

Are Census Variables Highly Correlated With Housing Choice Voucher Holders' Perception of the Quality of Their Neighborhoods?

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Abstract

This article presents the results of a study examining voucher holders' ratings of their neighborhoods on the U.S. Department of Housing and Urban Development's Housing Choice Voucher Program Customer Satisfaction Survey. Specifically, the study examines whether these ratings were internally consistent and whether they were highly correlated with any census neighborhood variables often used as measures of neighborhood quality. We found that the voucher holders' neighborhood ratings were consistent with their answers to more specific survey questions about the attributes of their neighborhoods but only weakly correlated with census-based measures of neighborhood quality. Internal consistency was demonstrated by the strong correlation between neighborhood ratings and voucher holders' perceptions of crime problems and physical disorder in their neighborhoods. The comparison with census-based measures of the neighborhood showed that, although a very systematic correlation exists between the neighborhood rating and census measures of the neighborhood, the correlation was not very strong for any of the census variables tested. The variable with the strongest correlation (percentage of female-headed households with children) explained less than 5 percent of the variation in the neighborhood rating. Furthermore, combining multiple census variables into a neighborhood quality indicator increased the explanatory power by only a small amount.

Introduction

To measure the customer satisfaction of Housing Choice Voucher Program (HCVP) recipients, the U.S. Department of Housing and Urban Development (HUD) surveyed housing voucher holders by mail (the HCVP Customer Satisfaction Survey), asking recipients about their housing and their neighborhoods. Focusing on one neighborhood question that asked respondents to rate their neighborhoods on a scale of 1 to 10, this study first examines whether voucher holders' neighborhood ratings were consistent with their responses to other survey questions about their neighborhoods. It then compares voucher holders' neighborhood ratings with census variables that measure attributes of their neighborhoods and explores whether there is a census-based indicator of neighborhood quality that is highly correlated with voucher holders' neighborhood ratings. If such a census-based indicator can be derived, then it can be used as a proxy for voucher holders' satisfaction with the quality of the neighborhoods where they use their vouchers.

Data

This study uses data from a national mail survey of HCVP recipients, conducted in 2000, 2001, and 2002, and the decennial census in 2000.

HCVP Customer Satisfaction Survey

The HCVP Customer Satisfaction Survey collects respondents' perceptions of the quality of their housing and neighborhoods. The survey questions were tested in two large pilot studies. The pilot studies sampled more than 5,000 households of various composition types and demographic categories in 11 counties of various sizes in Illinois, Indiana, and Missouri.

Those pilot studies had high response rates of 76 percent in the first pilot and 58 to 74 percent in the second pilot, depending on the survey delivery method and the housing program. In both pilot studies, residents' ratings on the quality of their housing were compared with an evaluation of their units by professional inspectors; the degree of agreement was high. Of the 64 dichotomous items compared, 38 percent had rates of agreement of 90 percent or higher, and another 23 percent had rates of agreement between 80 and 90 percent. Agreement rates for the 20 nondichotomous items tested were 80 percent or more for 80 percent of the items. In addition, inspectors' assessments of the same unit conducted at two different times agreed as much as residents' and inspectors' assessments. These results suggest that the survey responses on the dimensions of housing quality covered in the survey are as consistent and accurate as could be obtained using professional inspectors.

Although the survey validation issues analyzed in the pilot studies focused on housing quality rather than on neighborhood quality, the results indicate that survey respondents took the survey seriously and tried to provide meaningful answers. These results give us confidence that their responses to the neighborhood quality questions also are meaningful.

In addition to testing the validity of survey responses, the pilot studies tested two types of survey distribution methods: centralized distribution by mail compared with distribution by public housing agency (PHA) staff. The centralized, mail-delivered distribution was more successful. It

had a higher response rate and also provided a higher degree of confidentiality, both of which contributed to the quality and reliability of resident responses to the HCVP Survey.

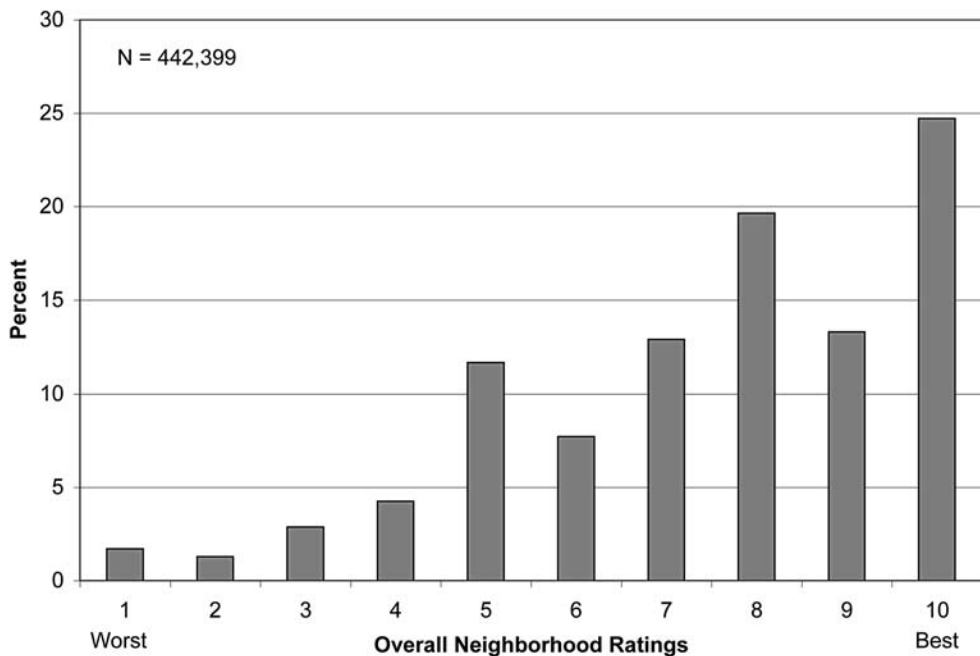
The HCVP Survey data for this study are from the annual surveys conducted between 2000 and 2002. The data set contains 887,689 records of all the households to which surveys were mailed in those 3 years. The overall response rate to the HCVP Survey, conducted in 2000, 2001, and 2002, was 51.7 percent, with a total of 459,298 responses.¹

The HCVP Survey asks voucher recipients to rate their neighborhoods on a scale of 1 to 10, with 1 being the worst rating and 10 being the best rating. The distribution of the neighborhood ratings is shown in exhibit 1. The neighborhood ratings were generally high, with nearly one-fourth of the respondents rating their neighborhoods a 10 (the highest possible rating) and 70 percent rating their neighborhoods a 7 or above. A small portion (3.7 percent) of the respondents did not rate their neighborhoods, leaving 442,399 records for analysis.

The neighborhood section of the HCVP Survey also asked voucher recipients to assess if each of the three neighborhood attributes listed in the next paragraph was “A Big Problem,” “Some Problem,” or “Not a Problem.” We used these neighborhood variables for checking whether

Exhibit 1

Distribution of HCVP Survey Respondents' Overall Neighborhood Ratings



HCVP = Housing Choice Voucher Program.

Note: The sample includes all survey respondents who provided a neighborhood rating (n = 442,399).

Source: HCVP Customer Satisfaction Survey, 2000, 2001, and 2002

¹ The responses by year number 173,362 in 2000, 166,844 in 2001, and 119,092 in 2002.

respondents' answers were consistent with their overall neighborhood ratings. That is, we used these variables to check the internal (within the same respondent's survey) consistency of their answers. Some respondents either did not respond to these neighborhood questions or responded that they did not know. Percentages of missing and "Don't Know" responses among those who rated their neighborhood are noted in parentheses.

1. Crime or drugs. (20.7 percent)
2. Vacant or rundown homes or stores. (11.7 percent)
3. Trash or junk on nearby streets, sidewalks, or properties. (6.1 percent)

Exhibit 2 shows the breakdown of missing rates among the neighborhood variables by the overall neighborhood rating. The missing rates of the neighborhood variables were not evenly distributed across the overall neighborhood rating. Respondents who rated their neighborhoods highest (8 to 10) were generally the least likely to have missing information on the other questions.

The differences were small in the mean neighborhood rating between the groups that answered these neighborhood questions and the groups that did not answer or answered "Don't Know." The groups that answered all three neighborhood questions rated their neighborhoods 7.5 on average. The groups that did not answer the neighborhood questions or answered "Don't Know" rated their neighborhoods from 7.0 to 7.4 on average. The differences were statistically significant but small and, therefore, did not meet the minimum size effect of a 1-point difference in the neighborhood rating that we determined was meaningful.

We established a minimum size effect to identify a difference that would be meaningful because statistical significance tests were not useful with a sample of more than 400,000 respondents. Even very small differences that did not reflect substantive differences would be statistically significant with a sample size this large. We based our determination of a 1-point difference in the overall neighborhood rating as a meaningful size effect based on research literature that defines a "medium effect size" as half a standard deviation of the variable of interest.² In the overall neighborhood

Exhibit 2

Missing Rate by Neighborhood Rating

Missings and Don't Knows for HCVP Survey Neighborhood Variables	Neighborhood Rating		
	1-4	5-7	8-10
	(N = 44,667)	(N = 142,723)	(N = 255,009)
	(percent)		
Crime and drugs in neighborhood	14.5	25.3	19.3
Trash or junk on nearby streets, sidewalks, or properties	6.9	7.4	5.2
Vacant or rundown homes or stores in neighborhood	16.0	13.0	9.3

HCVP = Housing Choice Voucher Program.

Note: The sample includes all survey respondents who provided a neighborhood rating (n = 442,399).

Source: HCVP Customer Satisfaction Survey, 2000, 2001, and 2002

² See Cohen (1988), who defines a medium effect size as an effect that is at least one-half the size of the standard deviation.

rating, we used the difference of 1 point in the 10-point neighborhood rating scale as a meaningful effect size because it was roughly half the standard deviation of the neighborhood rating, or 2.2. For example, a difference in the average neighborhood rating of an 8 for HCVP Survey respondents identifying crimes and drugs as a big problem in the neighborhood and a 7 for the group identifying it as some problem would exactly meet the minimum criterion to be a meaningful difference.

In addition to variables from the neighborhood section of the HCVP tenant survey, we also selected four “Yes/No” questions from the survey sections on “area outside of the home” and “sanitation and safety” for the internal consistency checks. We added these variables because they also seem to measure neighborhood conditions. Very few of the survey respondents were missing responses to these questions; therefore, we did not analyze these missing data further. The variables used for the internal consistency check are listed below; the percentages of missing responses are shown in parentheses.

1. Is there enough light for safety (outside your home)? (1.6 percent)
2. Does the garbage service pick up each week? (1.5 percent)
3. Did you see a rat anywhere in your building or outside around the grounds this week? (1.4 percent)
4. In the last 3 months, has your mail been stolen or tampered with? (1.8 percent)

Decennial Census 2000 Data

This study uses census data at the tract level from the 2000 Census to compare with voucher holders' neighborhood ratings from the survey. The census variables chosen for this study were based on a review of recent literature that used census variables as measures of neighborhood quality. We then merged the selected census tract-level data variables with the HCVP Survey data using the census tract identifiers.

Geocodes were missing for 5.5 percent of the HCVP Survey respondents who rated their neighborhoods. As a result, census tract-level variables could not be attached to those records, leaving 418,308 records for analysis. The difference in the average neighborhood rating between records with geocodes and records without geocodes was only 0.3 points, which is well below the 1-point effect size we used as a minimum threshold for a significant substantive difference. The differences in other HCVP Survey neighborhood variables were also very small and well below half the standard errors of those variables. From this difference, we concluded that missing geocodes would not bias the analysis of census data for respondents to the HCVP Survey.

A Comparison With Other Survey Responses About the Neighborhood

To check the consistency of voucher holders' overall neighborhood ratings to other questions about their neighborhoods, we used the other three questions from the neighborhood section of the HCVP Survey and four selected questions from the survey sections on “area outside of the home” and “sanitation and safety.”

Exhibit 3a shows the percentage of respondents who reported “A Big Problem” on the three specific neighborhood quality questions by their overall rating of the neighborhood (in rating groups 1 to 4, 5 to 7, and 8 to 10).

Exhibit 3a

Percentage of Respondents Reporting “A Big Problem” on Neighborhood Questions by Overall Neighborhood Rating Category

Problems in Neighborhood	Percent Reporting “A Big Problem” by Neighborhood Rating		
	1–4 (N = 44,667)	5–7 (N = 142,723)	8–10 (N = 255,009)
Crime and drugs in neighborhood	50.5	12.0	1.6
Trash or junk on nearby streets, sidewalks, or properties	31.1	7.9	1.6
Vacant or rundown homes or stores in neighborhood	15.9	3.1	0.6

Notes: The sample includes all survey respondents who provided a neighborhood rating (n = 442,399). Complete responses number 350,771 for the crime and drugs variable, 415,561 for the trash or junk variable, and 393,044 for the vacant or rundown buildings variable.

Source: Housing Choice Voucher Program Customer Satisfaction Survey, 2000, 2001, and 2002

The percentage of respondents reporting “A Big Problem” for each of these neighborhood quality variables was substantially higher, the lower the neighborhood rating.³ For each of the three variables, respondents who gave their neighborhood a low rating (between 1 and 4) were approximately 4 times more likely to report the quality variable was “A Big Problem” compared with respondents who gave their neighborhoods a middle rating (between 5 and 7); they were 20 to 30 times more likely to report the issue as “A Big Problem” than were respondents who gave their neighborhoods a high rating (between 8 and 10). For example, 50 percent of the respondents who gave their neighborhoods a low rating reported crime and drugs were “A Big Problem” in their neighborhoods compared with 12 percent of respondents who gave their neighborhoods a middle rating and 1.6 percent of respondents who gave their neighborhoods a high rating. Clearly, perceptions of big problems with these specific neighborhood issues are consistent with the overall neighborhood ratings.

We also examined differences in overall neighborhood ratings across respondents who reported an item in the neighborhood section of the survey as “A Big Problem,” those who reported it as “Some Problem,” and those who reported it as “Not a Problem” in their neighborhoods. Exhibit 3b shows these results.

Respondents reporting “Not a Problem” consistently rated their neighborhoods higher than those who reported “Some Problem,” who in turn rated their neighborhoods higher than those who reported “A Big Problem.” The differences in average neighborhood ratings between respondents citing various levels of problems were statistically significant and greater than our 1-point minimum size effect criterion.

The last column of exhibit 3b shows the Pearson correlation coefficient between recipients’ responses to each individual question in the neighborhood section and their overall rating of

³ All chi-squared statistics testing the relationship between the overall neighborhood rating and each specific neighborhood survey item were statistically significant.

Exhibit 3b

Average Neighborhood Rating and Pearson Correlation Coefficient by Response to Problem-in-Neighborhood Questions

Problems in Neighborhood	Average Neighborhood Rating (percent)	Pearson Correlation Coefficient
Crime and drugs in neighborhood		
“A Big Problem”	4.2	
“Some Problem”	6.3	– 0.62
“Not a Problem”	8.5	
Trash or junk on nearby streets, sidewalks, or properties		
“A Big Problem”	4.6	
“Some Problem”	6.1	– 0.49
“Not a Problem”	8.1	
Vacant or rundown homes or stores in neighborhood		
“A Big Problem”	4.4	
“Some Problem”	5.7	– 0.39
“Not a Problem”	7.9	

Notes: The sample includes all survey respondents who provided a neighborhood rating (n = 442,399). Complete responses number 350,771 for the crime and drugs variable, 415,561 for the trash or junk variable, and 393,044 for the vacant or rundown buildings variable.

Source: Housing Choice Voucher Program Customer Satisfaction Survey, 2000, 2001, and 2002

their neighborhoods. According to the Pearson correlation coefficients, all neighborhood problem variables were strongly and negatively correlated to the overall neighborhood ratings, confirming that respondents with more neighborhood problems gave their neighborhoods lower ratings. The correlation of –0.62 between the crime and drugs variable and the overall neighborhood rating was especially strong, suggesting that the perception of crime and drugs strongly influenced the overall neighborhood rating; it explained almost 40 percent of the variation in the neighborhood rating.⁴

We also selected four “Yes/No” questions from the survey sections on “area outside of the home” and “sanitation and safety” for our internal consistency checks. The results were similar to the HCVP Survey neighborhood variable results shown earlier, but the relationships were not as strong. As exhibit 4a shows, respondents who gave their neighborhoods a low rating were about twice as likely as respondents who gave their neighborhoods a middle rating and about four times as likely as respondents who gave their neighborhoods a high rating to report these issues as problems. The one exception was with the weekly garbage pickup variable, which did not vary much by neighborhood rating.

We also computed the Pearson correlation coefficient and average neighborhood rating for responses to each of the four selected variables from the survey sections on the area outside of the home and on sanitation and safety, as shown in exhibit 4b. The differences in average neighbor-

⁴ The square of the correlation coefficient is the same as the R-square of a regression of neighborhood rating on the neighborhood item of interest.

Exhibit 4a

Percentage of Respondents Reporting a Problem on Other HCVP Survey Questions by Overall Neighborhood Rating Category

Other HCVP Survey Variables That Are Potential Neighborhood Indicators	Percent Reporting Stated Issue by Neighborhood Rating		
	1-4 (N = 44,667)	5-7 (N = 142,723)	8-10 (N = 255,009)
Outside of home			
Not enough light for safety	30.2	16.2	7.9
Garbage service does not pick up each week	7.5	4.8	4.5
Sanitation and safety			
Rats in building or outside around grounds this week	21.0	9.9	4.7
Mail stolen or tampered with in last 3 months	18.1	7.9	3.8

HCVP = Housing Choice Voucher Program.

Notes: The sample includes all survey respondents who provided a neighborhood rating (n = 442,399). Complete responses number 435,388 for the external light variable, 435,583 for the garbage collection variable, 436,324 for the rats variable, and 434,401 for the mail-tampering variable.

Source: HCVP Customer Satisfaction Survey, 2000, 2001, and 2002

Exhibit 4b

Average Neighborhood Rating and Pearson Correlation Coefficient by Response to Other HCVP Survey Questions

Other HCVP Survey Variables That Are Potential Neighborhood Indicators	Average Neighborhood Rating (percent)	Pearson Correlation Coefficient
Outside of home		
Not enough light for safety		
Yes	6.2	- 0.22
No	7.7	
Garbage service does not pick up each week		
Yes	7.2	- 0.03
No	7.5	
Sanitation and safety		
Rats in building or outside around grounds this week		
Yes	6.1	- 0.19
No	7.6	
Mail stolen or tampered with in last 3 months		
Yes	6.0	- 0.17
No	7.6	

HCVP = Housing Choice Voucher Program.

Notes: The sample includes all survey respondents who provided a neighborhood rating (n = 442,399). Complete responses number 435,388 for the external light variable, 435,583 for the garbage collection variable, 436,324 for the rats variable, and 434,401 for the mail-tampering variable.

Source: HCVP Customer Satisfaction Survey, 2000, 2001, and 2002

hood ratings between respondents who cited problems and those who did not cite problems were statistically significant and greater than 1 point (except for problems with garbage pickup).

According to the Pearson correlation coefficients, the selected variables were negatively and moderately correlated to the overall neighborhood ratings, confirming that respondents who reported problems rated their neighborhoods lower. In other words, the selected variables seemed to play a role in respondents' overall neighborhood ratings. The only exception was the variable about weekly garbage pickup. Respondents who reported that the garbage service did not pick up their garbage weekly also rated their neighborhoods only 0.3 point lower than respondents who reported regular weekly garbage pickup. The correlation between the weekly garbage pickup variable and the overall neighborhood rating was almost nonexistent at only -0.03 , which led us to conclude that respondents' ratings of the variable on weekly garbage pickup had virtually no role in respondents' overall neighborhood ratings.

From our analysis, we conclude that respondents' overall neighborhood ratings are internally consistent with their responses to other questions about attributes of their neighborhood. The role of these neighborhood attributes in respondents' overall neighborhood ratings, however, range from strong (crime and drugs variable) to almost none (weekly garbage pickup variable). Exhibit 5 summarizes the findings by ordering the HCVP Survey variables from the strongest to weakest relationship with the overall neighborhood rating.

Exhibit 5

Summary of Internal Consistency Checks

HCVP Survey Variables That Are Potential Neighborhood Indicators	Pearson Correlation Coefficient
Problems with crime and drugs in neighborhood	- 0.62
Problems with trash or junk on nearby streets, sidewalks, or properties	- 0.49
Problems with vacant or rundown homes or stores in neighborhood	- 0.39
Not enough light for safety outside of home	- 0.22
Rats in building or outside around grounds this week	- 0.19
Mail stolen or tampered with in last 3 months	- 0.17
Garbage service does not pick up each week	- 0.03

HCVP = Housing Choice Voucher Program.

Notes: The sample includes all survey respondents who provided a neighborhood rating (n = 442,399). Complete responses number 350,771 for the crime and drugs variable, 415,561 for the trash or junk variable, 393,044 for the vacant or rundown buildings variable, 435,388 for the external light variable, 436,324 for the rats variable, 434,401 for the mail-tampering variable, and 435,583 for the garbage collection variable.

Source: HCVP Customer Satisfaction Survey, 2000, 2001, and 2002

A Comparison of Neighborhood Ratings and Census-Based Measures of Neighborhood Quality

The census tract poverty rate is the most widely used neighborhood quality indicator from census data. We calculated the percentage of voucher holders in each poverty rate category by the voucher holders' rating of their neighborhood. The results in exhibit 6 indicate that the voucher hold-

ers' neighborhood ratings moderately correlate with the census tract poverty rate. For example, respondents who gave their neighborhoods high ratings were more than twice as likely to live in census tracts with poverty rates below 10 percent as were respondents who gave their neighborhoods poor ratings (32.7 percent compared with 15.8 percent, respectively). Conversely, respondents who rated their neighborhoods as high were half as likely to live in a census tract with poverty rates above 30 percent as were respondents who rated their neighborhoods as low (10.1 percent compared with 22 percent, respectively).

This pattern was also clear when we looked at average overall neighborhood ratings by respondents in census tracts with various poverty rates (also shown in exhibit 6). The respondents' average neighborhood rating dropped systematically from 8 to 6.8 as we moved from respondents living in low-poverty census tracts to respondents living in high-poverty census tracts; however, the difference in the average neighborhood rating between the respondents in the lowest and highest poverty census tracts was only slightly above our 1-point minimum effect size. This narrow variation in the average overall neighborhood rating between respondents living in a census tract with differing poverty rates was corroborated by the Pearson correlation coefficient of -0.18 between the poverty rate and the overall neighborhood rating, shown in exhibit 7. These results suggest that, even though the census tract poverty rate was correlated with the respondents' overall neighborhood rating, it alone did not explain most of the differences in neighborhood ratings.

Exhibit 7 shows the correlation between respondents' overall neighborhood ratings and a host of census variables that have been reported in the research literature as measures of neighborhood quality. The relationships among all the census tract neighborhood variables and the respondents' overall neighborhood ratings were in the expected direction; however, none of the correlations were very strong. The strongest correlation was only -0.22 . In other words, not one census variable on its own captured much of what determines the respondents' overall neighborhood ratings.

We also computed the averages of all census variables for each of the 10 groups of respondents rating their neighborhoods on a scale from 1 to 10. Exhibit 7 shows the average of each census

Exhibit 6

Comparison of Neighborhood Ratings and Census Tract-Level Poverty Rate Categories

Census Tract-Level Poverty Rate	Percent in Poverty Category by Neighborhood Rating			
	1-4 (N = 42,597)	5-7 (N = 135,815)	8-10 (N = 239,896)	Average
Less than 10%	15.8	22.2	32.7	8.0
10-19.99%	36.3	40.0	40.3	7.5
20-29.99%	25.9	22.4	17.0	7.1
30-39.99%	14.5	10.4	6.7	6.8
40% or more	7.5	4.9	3.4	6.8
Total	100.0	100.0	100.0	7.5

Note: The sample includes survey respondents who provided a neighborhood rating and could have their record matched to census data at the census tract level (n = 418,308).

Sources: Housing Choice Voucher Program Customer Satisfaction Survey, 2000, 2001, and 2002; 2000 Decennial Census

Exhibit 7

Comparison of Neighborhood Ratings and Census 2000 Variables

Selected Census Variables	Correlation to Neighborhood Rating		Average by Neighborhood Rating		
	Sign	Coefficient	1	5	10
Households with female heads and own children under 18 years old (percent)	-	0.2160	13	11	8
Households with female heads (percent)	-	0.2077	21	17	14
People with income twice or more the poverty level (percent)	+	0.1867	52	57	64
People 15 years old or older who are married females (percent)	+	0.1836	23	25	27
Families with related children under 18 years old (percent)	-	0.1827	59	57	53
Households receiving public assistance income (percent)	-	0.1798	7	6	4
Housing units that are owner occupied (percent)	+	0.1780	49	53	61
People with income lower than the poverty level (percent)	-	0.1780	24	20	16
Housing units without vehicles (percent)	-	0.1720	20	16	12
People who are non-Hispanic Whites (percent)	+	0.1671	49	60	71
People who are minorities (percent)	-	0.1671	51	40	29
Households with minority heads (percent)	-	0.1646	47	36	25
Civilian people 16 years old or older who are unemployed (percent)	-	0.1620	6	5	4
Civilian people 16 years old or older In managerial, professional, and technical employment (percent)	+	0.1552	23	25	28
People who are non-Hispanic Blacks (percent)	-	0.1541	31	21	13
Median household income (dollars)	+	0.1500	29,658	32,044	36,390
People 25 years old or older without a high school diploma (percent)	-	0.1437	30	27	23
People who are 9 years old or younger (percent)	-	0.1391	16	15	14
People 25 years old or older with a college degree or more education (percent)	+	0.1289	19	21	25
People 16 to 19 years old who are high school dropouts (percent)	-	0.1273	16	14	11
Civilian uninstitutionalized people 5 years old or older who are disabled (percent)	-	0.1259	25	24	22
People 16 to 19 years old who are in school (percent)	+	0.1217	72	73	77
Households with heads under 35 years old (percent)	-	0.1137	26	26	23
Median gross rent to median value of owner-occupied housing (capitalization rate) (percent)	-	0.1106	0.68	0.65	0.59

Exhibit 7

Comparison of Neighborhood Ratings and Census 2000 Variables (continued)

Selected Census Variables	Correlation to Neighborhood Rating		Average by Neighborhood Rating		
	Sign	Coefficient	1	5	10
Housing units (with heads 15 years old or older) that households moved into more than 5 years ago (percent)	+	0.1091	47	48	51
Housing units built since 1980 (percent)	+	0.1052	21	22	27
Median value of owner-occupied housing units (dollars)	+	0.0857	87,775	93,413	107,219
Median gross monthly rent (dollars)	+	0.0506	508	522	542
Housing units that are vacant (percent)	-	0.0442	10	9	9

Note: The sample includes survey respondents who provided a neighborhood rating and could have their record matched to census data at the census tract level (n = 418,308).

Sources: Housing Choice Voucher Program Customer Satisfaction Survey, 2000, 2001, and 2002; 2000 Decennial Census

tract neighborhood variable for respondents who gave their neighborhoods the lowest ratings (1), middle ratings (5), and highest ratings (10). The consistency in the way the averages of the census tract neighborhood variables changed from one respondent groups' neighborhood ratings to another was remarkable. This pattern is more clearly visible in the complete table in the appendix.⁵ Although a consistent relationship exists between the census variables and the neighborhood ratings, the differences in the average value of the census variables across the overall neighborhood ratings were small. The small difference indicates that each census variable on its own was not capturing much of what determined respondents' neighborhood ratings.

Nevertheless, several variables stood out. The percentage of female-headed households with children had the strongest correlation with overall neighborhood ratings. In fact, the correlation of the single-mother variable to the overall neighborhood rating was stronger than the correlation between the neighborhood poverty rate and the overall neighborhood rating. In addition, the overall neighborhood rating also had a slightly stronger correlation with the prevalence of receipt of public assistance and share with income greater than two times the poverty level in the neighborhood than with the neighborhood poverty rate.

From our analysis, we conclude that the neighborhood rating is weakly correlated with the external census measures of neighborhood quality. We say "weakly" because none of the census variables have a very strong relationship with the responding voucher holders' neighborhood ratings. Nonetheless, across a wide spectrum of census measures of neighborhood quality, a consistent pattern is evident that respondents' higher neighborhood ratings are associated with higher census measures of neighborhood quality.

⁵ The appendix shows the values for every neighborhood rating from 1 to 10. The appendix also includes several additional variables that had low correlations with neighborhood ratings and, thus, were not included in exhibit 7.

Deriving a Census-Based Measure of Neighborhood Quality

Because none of the individual census variables were strongly correlated with responding voucher holders' overall neighborhood ratings, we attempted to derive a neighborhood quality index from census variables that would be strongly correlated with neighborhood quality. As a first step to building a census-based measure of neighborhood quality, we compiled a list of 55 census variables that were used as neighborhood quality indicators in the research literature and grouped them into 10 categories, such as household type and income.⁶ Using the decennial Census 2000 data, we created census variables quantifying census tract-level percentages (for example, percentage of persons in the census tract with incomes below the poverty level). After preparing the data, we selected a 25-percent random subsample of HCVP Survey respondents for use in establishing a census-based neighborhood quality indicator. The subsample contains 104,580 HCVP Survey respondent records.

Because the studies of neighborhood quality we reviewed had closely related variables, our compiled list contained duplicate or similar variables. We eliminated obvious duplicates (for example, "percent White" was kept but "percent minority" was not). Then we chose between two or more census variables measuring very similar attributes—often derived from the same census count data—based on their correlation with the HCVP Survey respondents' neighborhood ratings and with each other. As a result, we pared the list from 55 variables to 35 variables, shown in exhibit 8 in descending order of their correlation with the HCVP Survey respondents' neighborhood ratings. The census variable with the strongest correlation coefficient is shown first; the variable with the next highest correlation coefficient is shown second, and so on.

Exhibit 8 shows that six census variables—the percentage of households headed by a female with own children under 18 years old in particular—have a higher correlation with the HCVP neighborhood ratings than do the poverty rates. The percentage of households headed by a female with own children explained 4.7 percent of the variation in the HCVP neighborhood rating compared with 3.1 percent explained by the poverty rate.⁷ This finding that some census variables have a higher correlation with the voucher holders' neighborhood ratings suggests that building a census-based index of neighborhood quality might result in a more accurate census-based neighborhood quality measure than using the poverty rate alone.

Preliminary Regression Analysis

We started our analysis with ordinary least square (OLS) regressions of the HCVP Survey respondents' neighborhood ratings on the poverty rate alone and then on all 35 census variables. Exhibit 9 shows selected regression fits. All of the regression fits were poor, but the combination of all 35 census variables explained 6.9 percent of the variation in the HCVP Survey respondents' neighborhood rating, a little more than twice the variation explained by the poverty rate alone (3.1 percent).

⁶ The primary sources of census variables measuring neighborhood quality were from Devine et al. (2003), Feins and Patterson (2005), Galster, Hayes, and Johnson (2005), Holin et al. (2003), and Newman and Schnare (1997).

⁷ The square of the correlation coefficient (in exhibit 8) is the percentage of the variation in the neighborhood rating that is explained by the census variable; that is, the square of the correlation coefficient is the same as the R-square from a regression of the neighborhood rating on that census variable and an intercept term.

Exhibit 8

Selected Census Variables

Selected Census Variables (as Percent)	Correlation to HCVP Neighborhood Rating	
	Sign	Correlation Coefficient
Households with female heads and own children under 18 years old	-	0.2160
Tract median household income relative to county median household income	+	0.1892
People with income twice or more the poverty level	+	0.1867
People 15 years old or older who are married females	+	0.1836
Families with related children under 18 years old	-	0.1827
Households receiving public assistance income	-	0.1798
People with income lower than the poverty level (poverty rate)	-	0.1780
Housing units that are owner occupied	+	0.1780
Housing units without vehicles	-	0.1720
People who are non-Hispanic Whites	+	0.1671
Civilian people 16 years old or older who are unemployed	-	0.1620
Civilian people 16 years old or older in managerial, professional, and technical employment	+	0.1552
People who are non-Hispanic Blacks	-	0.1541
People 25 years old or older without a high school diploma	-	0.1437
People who are 9 years old or younger	-	0.1391
People 25 years old or older with a college degree or more education	+	0.1289
People 16 to 19 years old who are high school dropouts	-	0.1273
Civilian uninstitutionalized people 5 years old or older who are disabled	-	0.1259
People 16 to 19 years old who are in school	+	0.1217
Households with heads under 35 years old	-	0.1137
Median gross rent to median value of owner-occupied housing (capitalization rate)	-	0.1106
Housing units (with heads 15 years old or older) that households moved into more than 5 years ago	+	0.1091
Housing units built since 1980	+	0.1052
Households with heads older than 65 years old	+	0.0944
Tract median value of owner-occupied housing relative to county value of owner-occupied housing	+	0.0857
Housing units built before 1940	-	0.0834
People who are 10 to 19 years old	-	0.0796
People who are citizens	+	0.0708
People who are Hispanics	-	0.0535
Civilian people 16 years old or older who are in the labor force	+	0.0470
Housing units that are vacant	-	0.0442
Housing units in single-family structures (1-4 units)	+	0.0385
Housing units that households moved into between 1995 and 1998	+	0.0383
Housing units without plumbing	-	0.0319
Households with wage or salary income	+	0.0048

HCVP = Housing Choice Voucher Program.

Note: The sample includes a random one-fourth of 418,308 survey respondents who provided neighborhood ratings and could match their data to census data at the census tract level (n = 104,850).

Sources: HCVP Customer Satisfaction Survey, 2000, 2001, and 2002; 2000 Decennial Census

Exhibit 9

Regressions of HCVP Survey Respondents' Neighborhood Rating

Independent Variables	R ²
OLS regressions	
Poverty rate	0.0309
Percentiles of poverty rate	0.0367
All 35 census variables	0.0693
Percentiles of all 35 census variables	0.0696
Ordered logistic regressions	
Poverty rate	0.0218

HCVP = Housing Choice Voucher Program. OLS = ordinary least square.

Note: The sample includes a random one-fourth of 418,308 survey respondents who provided neighborhood ratings and could have their records matched to census data at the census tract level (n = 104,850).

Sources: HCVP Customer Satisfaction Survey, 2000, 2001, and 2002; 2000 Decennial Census

We then changed the continuous independent variables into categorical variables based on percentiles, deciles, quintiles, and quartiles, and we performed regressions again for each of these methods of categorizing the census variables; however, these categorical variables could not improve the regression fit. In other words, categorizing each census variable into as many as 100 categories each (that is, the percentiles) did not improve the explanatory power of the regression. We also performed ordered logistic regressions to investigate other functional forms, but ordered logistic regressions fit worse than OLS regressions. Exhibit 9 shows the R-square from a typical ordered logistic regression.

Paring Down Census Variables

Because of their poor fit, none of the regression models we tried could predict the HCVP Survey respondents' neighborhood ratings well. Another way to improve the accuracy of predicting the HCVP ratings was to categorize census variables and then create appropriate interaction terms, but the list of 35 census variables needed to be pared further to effectively explore this method. First, we conducted an exploratory factor analysis to identify census variables representing different neighborhood dimensions.⁸ We could identify six distinct factors and a handful of census variables that highly influenced these factors.⁹

We used the results of the exploratory factor analysis plus correlation and distribution analyses to calculate a 6-point scale to further pare down the number of census variables. Every census

⁸ The exploratory factor analysis we conducted is similar to the one reported in Galster, Hayes, and Johnson (2005). We included factors with eigenvalues higher than 1.5 and performed both Varimax and Promax rotations. We selected the Varimax rotation because the interfactor correlations in the Promax rotation were low and factor loadings were similar in both rotations using a cutoff of 0.45.

⁹ We created six distinct factors using the standardized values of the 35 census variables and their weight coefficient determined through the factor analysis. When we regressed the Housing Choice Voucher Program neighborhood rating to the 6 factors, the fit was weaker than the ordinary least squares regression using all 35 census variables. This result was expected, considering the reduction in the number of dependent variables from 35 census variables to 6 factors.

variable received a point for each of the six criteria that it met. Exhibit 10 describes these criteria. The maximum number of possible points a variable could receive was 6, and we selected census variables that received 3 or more points. A handful of the selected variables still measured similar aspects of the neighborhood, as indicated by the factor analysis; thus, we excluded some of those variables if either criterion A or D was not satisfied.

After this selection process, we retained the following 11 census variables:

- Percentage of people living below the poverty level.
- Percentage of people with income two or more times the poverty level.
- Percentage of households headed by a female with own children under 18 years old.
- Percentage of housing units that are owner occupied.
- Ratio of census tract median household income to county median household income.
- Percentage of people 16 years or older who are unemployed.
- Percentage of people who are White.
- Percentage of people 16 years or older in professional jobs.
- Percentage of people 25 or older without a high school diploma.
- Percentage of housing units without vehicles.
- Percentage of households receiving public assistance income.

We then performed an OLS regression of the HCVP neighborhood rating to these 11 census variables to test the fit and discovered that the percentage of people with incomes twice or more the poverty level and the percentage of households receiving public assistance income were

Exhibit 10

Qualifying Criteria for Further Selection of Census Variables

Point	Qualifying Criteria for Census Variables
A	1 if the correlation coefficient with HCVP neighborhood rating is 0.15 or above (15 variables qualified)
B	1 if the correlation with HCVP neighborhood rating is the highest in the category, such as housing type or race (10 variables qualified, 1 in each category)
C	1 if R ² is 0.5 or above when the variable is regressed with the factor it loads (22 variables qualified)
D	1 if the variable has the highest R ² in regression with the factor it loads (6 variables qualified)
E	1 if the difference in average for HCVP neighborhood ratings 4 and 10 were the highest (10 variables qualified)
F	1 if the percentage point difference in the distribution of HCVP neighborhood ratings 4 and 10 was greater than 20 when binary variable was created using the sample mean as the average (8 variables qualified)
Total	A + B + C + D + E + F

HCVP = Housing Choice Voucher Program.

diminishing the effect of the poverty rate on the HCVP neighborhood rating without improving the fit (R-square was 0.0611). In other words, those two variables were not adding explanatory power; therefore, we excluded those two variables, retaining nine census variables for creating categories and interaction terms.

Creation of Census-Based Measures

We tested various ways of categorizing the nine selected census variables and creating interaction terms. The most promising method we found was to create binary variables that could be added to create interaction terms.

First, we created standardized binary census variables to indicate more favorable neighborhood attributes, designated as 1. We used the following six cutoffs for each variable: (1) sample averages to indicate neighborhoods that were better than the sample average, (2) national averages to indicate neighborhoods that were better than the national average, (3) sample medians to indicate neighborhoods that were better than half or more of the sample neighborhoods, (4) sample 25th percentiles to indicate neighborhoods that were better than 25 percent of the sample neighborhoods, (5) sample 75th percentiles to indicate neighborhoods that were better than 75 percent of the sample neighborhoods, and (6) sample 10th percentiles to indicate neighborhoods that were better than 10 percent of the sample neighborhoods.

The distributions of HCVP neighborhood rating appeared somewhat similar across broad categories (0 to 9 “good” attributes) of the scores, with minimal but consistent variation across scores. That is, the distributions of various scores for each of the 10 HCVP neighborhood ratings varied but were somewhat clumped in the middle (4 or 5 “good” attributes). We were able, however, to exploit the distributions of the various scores and collapse the HCVP neighborhood ratings based on the location of the median score. The exact cutoffs varied somewhat for each type of score (that is, based on 25th percentile, based on 75th percentile, and so on) but the most sensible rule was to combine HCVP neighborhood ratings into four categories: 1 to 4, 5 or 6, 7 or 8, and 9 or 10.

We then added the binary census variables from the methods described above to create six score variables with the maximum possible value of 9 and the minimum possible value of 0. We compared each of the resulting variable scores with the HCVP Survey respondents' neighborhood ratings. The relationships were consistent between each of the six census scores and the HCVP Survey respondents' neighborhood ratings (that is, the census variable scores indicating more good attributes correlated consistently with the likelihood that respondents rated their neighborhoods higher); however, the relationship was not strong. This observation means that none of the six census scores met the objective of providing a census-based indicator of neighborhood quality that was highly correlated with the voucher holders' neighborhood ratings.

We also tested whether using the variable cutoffs as the 10th percentile values (better than only 10 percent of the neighborhoods) for the group of survey respondents with HCVP neighborhood ratings of 9 or 10 could be exploited to make a better prediction for the survey respondents with HCVP neighborhood ratings of 1 to 4. That is, we tried to identify the factors that would separate the worst rated neighborhoods from the best rated neighborhoods. We used a stepwise approach:

We selected the census variable with the highest difference in distributions between the highest and lowest groups of HCVP neighborhood ratings at each stage. This stepwise selection was unsuccessful in distinguishing between the highest and lowest groups of HCVP neighborhood ratings in any significant way. After the fourth stage, the difference in prediction between the groups of HCVP neighborhood ratings of 9 or 10 and 1 to 4 was less than 14 percentage points, and this difference grew by less than one-half a percentage point with the fourth variable added.

Finally, because the six census scores we created from the binary census variables were lacking in variation in the distribution—most of the observations had four or five positive attributes—we decided to add some of these scores together to create new scores. The goal was to create a new census score that had more variation and a stronger correlation with the voucher holder's neighborhood rating. After studying the correlations between combinations of the census scores and the HCVP neighborhood ratings, we picked the sum of the scores based on the 25th, 50th, and 75th percentiles of the sample for the cutoffs as our best census-based measure of neighborhood quality. This census score ranged from 0 to 27; in this score, neighborhoods above the 75th percentile received 3 points for a positive attribute, neighborhoods between the median and the 75th percentile received 2 points for a positive attribute, and neighborhoods between the 25th percentile and the median received 1 point for a positive attribute.

Results: Comparison of Poverty Rate and Combined Census-Based Measure of Neighborhood Quality To Predict Housing Choice Voucher Holders' Neighborhood Ratings

For a comparison, we first tested how the poverty rate predicted the HCVP neighborhood ratings. We grouped the poverty rate into four categories: 30 percent or more, between 20 and 29.99 percent, between 10 and 19.99 percent, and below 10 percent. We also grouped the neighborhood ratings into the following four categories:

- 1 to 4.
- 5 or 6.
- 7 or 8.
- 9 or 10.

The results are shown in exhibit 11. As can be seen in the poverty rate row of the exhibit, the poverty rate was a correct predictor in 33 percent of all neighborhood ratings, including—

- 22 percent of HCVP neighborhood ratings of 1 to 4.
- 24 percent of HCVP neighborhood ratings of 5 or 6.
- 41 percent of HCVP neighborhood ratings of 7 or 8.
- 34 percent of HCVP neighborhood ratings of 9 or 10.

The most common poverty rate category for each group of neighborhood ratings was 10 to 19.99 percent. In other words, under the maximum likelihood criteria, an HCVP neighborhood rating of 7 or 8 will be picked every time instead of the correct HCVP neighborhood rating.

Using the categories of the 0-to-27 census score as shown in exhibit 11, on the row “Census score (optimal—each HCVP rating category predicted equally accurately),” the prediction rate could be optimized so that each category of the HCVP neighborhood rating was predicted with similar accuracy. This census score correctly predicted 32 percent of all neighborhood ratings, including—

- 33 percent of HCVP neighborhood ratings of 1 to 4.
- 29 percent of HCVP neighborhood ratings of 5 or 6.
- 32 percent of HCVP neighborhood ratings of 7 or 8.
- 33 percent of HCVP neighborhood ratings of 9 or 10.

In addition, the same prediction rates would hold even when the maximum likelihood was used as the criteria.

We were also able to create categories of the census score that predicted the HCVP neighborhood rating slightly better than the poverty rate, as shown in exhibit 11, row “Census score (maximum overall accuracy);” however, a neighborhood quality index should not be judged only by the higher overall prediction rate. Given the distribution of the HCVP neighborhood rating, an index that

Exhibit 11

Correct Prediction of HCVP Neighborhood Rating

Census Neighborhood Quality Indicator	HCVP Neighborhood Rating				Overall Correct Prediction
	1-4	5-6	7-8	9-10	
Poverty rate					
	(percent)				
30% or more	21.9	16.6	11.6	9.5	
20-29.99%	25.9	24.0	19.3	16.4	
10-19.99%	36.1	39.4	40.9	39.7	33.26
Less than 10%	16.1	20.0	28.2	34.4	
Total	100.0	100.0	100.0	100.0	
Census score (optimal—each HCVP rating category predicted equally accurately)					
	(percent)				
0-5	33.3	25.8	17.0	12.3	
6-12	28.4	28.8	26.2	22.1	
13-19	24.6	28.1	31.9	32.9	31.75
20-27	13.8	17.3	24.9	32.7	
Total	100.0	100.0	100.0	100.0	
Census score (maximum overall accuracy)					
	(percent)				
0-3	24.3	17.8	11.1	7.6	
4-9	25.9	24.2	19.8	15.5	
10-18	33.0	36.8	39.4	38.8	34.43
19-27	16.7	21.2	29.7	38.1	
Total	100.0	100.0	100.0	100.0	

HCVP = Housing Choice Voucher Program.

Notes: The sample includes a random one-fourth of 418,308 survey respondents who provided neighborhood ratings and could have their record matched to census data at the census tract level (n = 104,850). The bold numbers are the percentage of that neighborhood-rating category that is accurately categorized by the census neighborhood quality indicator.

Sources: HCVP Customer Satisfaction Survey, 2000, 2001, and 2002; 2000 Decennial Census

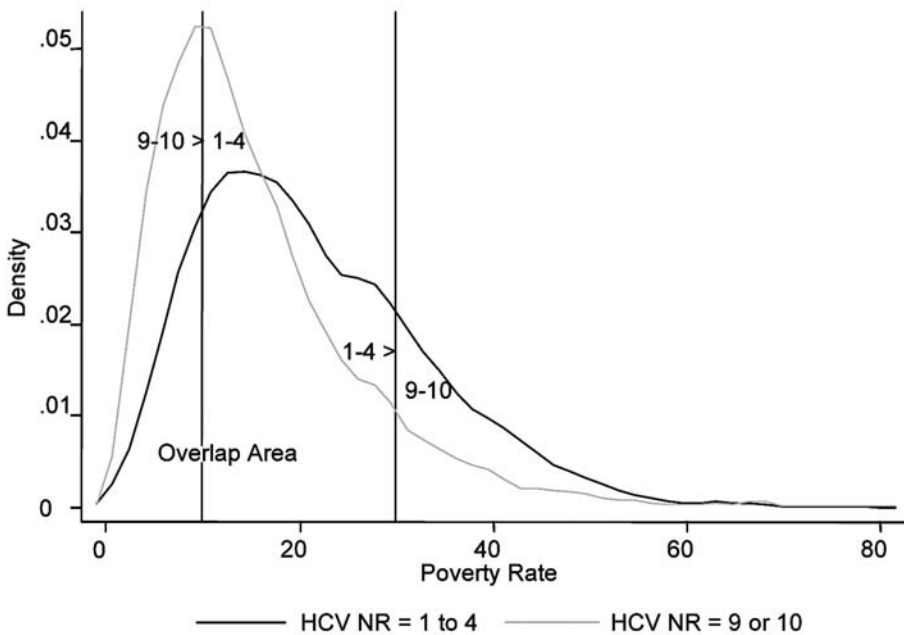
always picks a neighborhood rating of 9 or 10 is correct more than 40 percent of the time and an index that selects 7 to 10 is correct 70 percent of the time. On the other hand, these indices have zero prediction power for the lower neighborhood ratings; thus, optimizing the balance in predicting all levels of neighborhood quality should be preferred over maximizing the overall prediction.

Despite a slight improvement over the poverty rate, our census score is not a strong proxy for the HCVP neighborhood rating because it can predict the correct HCVP neighborhood rating only one-third of the time.

The reason for these results can be better understood by examining exhibits 12a and 12b. In exhibit 12a, we graphed the distribution of poverty rate for the Housing Choice Voucher holders' neighborhood rating (HCV NR) categories 1 through 4 (darker line) and the HCV NR categories 9 and 10 (lighter line). The two distributions had most of their areas under the curves in common, as shown by the area labeled "Overlap Area"; hence, the poverty rate is not very effective in distinguishing between the lowest and highest categories of neighborhood rating. The first vertical line separated the lowest poverty group (less than 10 percent) to its left. More than half of the area under the lighter line (HCV NR 9 or 10) was also under the darker line (HCV NR 1 through 4). The second vertical line separated the highest poverty group (greater than or equal to 30 percent).

Exhibit 12a

Distribution of Poverty Rate for HCVP Neighborhood Rating Categories 1 to 4 and 9 or 10



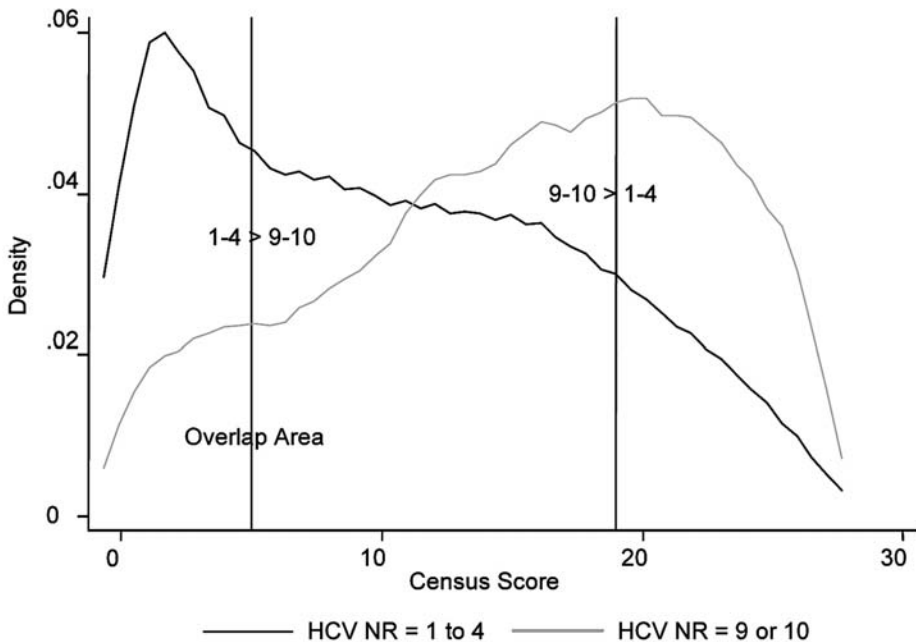
HCV NR = Housing Choice Voucher holders' neighborhood rating. HCVP = Housing Choice Voucher Program.
Note: The sample includes a random one-fourth of 418,308 survey respondents who provided neighborhood ratings and could match their data to census data at the census tract level (n = 104,850).
Sources: HCVP Customer Satisfaction Survey, 2000, 2001, and 2002; 2000 Decennial Census

About one-half of the area under the darker line (HCV NR 1 through 4) was also under the lighter line (HCV NR 9 or 10). The commonality in the middle area between the two vertical lines is even more severe.

In Exhibit 12b, we graphed the distribution of our census score for the HCV NR categories 1 through 4 (darker line) and the HCV NR categories 9 and 10 (lighter line). The two distributions had most of their areas under the curves in common, but the area of commonality is slightly reduced compared with the poverty rate. The first vertical line separated the lowest census score group (less than or equal to 5) to its left. Less than half of the area under the lighter line (HCV NR 9 or 10) was also under the darker line (HCV NR 1 through 4). The second vertical line separated the highest census score group (20 through 27). Less than half of the area under the darker line (HCV NR 1 through 4) was also under the lighter line (HCV NR 9 or 10). This distribution was a modest improvement over the poverty rate.

Exhibit 12b

Distribution of Census Score for HCVP Neighborhood Rating Categories 1 to 4 and 9 or 10



HCV NR = Housing Choice Voucher holders' neighborhood rating. HCVP = Housing Choice Voucher Program.

Note: The sample includes a random one-fourth of 418,308 survey respondents who provided neighborhood ratings and could match their data to census data at the census tract level ($n = 104,850$).

Sources: HCVP Customer Satisfaction Survey, 2000, 2001, and 2002; 2000 Decennial Census

Conclusion

We did not find a census-based housing quality measure that is highly correlated with voucher holders' ratings of the quality of their neighborhoods. The census tract poverty rate—the most common census measure of neighborhood quality in the research literature—does almost as well by itself as the more complex measures that draw on multiple census variables.

At this point, the question arises regarding whether the voucher holder respondents are rating their neighborhoods or rating something else, such as their housing or their living situation. The neighborhood ratings were highly correlated with voucher holders' responses about specific neighborhood attributes, such as problems with crime, trash on the streets, and vacant lots. This consistent relationship suggests that the neighborhood ratings do indeed reflect the respondents' perceptions of their neighborhoods.

We believe two other reasons more likely explain why the census variables we tested are not highly correlated with voucher holders' neighborhood ratings. First, the neighborhood that voucher holders are rating may not coincide with a census tract. The neighborhood may be smaller or larger or be an area that crosses census tract boundaries. Additional research could test whether census variables at the block level are more correlated with voucher holders' ratings. Second, perhaps the census variables we tested are not the attributes that drive voucher holders' ratings. We tested a comprehensive list of census variables, and, thus, it may be neighborhood attributes that are not captured by the census. With the high correlation between voucher holders' ratings of their neighborhoods and their indicated perception of crime, neighborhood measures that use the crime rate might be more strongly correlated with neighborhood ratings. Based on the research of Galster, Hayes, and Johnson (2005), neighborhood measures based on home loan applications, the size of loans, and business activity may be more appropriate indicators than census-based variables of neighborhood quality. Followup conversations or cognitive testing would be efficient ways to understand whether the census variables we tested are not strongly correlated with voucher holders' ratings because the census tract is not the geography they are basing their neighborhood ratings on or because the census data does not capture the factors that are determining their neighborhood ratings.

Appendix
Exhibit A-1

Averages of Decennial Census 2000 Variables by Overall Neighborhood Rating

Census Variables	Average by Neighborhood Rating										
	Correlation	1	2	3	4	5	6	7	8	9	10
Sample Size		7,107	5,404	12,150	17,939	49,136	32,486	54,199	82,320	55,424	102,155
Household type		(percent)									
Households with female heads and own children under 18 years old	-0.2160	13	12	12	12	11	11	10	9	9	8
Households with female heads	-0.2077	21	19	19	18	17	17	16	15	14	14
People 15 years old or older who are married females	0.1836	23	24	24	24	25	25	25	26	27	27
Families with related children under 18 years old	-0.1827	59	58	58	58	57	56	55	54	53	53
Households with own children under 18 years old	-0.0619	35	34	34	34	34	33	33	33	33	32
Age		(percent)									
People who are 9 years old or younger	-0.1391	16	16	15	15	15	15	15	14	14	14
Households with heads under 35 years old	-0.1137	26	26	27	27	26	26	25	25	24	23
Households with heads older than 65 years old	0.0944	21	21	21	21	21	22	22	22	23	23
People who are 10 to 19 years old	-0.0796	15	15	15	15	15	15	14	14	14	14
Ethnicity/race		(percent)									
People who are non-Hispanic Whites	0.1671	49	54	57	58	60	62	65	68	70	71
People who are minorities	-0.1671	51	46	43	42	40	38	35	32	30	29
Households with minority heads	-0.1646	47	41	39	38	36	34	31	28	26	25
People who are non-Hispanic Blacks	-0.1541	31	26	24	23	21	20	17	15	13	13
People who are not Whites, Blacks, Hispanics, Asians, or Native Americans	-0.0641	2	2	2	2	2	2	2	2	2	2
People who are Hispanics	-0.0535	15	15	14	14	14	13	12	12	11	11
People who are not Whites, Blacks, or Hispanics	-0.0214	5	5	5	5	5	5	5	5	5	5
People who are Native Americans	-0.0110	1	1	1	1	1	1	1	1	1	1
People who are Asians	0.0022	2	2	2	2	2	2	2	2	3	2

Exhibit A-1

Averages of Decennial Census 2000 Variables by Overall Neighborhood Rating (continued)

Census Variables	Average by Neighborhood Rating										
	Correlation	1	2	3	4	5	6	7	8	9	10
Education											
People 25 years old or older who are high school dropouts	-0.1704	19	17	17	17	16	16	15	14	14	14
People 16 to 19 years old who are high school dropouts	-0.1273	16	15	15	15	14	13	13	12	11	11
People 16 to 19 years old who are in school	0.1217	72	72	73	73	73	74	75	76	77	77
People 25 years old or older with some college education or more	0.1205	38	40	41	41	41	42	44	45	46	45
People 25 years old or older without a high school diploma	-0.0825	12	11	11	10	10	10	9	9	9	9
People 25 years old or older with some college education	0.0309	19	20	20	20	20	20	21	21	21	20
People 25 years old or older with a high school diploma	-0.0062	31	32	32	32	32	32	32	32	32	32
Immigration											
People who are citizens	0.0708	93	93	93	93	94	94	94	94	95	95
People who are noncitizens	-0.0708	7	7	7	7	6	6	6	6	5	5
People who are natural-born citizens	0.0494	90	90	90	90	90	91	91	91	92	92
People who are foreign born	-0.0494	10	10	10	10	10	9	9	9	8	8
People who are foreign-born citizens	0.0011	3	3	3	3	3	3	3	3	3	3
Institutionalization											
Civilian uninstitutionalized people 5 years old or older who are disabled	-0.1259	25	24	24	24	24	23	23	22	22	22
People who are institutionalized	0.0072	2	2	2	2	2	2	2	2	2	2

Exhibit A-1

Averages of Decennial Census 2000 Variables by Overall Neighborhood Rating (continued)

Census Variables	Average by Neighborhood Rating										
	Correlation	1	2	3	4	5	6	7	8	9	10
Labor force						(percent)					
Civilian people 16 years old or older who are unemployed	-0.1620	6	5	5	5	5	5	5	4	4	4
Civilian people 16 years old or older in managerial, professional, and technical employment	0.1552	23	24	24	24	25	25	26	27	28	28
Males 16 years old or older who are not working at least part time more than 26 weeks	-0.0786	11	11	11	10	10	10	10	10	10	10
Civilian people 16 years old or older who are in the labor force	0.0470	60	61	61	61	61	62	62	62	63	62
Income						(percent)					
People with income twice or more the poverty level	0.1867	52	55	55	56	57	58	61	62	64	64
Households receiving public assistance income	-0.1798	7	7	7	6	6	6	5	5	4	4
People with income lower than the poverty level	-0.1780	24	22	21	21	20	19	18	17	16	16
Housing units without vehicles	-0.1720	20	18	17	17	16	15	14	13	12	12
Median household income	0.1500	29,658	30,878	31,330	31,541	32,044	32,879	34,119	35,083	36,446	36,390
Households with wage or salary income	0.0048	74	75	75	75	75	75	75	75	75	75
Housing costs						(percent)					
Median gross rent to median value of owner-occupied housing (capitalization rate)	-0.1106	0.68	0.67	0.66	0.66	0.65	0.64	0.62	0.61	0.59	0.59
Median value of owner-occupied housing units	0.0857	87,775	91,230	92,375	92,101	93,413	96,539	100,696	102,769	107,370	107,219
Median gross monthly rent	0.0506	508	521	522	522	522	530	538	540	548	542
Median monthly rent	0.0222	430	446	443	446	442	442	450	457	461	455

Exhibit A-1

Averages of Decennial Census 2000 Variables by Overall Neighborhood Rating (continued)

Census Variables	Average by Neighborhood Rating										
	Correlation	1	2	3	4	5	6	7	8	9	10
Housing market											
Housing units that are owner occupied	0.1780	49	50	51	51	53	54	55	57	60	61
Housing units (with heads 15 years old or older) that households moved into more than 5 years ago	0.1091	47	47	47	47	48	48	48	49	50	51
Housing units built since 1980	0.1052	21	22	22	22	22	22	24	25	27	27
Housing units built since 1970	0.0990	38	39	39	39	39	39	41	43	45	45
Housing units built before 1940	-0.0834	33	32	33	33	32	32	31	29	28	27
Housing units that are vacant	-0.0442	10	10	9	9	9	9	9	9	8	9
Housing units in single-family structures (1-4 units)	0.0385	73	74	74	74	74	75	75	75	76	76
Housing units that households moved into between 1995 and 1998	0.0383	21	22	22	22	22	22	23	23	23	23
Housing units without plumbing	-0.0319	1	1	1	1	1	1	1	1	1	1
Census tract matches		95	95	96	95	95	95	95	95	94	93

Note: The sample includes all survey respondents who provided neighborhood ratings and could match their data to census data at census tract level (n = 418,308).
Sources: Housing Choice Voucher Program Customer Satisfaction Survey, 2000, 2001, and 2002; 2000 Decennial Census

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