	1	1	.	8	100
Moderate		4	3	2	25	32	10	6	7	2	.	.	.	2	8	100
High		.	6	.	6	14	30	18	16	.	.	.	.	.	10	100
Very High		.	.	.	.	14	43	43	.	.	.	.	.	.	.	100
Total		13	6	18	24	10	6	5	9	1	0	0	1	0	7	100

Conclusion

The MSA level analysis shows some interesting results for what is occurring in different areas for the years 1995 through 1999.

However, the results need to be viewed cautiously due to potential issues caused by the small sample sizes. Some of the results may be a result of "noise" as opposed to actual changes in the market.

In addition, the small samples used for the metropolitan areas may also be affected by the issues with allocations as described in the larger data.

Nonetheless, useful insights as to trends are possible to see.

Appendix B: Methodology for Rental Dynamics

Introduction

As described earlier in this paper, the goal of the project is to replicate the work of Nelson-Vandenbroucke, and analyze the extent to which housing units shifted in affordability. A number of changes needed to be made to their methodology due to differences in data used and the characteristics of the data.

Nelson-Vandenbroucke used a collection of data from different metropolitan areas, which had been surveyed through the AHS Metro surveying. Unfortunately, we did not have enough of a time series possible using AHS Metro data due to sample changes. As a result, we instead used the Metro oversample present in the 1995 and 1999 AHS National sample.

The six Metro areas used were:

MSA Number	MSA Name
1600	Chicago, IL
2160	Detroit, MI
4480	Los Angeles, CA
5600	New York, NY
9993	Northern NJ
6160	Philadelphia, PA

This section briefly describes what was done in the analysis of the data and notes about our findings. More detailed descriptions of weighting and allocation issues can be found in later appendices.

Data used and reweighting

The data used was from the 1995 and 1999 AHS. Initially, observations from the relevant metropolitan areas were extracted and matched with each other. Then, missing weights were controlled for through adjustments to weights and the missing cases removed.

13,837 observations were extracted from the 1995 data.
14,539 observations were extracted from the 1999 data.

Merged together, these produced a data set of: 14,564 observations.

Note that this count of observations includes units that were not renter-occupied.

There was certain data that did not have adjusted weights in one year or another. This could be due to the observation being removed from the housing stock, and so there resulting in no adjusted weight in the later year, or it could be that the unit was new construction, therefore there was no information on the unit in the earlier year.

The reweighting that was done was as follows:

1) Create comparable weighting variables. The 1995 data had two implied decimals on weights, and so they needed to be explicitly shown.
2) Divide the data into "good" and "bad" data. "Good" data has values for pure weight (PWT) in 1999, while "bad" data does not.
3) For each of the good and bad data, create a sum of the 1995 pure weights. This was calculated for every combination of: SMSA, Tenure, and Structure Type.
4) For each combination, create a ratio of [(sum of good)+(sum of bad)]/(sum of good). This provides a ratio for estimating the missing 1999 pure weight..
5) Create "newpwt" which is the ratio in Step 4, applied to the 1995 pure weight. This is applied at the combination of: SMSA, Tenure, and Structure Type.
6) By SMSA, create a sum of the new pure weight and the 1995 adjusted weight.
7) Create "ratio_adjusted" which is the sum of the adjusted 1995 weights, divided by the sum of the new 1995 pure weights. This is computed for each SMSA.
8) For each observation, multiple the new pure weight by the new ratio for adjusted, and thereby create a newwgt95, where the control totals should match the sum of the adjusted weights for the SMSA.
9) If an observation was not present in 1995, due to being new construction, the newwgt95 was set equal to the 1999 pure weight.
10) Delete Type A Non-interviews.

At the conclusion of this reweighting, and the removal of the Type A non-interviews, there were 11,952 observations. The reweighting takes into account these Type A non-interviews.

Additional discussion about weighting and why we deviated from Nelson-Vandenbroucke can be found in Appendix C.

Analysis

To perform the analysis, we followed the same logic as in Nelson-Vandenbroucke.

Using the 1995 Area Median Income (AMI) as a base, we also calculated an inflated AMI for 1999 based on changes in the economy. This was necessary for measuring changes in affordability.

Exhibit B-1: Annual AMI for 1995 and inflated for 1999.

MSA	MSA Name	1995 AMI	1999 AMI based on inflation from 1995
1600	Chicago, IL	51,300	56,350
2160	Detroit, MI	47,000	51,850
4480	Los Angeles, CA	45,200	48,550
5600	New York, NY	43,000	46,900
6160	Philadelphia, PA	47,100	50,550
9993	Northern, NJ	56,500	61,650

These AMI figures were then adjusted based on the number of bedrooms in each unit. The adjustment factor for bedrooms were the following:

Number of Bedrooms	Adjustment Factor
0	0.70
1	0.75
2	0.90
3	1.04
4	1.16
5	1.28
6	1.40
7	1.52
8	1.64
9	1.76
10	1.88

Housing units were defined at different level of affordability depending on how the monthly housing cost for that unit (as reported in the data) compared to 30% of monthly AMI multiplied by the bedroom adjustment factor appropriate for that unit.

Housing Affordability bands:

Affordable at less than ___ percent of AMI	Name
30%	Extremely low income
50%	Very low income
65%	Low Income
80%	Moderate Income
100%	High
Greater than 100%	Very High

This housing affordability was calculated for each unit for both 1995 and 1999 and then compared. Non-market or subsidized units were categorized separately.

As seen from these tables, this analysis was done only for renter occupied units. Affordability of owner-occupied units was not covered inside of this analysis.

Allocations

In initial stages of this research, we explored the issues of allocations and the impacts they may be having on the results. Basically, there is the potential for allocations to be overstating the degree to which shifting is occurring among different affordability categories.

As a result, results were also examined limiting to just reported data, and comparing reported data to allocated data.

Additional discussion about allocations are in Appendix D.

Metro level analysis

In addition to performing the analysis at the aggregate of the six metropolitan areas, each MSA was also examined separately. One caution about interpreting and analyzing the results at the MSA level is that there are very small numbers of observations used in certain cells. This means that there are potential issues of small sample sizes and so apparent excessive sensitivity as a result of the small number of observations.

Appendix C: Weighting

Appendix Notes

One of the strengths of the AHS can also serve as a difficulty in performing analysis. The AHS includes weights for each sampled unit, so that estimates of the number of similar units can be made. Unfortunately, these weights are not always constant across years. The discussion in this section is taken largely from an intermediate work product developed as a part of the research. This section illustrates some of the weighting issues and why we deviated from Nelson-Vandenbroucke. This section may also provide context to future researchers of why decisions were made. The original complete memo can be made available on request.

This section is not key to the understanding of the other research, but merely provides additional information and context of why we did the weighting the way we did.

Introduction to weighting

When examining longitudinal data from the AHS, one of the major difficulties is ensuring that the weighting is consistent and appropriate. The issue is that there are both pure weights based on the original sample selection, and also adjusted weights, set to match totals estimated by the Census Bureau.

Our work builds off of the paper "Affordable Rental Housing: Lost, Stolen, or Strayed?" produced by Kathryn Nelson and David Vandenbroucke for the U.S. Department of Housing and Urban Development's Office of Policy Development and Research. Their work used different sets of data from the MSA sample of the AHS, while our research is using selected data from the 1995 and 1999 National sample of the AHS. The selected data is from the six largest metropolitan areas, which were oversampled in those years.

Brief Background on Nelson-Vandenbroucke Weighting

Nelson-Vandenbroucke adjusted their weights to account for a data change, and then other difficulties in the data before finally making a ratio adjustment to match control totals estimated by the Census Bureau.

Our situation is a little different – simpler in some ways, more difficult in others.

The major reason for their adjustments to weights was to account for whole panels of surveying that were dropped from one year of the survey to another year. Fortunately, this is not an issue in our case.

A second group of observations who had their weights adjusted were observations that were in the base year (the first year), but not in the second year because of non-interviews or some other reason. Nelson-Vandenbroucke performed a procedure to adjust weights based on observations with similar characteristics. We

faced the same problem, but were not convinced the same technique is appropriate, due to a significantly smaller sample size.

Weighting questions

Prior to implementing any reweighting strategy, we verified and examined the weights. In doing so, we came across some unexpected things. While we do not believe any of these are major, we note them here as they may affect the future strategy of other researchers and explain some of our decisions.

Summary statistics are as follows:

Exhibit C-1: Summary Statistics

Variable	N	Mean	Median	Sum	Minimum	Maximum
weight95	3219	1,387.60000	1,073.24000	4,466,678.84000	69.29000	10,484.25000
weight99	3219	1,437.08000	1,128.73000	4,625,972.81000	64.46235	10,004.72000
pwt95	3219	1,228.13000	914.55000	3,953,356.26000	64.93000	7,479.98000
pwt99	3219	1,225.93000	914.54637	3,946,265.59000	65.29861	7,479.98000
delta_weight	3219	1.05773	1.01887	3,404.83000	0.39794	3.67189
delta_pwt	3219	0.99899	1.00000	3,215.74000	0.42574	1.00568

Note: This sample is weighted to the housing units that will make up the core of the analysis. These are units that are:

1. Occupied regular interviews in both years
2. Renters in both years.

The variables are as follows:

Weight95

This is the adjusted weight for 1995. This estimates 4.467 million units in the MSAs we are interested in.

Weight99

This is the adjusted weight for 1999. This estimates 4.626 million units. We have suddenly “gained” about 150,000 units using this new weight. This translates into about a 3.5% increase.

This illustrates why we could not just use the yearly weight, and why weighting adjustments need to be performed. However, it also highlights that when trying to match figures published in books, why we were not able to match both years.

PWT95

This is the 1995 pure weight. The pure weight should be the inverse of the probability of selection, based on the original sample.

The sum of adjusted weights for 1995 is approximately 13% higher than the pure weight. This is a substantial difference, and encourages the theory that using just the pure weights is not appropriate.

PWT99

This is the 1999 pure weight. Again, the pure weight should be the inverse of the probability of selection, based on the sample.

Compared to the 1999 weight, we show a much greater difference. Currently, the sum of the 1999 adjusted weights is more than 17% greater than the pure weights. Again, this highlights the importance of modifying the weights as opposed to using only the pure weights.

Note: If we had a changing sample, such as an oversample, we would see significant differences in the sum of pure weights between the two years because we are looking at units that were in the sample in both years.

Delta_weight

This is a variable we created and is defined as: (weight99/weight95). This is computed at the observation level, so the statistics are across the different observations.

An interesting observation on the data is that the change is not all in one direction. If the sample weights were adjusting because of excess attrition from the sample, we would expect that this variable would be only equal to 1 or greater. Unfortunately, it ranges from roughly .40 to 3.67. That means that the change is going both up and down.

Delta_pwt

This is a variable we defined and is the analog to delta_weight. This is defined as: (pwt99/pwt95).

This should nearly always be a value of 1, stating that there was no change in the pure weight. Unfortunately, there is a change. This was one of the things that was an issue in CINCH where there were major changes. For the most part, this is not a serious issue for this research.

If there were a change in sample size, then the pure weight should change to reflect the new sample. As a result, if there were sample changes, we should expect a very wide range in Delta_pwt values. We do see a relatively low minimum, but very little variation. The low values are actually very few and unexpectedly in the Philadelphia MSA.

Pure weights by Metropolitan area

We also examined the sum of the pure weights by Metropolitan area.

Exhibit C-2:

		sum_both_	sum_both_	sum_first_	sum_second_
Obs	SMSA	pwt95	pwt99	pwt95	pwt99
1	Chicago, IL	440223.24	440223.30	235669.73	158092.48
2	Detroit, MI	274102.06	274101.53	92184.50	67660.47
3	Los Angeles, CA	1011607.90	1011606.25	252963.08	259756.38
4	New York, NY	1444401.13	1444395.96	315256.85	266780.00
5	Philadelphia	263805.06	256721.68	142954.52	116745.82
6	Northern NJ	519216.87	519216.87	182915.18	99528.08

The variables are defined as follows:

Sum_both_pwt95:	Sum of PWT95 for observations that were rental units in both years
Sum_both_pwt95:	Sum of PWT99 for observations that were rental units in both years
Sum_first_pwt95:	Sum of PWT95 for observations that were rental units only in the first year
Sum_second_pwt95:	Sum of PWT99 for observations that were rental units only in the second year

The reason to look at the sum of PWTs present in only one year was as part of the checking of different samples.

Closing about weighting review

Summarizing, in reviewing the weighting data, we found a few values we have questions with. Furthermore, based on a review of the differences between the pure weight and the adjusted weight, we believed that there needed to be some adjustment to the pure weight to match to control totals.

However, one issue we dealt with was whether or not to precisely replicate the Nelson-Vandenbroucke adjustments.

Replication of Nelson-Vandenbroucke

The issue of whether or not to replicate Nelson-Vandenbroucke has a substantial issue for work involved, but it is unclear if it would have added significant precision to our estimates.

The first part of the Nelson-Vandenbroucke weighting accounts for the changing sample that they have. We do not have that issue as it appears we do not have any sample changes.

However, Nelson-Vandenbroucke, starting on P. 8 of their technical appendix, discuss a procedure to adjust other weights when they had to drop observations. If they have to drop an observation, because for example, there was an error in one year, they then redistributed the weight of that observation to other observations with similar characteristics. The result of this is that the weighted proportions of these different characteristics are kept the same even after some of these cases are dropped.

As a final step, they compute a ratio between the total adjusted weights and the total pure weight, and apply this ratio to the data they have.

As we can see from Exhibit 2, we do have a significant proportion of cases which are only present in one year. We found that some of these cases disappeared as we account for tenure changes and removals from housing stock. We further examined the cause of these being present in one year to ensure that they are appropriate.

But from that, we decided to make adjustments when cases are dropped. Nelson-Vandenbroucke use a set of variables, described in Table A.4. of their report for redistributing weights. These variables are:

- SMSA
- Metro – collapsed into three categories
- ZoneCode – dummy variable
- Tenure – left as three categories
- Unit Type – collapsed into five categories
- History – collapsed into three categories

Our data is based on the national sample, and in addition, our data is based on only six different metropolitan areas. We also had the potential problem of far fewer observations than they did. For example, the SMSA with the smallest number of observations in their work was Fort Worth with 3,772 observations. In comparison, only one of ours has over 1,000 observations that are rental in both years. Our counts improve when considering rentals in either year or owner occupied units.

Also, using the national data has a different set of possible variables, for example, Zone is not present so Zonecode cannot be created.

We reduced the combination of variables to be used to:

- SMSA
- Metro3 – expecting three categories. Metro is not present in the National file in 1999 due to a data change in 1997. The 1995 data will be adjusted to conform to similar categories.
- Tenure – left as three categories.
- Unit Type – left as original categories. We expect to see relatively few mobile homes. We think that due to the characteristics of the MSAs that it would be worthwhile distinguishing among 1) detached houses, 2) attached houses,

and 3) apartments. This distinction was not done in the Nelson-Vandenbroucke paper.

After doing the pure weight adjustments, we followed the same final ratio adjustment. We will plan on matching to the 1995 control totals.

This is the strategy that was followed, and is documented in the earlier methodology appendix, Appendix B.

Appendix D: Allocations

Introduction to Appendix

The core of this section was developed as an intermediate work product as part of the rental dynamics research. Previous research has not addressed the potential impacts of allocated as opposed to reported data to any significant degree. Based on previous work conducted, we know that there are certain potential issues, and so we tested for the impacts of allocations and how that would affect the research.

This section contains some of our findings and is based on a memo that was developed for HUD during the course of the research. The information presented here is not essential to the project but helps provide context as to why we believed that allocations are an issue and why they are addressed in the document.

The original full memo is available from the authors.

Introduction

Nelson and Vandenbroucke explore two particular issues. One issue is the shifting of tenure of the units, and the other is the change of affordability for a rental unit over time.

In order to replicate and revisit their work, we have been exploring the underlying characteristics of the data to ensure that it is appropriate, or to make any adjustments. One issue we have encountered deals with the prevalence of allocations in some of the data. The concern is that some of the apparent changes may not in fact be occurring, but rather as a result of "noise" being introduced by the allocated or edited values.

This section discusses some of our findings regarding allocations. Nelson and Vandenbroucke do not address allocations in their paper. We believe that allocated or edited data is an issue that needs to be addressed due to potential bias or errors it could introduce.

We have been concerned about allocations taking place in only two areas:

1. Tenure
2. Monthly Housing Cost

These reflect the issues relating to housing rental dynamics.

Tenure

The shifting of housing units from one ownership state to another is an issue of interest in public policy, insofar as where the housing stock is coming from and going.

The following table shows a cross-tabulation between tenure in 1995 and tenure in 1999 for the six metropolitan areas that were oversampled in those years and are of interest. Note: Since our research focuses on rental housing, we have removed observations where:

1) The unit was owned in both years. Units that were owned in only one year were kept.
2) The unit was not in the housing stock in both years. Units that were present in the stock in only one year were kept.

The unweighted crosstab is as follows:

Exhibit D-1:

Table of tenure95 by tenure99

tenure95	tenure99				
Frequency					
Percent					
Row Pct					
Col Pct	Missing	Owner	Renter	No cash rent	Total
Missing	0	503	646	22	1171
	0.00	6.88	8.84	0.30	16.02
	0.00	42.95	55.17	1.88	
	0.00	43.78	12.52	17.60	
Owner	290	0	514	33	837
	3.97	0.00	7.03	0.45	11.45
	34.65	0.00	61.41	3.94	
	33.14	0.00	9.96	26.40	
Renter	567	589	3951	30	5137
	7.76	8.06	54.06	0.41	70.28
	11.04	11.47	76.91	0.58	
	64.80	51.26	76.57	24.00	
No cash rent	18	57	49	40	164
	0.25	0.78	0.67	0.55	2.24
	10.98	34.76	29.88	24.39	
	2.06	4.96	0.95	32.00	
Total	875	1149	5160	125	7309
	11.97	15.72	70.60	1.71	100.00

(Note: Cases of missing are ones which have a STATUS of 2, 3, or 4, and so were not occupied regular interviews.)

As can be seen, there is some shifting among tenure states. For example, there are 589 observations that were rentals in 1995 and owned in 1999. There were 514 observations that were owned in 1995 and rented in 1999.

To examine whether or not tenure was allocated or edited for an observation in one year or another, we looked at the allocation variables. For tenure in 1995, we used the AC8B variable, and for tenure in 1999, we used the JENURE variable. We also looked at the cross-tabulation of the two variables to explore if the same unit was allocated in each year.

This crosstab between the two is as follows:

Exhibit D-2:

Table of AC8B by JENURE

AC8B(1995 Tenure allocation)	JENURE(Edit flag for TENURE)		
Frequency / Percent / Row Pct / Col Pct	Unchanged	Allocated	Total
.	315 4.31 99.06 4.33	3 0.04 0.94 7.69	318 4.35
Unchanged	6524 89.26 99.51 89.74	32 0.44 0.49 82.05	6556 89.70
Edited	431 5.90 99.08 5.93	4 0.05 0.92 10.26	435 5.95
Total	7270 99.47	39 0.53	7309 100.00

As show, very few observations (only 4) were allocated or edited in both years. Note also that most of the allocations or edits occurred in 1995 as opposed to 1999. Missing value may occur if the unit is not present in 1995.

Overall, the distribution of whether or not there was an allocation in either year is as follows:

Exhibit D-3:

tenure_allocation	Frequency	Percent	Cumulative Frequency	Cumulative Percent
No edits	6839	93.57	6839	93.57
1+ edit	470	6.43	7309	100.00

Approximately 6.5% of the observations had an allocation in at least one of the years.

However, weighting the data does change the sample proportions. For comparison, when using the 1995 pure weight (PWT), the distribution is as follows:

Exhibit D-4:

tenure_allocation	Frequency	Percent	Cumulative Frequency	Cumulative Percent
No edits	7798952	93.50	7798952	93.50
1+ edit	542268.2	6.50	8341221	100.00

When using weighted data, cases with an edit are effectively unchanged.

Unfortunately, we cannot dismiss this as not being an issue so easily. When we examined the weighted data more closely, we discovered that the allocated cases were not distributed evenly across the different types.

Exhibit D-5 shows weighted counts with percentages. The 1995 PWT variable was used.

Exhibit D-5

		tenure99								All	
		Missing dummy		Owner dummy		Renter dummy		No cash rent dummy		All dummy	
		Sum	PctSum	Sum	PctSum	Sum	PctSum	Sum	PctSum	Sum	PctSum
tenure95	tenure allocation										
Missing	No edits	.	.	281191	98.72	678729	99.28	26011	100.00	985931	99.14
	1+ edit	.	.	3658	1.28	4892	0.72	.	.	8550	0.86
Owner	No edits	288148	87.08	.	.	520513	84.76	32052	94.60	840713	85.88
	1+ edit	42750	12.92	.	.	93592	15.24	1829	5.40	138171	14.12
Renter	No edits	588390	95.61	531641	80.11	4632845	95.42	29438	90.58	5782314	93.76
	1+ edit	27019	4.39	132013	19.89	222435	4.58	3063	9.42	384530	6.24
No cash rent	No edits	19269	86.29	63753	90.06	56503	100.00	50470	98.22	189995	94.52
	1+ edit	3063	13.71	7040	9.94	.	.	915	1.78	11017	5.48
All		968639	100.00	1019295	100.00	6209508	100.00	143778	100.00	8341221	100.00

(Note: The percentages are calculated as using the sum of particular category for 1995 as the denominator. For example, percentages are based on 1995 owners, 1995 renters, etc. Whether or not there was an edit occurred applies to either year.)

This table has several interesting results. Although overall, the weighted percentage of units with an allocation or edit for tenure was only 6.5%, certain cells were significantly higher.

Since the research is primarily concerned with occupied units in both years, only those cases are highlighted. Interesting statistics:

- Owner to Renter: 15.24% of the cases had an edit in at least one year. This represents approximately 93,000 housing units.[19]
- Renter to Owner: 19.89% of the cases had an edit in at least one year. This represents approximately 132,000 housing units.
- Renter to Renter: 4.58% of the cases had an edit in at least one year. This represents approximately 222,000 housing units.

The "Renter to Renter" category has a much larger number of housing units present in it.

The issue is whether or not the allocations are accurate. There is a sizable percentage of units in this changing categories which may not have actually changed. This could disrupt the analysis and the predictions of when units shift categories. The concern is that the allocations are not accurate and we may be overstating changes. With pure randomness, we may have expected the percentage allocated in each category to be consistent.

Rental Housing Costs

The analysis of the housing cost data for rental properties is similar. When examining rental dynamics and the shifting of households among different affordability categories, we are interested in if allocations may be disrupting results and may be erroneously indicating changes.

Prior to examining the allocations, the housing units were assigned into different housing affordability bands.

For this examination of shifting housing costs over time and allocations, we limited the examination to units that were rental units in both years. In addition, there had to have a cash rent in both years.

We simplified the framework from Nelson-Vandenbroucke, and rather than creating a new housing cost variable, we used the Monthly Housing Cost variable (ZSMHC) from the AHS data. We followed the same process of comparing housing costs to area median incomes with adjustment factors for number of bedrooms.

The housing affordability bands used were:

- Extremely low
- Very low
- Moderate
- High

[19] Note: The pure weight for 1995 was used for this statistic. The weighting used in the analysis is slightly different due to adjustments.

- Very High
- Missing

With unweighted data, the results look as follows:

Exhibit D-6:

Table of cost95 by cost99

cost95	cost99							
Frequency Percent Row Pct Col Pct	Missing	Extremely Low	Very Low	Low	Moderate	High	Very High	Total
Missing	305 7.72 92.99 41.67	8 0.20 2.44 1.74	4 0.10 1.22 0.71	6 0.15 1.83 0.67	3 0.08 0.91 0.49	1 0.03 0.30 0.26	1 0.03 0.30 0.35	328 8.30
Extremely Low	32 0.81 6.26 4.37	262 6.63 51.27 56.83	99 2.51 19.37 17.62	48 1.21 9.39 5.33	28 0.71 5.48 4.54	21 0.53 4.11 5.37	21 0.53 4.11 7.29	511 12.93
Very Low	75 1.90 13.51 10.25	79 2.00 14.23 17.14	245 6.20 44.14 43.59	99 2.51 17.84 11.00	33 0.84 5.95 5.35	13 0.33 2.34 3.32	11 0.28 1.98 3.82	555 14.05
Low	99 2.51 10.36 13.52	52 1.32 5.44 11.28	159 4.02 16.63 28.29	483 12.22 50.52 53.67	109 2.76 11.40 17.67	40 1.01 4.18 10.23	14 0.35 1.46 4.86	956 24.20
Moderate	116 2.94 14.37 15.85	35 0.89 4.34 7.59	33 0.84 4.09 5.87	208 5.26 25.77 23.11	321 8.12 39.78 52.03	75 1.90 9.29 19.18	19 0.48 2.35 6.60	807 20.43
High	67 1.70 13.32 9.15	16 0.40 3.18 3.47	13 0.33 2.58 2.31	46 1.16 9.15 5.11	106 2.68 21.07 17.18	188 4.76 37.38 48.08	67 1.70 13.32 23.26	503 12.73
Very High	38 0.96 13.06 5.19	9 0.23 3.09 1.95	9 0.23 3.09 1.60	10 0.25 3.44 1.11	17 0.43 5.84 2.76	53 1.34 18.21 13.55	155 3.92 53.26 53.82	291 7.37
Total	732 18.53	461 11.67	562 14.22	900 22.78	617 15.62	391 9.90	288 7.29	3951 100.00

As shown in this chart, most of the observations are on the “diagonal” meaning that they didn’t change affordability categories from 1995 to 1999. There are often a high number of observations in adjoining cells, which drops off the further away from the diagonal.

However, there is the same concern that some of this shifting of cost categories may actually be a result of allocations and not an actual change in affordability for the unit.

To examine this, the allocation variable must be checked. However, the housing cost variable that is used, ZSMHC, is not a reported variable. Rather it is a calculated variable based on components. The components include rent, taxes, utilities, etc.

Following the assumption that the rent was likely to be the major component of monthly housing cost, the allocations for rent were examined. For 1995, the A2510 variable was used. For 1999, the JRENT variable was used. An unweighted cross-tabulation of those variables is in Exhibit 7. Rent allocations were then viewed as a proxy for allocated monthly housing costs. The other cost components are likely to have an impact, but not as significant an impact.

An important note about the allocation variable is that it only reports if the variable was allocated, it does not report if the variable was "top-coded". This means that we do *not* improperly categorize all top-coded values as allocated.

Exhibit D-7:

Table of A2510 by JRENT

A2510(1995 Rent allocation)

	JRENT(Edit flag for RENT)		
Frequency			
Percent			
Row Pct			
Col Pct	Unchanged	Edited	Total
Unchanged	3449	260	3709
	87.29	6.58	93.87
	92.99	7.01	
	94.42	87.25	
Allocated	204	38	242
	5.16	0.96	6.13
	84.30	15.70	
	5.58	12.75	
Total	3653	298	3951
	92.46	7.54	100.00

These rental results are interesting in comparison with the tenure allocations. Allocations or edits in rent are occurring in both years in similar (although not exact) proportions. There are also approximately 1% of the cases which were edited or allocated in both years.

Overall, the distribution of whether or not an allocation or edit had been performed for rent for a particular housing unit are in Exhibit 8.

Exhibit D-8:

rent_allocation	Frequency	Percent	Cumulative Frequency	Cumulative Percent
No edits	3449	87.29	3449	87.29
1+ edit	502	12.71	3951	100.00

According to unweighted data, 12.71% of the units that were rental in each year, had an allocation in the rent amount.

However, looking at the data weighted provides a slightly different statistic. For the tenure allocation, weighted data and unweighted data were similar in sample proportions. However, for the rental allocation, using the 1995 pure weight, increased the proportion of units that had allocations in rent, as shown in Exhibit 9.

Exhibit D-9.

rent_allocation	Frequency	Percent	Cumulative Frequency	Cumulative Percent
No edits	4170545	85.90	4170545	85.90
1+ edit	684734.9	14.10	4855280	100.00

Similar to tenure, the distribution of allocations/edits is not uniform across the distribution. Exhibit 9 shows the distribution of affordability bands with whether or not an allocation occurred. The analysis shows that a substantial proportion of changes in some categories have allocations taking place.

		cost99														All	
		Missing		Extremely Low		Very Low		Low		Moderate		High		Very High			
		dummy		dummy		dummy		Dummy		dummy		dummy		dummy		dummy	
		Sum	PctSum	Sum	PctSum	Sum	PctSum	Sum	PctSum	Sum	PctSum	Sum	PctSum	Sum	PctSum	Sum	PctSum
cost95	rent_allocation																
Missing	No edits	356156	94.33	8542	78.33	4892	100.00	6201	74.27	4296	82.45	2148	100.00	.	.	382235	92.95
	1+ edits	21396	5.67	2363	21.67	.	.	2148	25.73	915	17.55	.	.	2148	100.00	28970	7.05
Extremely Low	No edits	40229	97.78	292415	88.31	97458	82.51	35574	63.78	21765	61.26	24501	77.68	14356	51.57	526299	82.10
	1+ edits	915	2.22	38711	11.69	20652	17.49	20205	36.22	13761	38.74	7040	22.32	13484	48.43	114767	17.90
Very Low	No edits	71629	88.33	79711	85.83	261688	91.37	89836	76.86	28117	70.21	10103	55.95	6125	37.75	547209	83.98
	1+ edits	9465	11.67	13165	14.17	24727	8.63	27047	23.14	11932	29.79	7954	44.05	10103	62.25	104393	16.02
Low	No edits	113854	98.42	46266	74.72	151779	83.92	509709	94.07	101132	78.97	38124	64.35	12753	61.59	973616	87.85
	1+ edits	1829	1.58	15655	25.28	29074	16.08	32137	5.93	26926	21.03	21120	35.65	7954	38.41	134695	12.15
Moderate	No edits	147833	95.26	29884	69.44	15866	43.65	221520	95.49	353254	92.88	80488	87.90	14910	57.51	863756	89.56
	1+ edits	7359	4.74	13153	30.56	20482	56.35	10455	4.51	27086	7.12	11085	12.10	11017	42.49	100636	10.44
High	No edits	67070	88.14	15292	79.36	2744	19.11	31977	50.35	118655	81.36	227646	93.82	79225	88.37	542609	83.30
	1+ edits	9022	11.86	3977	20.64	11613	80.89	31533	49.65	27193	18.64	14994	6.18	10422	11.63	108753	16.70
Very High	No edits	43513	78.87	3977	25.44	4296	29.84	6484	43.94	5806	25.35	69208	83.37	201537	91.00	334821	78.35
	1+ edits	11655	21.13	11655	74.56	10103	70.16	8273	56.06	17103	74.65	13803	16.63	19929	9.00	92521	21.65
All		901924	100.00	574767	100.00	655373	100.00	1033100	100.00	757939	100.00	528214	100.00	403963	100.00	4855280	100.00

The following table is of category changes where more then 20% of the values had at least one allocation or edit. Cells with **bold** had more than 50% of the cases in that cell had allocations. However, some of the cells still had small absolute numbers of observations.

1995 Affordability band	1999 Affordability band	***Percentage allocated***
Extremely Low	Low	36.22
	Moderate	38.74
	High	22.32
	Very High	48.43
Very Low	Low	23.14
	Moderate	29.79
	High	44.05
	Very High	**62.25**
Low	Extremely Low	25.28
	Moderate	21.03
	High	35.65
	Very High	38.41
Moderate	Extremely Low	30.56
	Very Low	**56.35**
	Very High	42.49
High	Extremely Low	20.64
	Very Low	**80.89**
	Low	49.65
Very High	**Extremely Low**	**74.56**
	Very Low	**70.16**
	Low	**56.06**
	Moderate	**74.65**

As can be seen from this table, some of the changes have noticeable percentages of housing units with an allocation in one or more years.

Allocation discussion

The previous sections demonstrate that there are noticeable percentages of cases in certain cells, where allocations or edits occurred.

Review of allocation/edits

The Census Bureau will edit or allocate data under a variety of circumstances. Most typically, this is because of missing data. However, editing and allocations may also occur for top-coding to preserve confidentiality, or for obvious mistakes in the data. Censuses use a hot-decking procedure to match the unit with a “similar” unit across

different dimensions, and then copy the data in. This procedure has the effect of randomly assigning values to fill in the gaps. Top-coded data is not flagged as allocated due to top-coding.

Theoretically, the strength of this method is that the overall distributions should theoretically reflect the universe and be appropriate. This is true when examining the data as a cross-sectional collection of data. However, our difficulty is that we are examining panel data. It is possible that data is allocated without reference to the past history of the unit. This means that some of the changes we see may be "spurious" and due to the allocations.

Of course, the belief that there is a problem is based on an implicit assumption that the allocations are "bad" – meaning do not properly allocate to replace the missing values. This may not be the case, rather, the allocations may appropriately fill in the missing values. However, our finding of the greater proportion of allocated cases in the extremes raise concerns. In reality, some of the allocations are probably accurate while others are off.

Closing of Appendix Section

As demonstrated in this discussion, allocations should not simply be disregarded as not important. This is the reason why we provide both allocated and unallocated results in the analysis.