

The Effects of Using Census Block Groups Instead of Census Tracts When Examining Residential Housing Patterns

By John Iceland and Erika Steinmetz

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Residential housing patterns (often referred to as “residential segregation” in the technical literature) usually describe the distribution of different groups across units within a larger area. To examine the residential housing patterns of racial and ethnic groups, an appropriate area and its component parts or units of analysis must be chosen. As in previous work¹, this analysis focuses on metropolitan areas (MAs) as reasonable approximations of housing markets. The second geographic consideration-the smaller unit of analysis-also presents choices. Although census tracts are most often used, this analysis examines the effect of using census block groups, which are smaller than tracts.

Measuring Residential Housing Patterns

Residential housing patterns have been the subject of considerable research for many years. Massey and Denton identified 20 indexes of residential housing patterns (19 of which we discuss) and used cluster analysis to distinguish among five key dimensions: evenness, exposure, concentration, centralization, and clustering.² The dissimilarity, Gini, entropy, and Atkinson indexes are a part of the evenness dimension, which involves the differential distribution of the subject population. The interaction, isolation, and correlation indexes are listed under the exposure dimension, which measures potential contact. The delta, absolute concentration, and relative concentration indexes are classified under the centralization dimension, which indicates

¹ See John Iceland, Daniel H. Weinberg, and Erika Steinmetz. 2002. *Racial and Ethnic Residential Segregation in the United States: 1980-2000*. U.S. Census Bureau, Census Special Report, CENSR-3, Washington, DC: U.S. Government Printing Office.

² Massey, Douglas S. and Nancy A. Denton. 1988. "The Dimensions of Residential Segregation." *Social Forces* 67: 281-315.

the degree to which a group is located near the center of an urban area. Absolute clustering, spatial proximity, relative clustering, distance-decay interaction, and distance-decay isolation indexes belong to the clustering dimension, which measures the degree to which members of a group live disproportionately in contiguous areas.³

Areas and Units of Analysis

This analysis compares census tracts and block groups as the unit of analysis. Block groups are clusters of census blocks created by the Census Bureau as a geographic level between blocks and census tracts to permit the release of tabulated data that cannot be presented at the block level for confidentiality purposes. Block groups generally contain between 600 and 3,000 people and never cross the boundaries of states or counties; census tracts consist of one or more block groups. Census tracts, which typically have between 1,500 and 8,000 people, with an average size of about 4,000 people, are defined with local input, are intended to represent neighborhoods (they are designed to be relatively homogeneous with respect to population characteristics, economic status, and living conditions). They typically do not change much from census to census, except to subdivide due to population growth or to combine as a result of substantial population decline. Census 2000 was the first decennial census in which the entire United States was covered by census tracts. Census tracts are often chosen by other researchers in their analysis of residential housing patterns.⁴

³ For more information on the indexes of residential housing patterns, refer to: Iceland, Weinberg, and Steinmetz, (2002), Appendix B or Massey and Denton, (1988).

⁴ In addition to Iceland, Weinberg, and Steinmetz (2002), see, for example, Massey and Denton, (1988), Glaeser, Edward L. and Jacob Vigdor. 2001. "Racial Segregation in the 2000 Census: Promising News." Center on Urban and Metropolitan Policy, The Brookings Institution. <http://www.brook.edu/es/urban/census/glaeser.pdf>. Lewis Mumford Center. 2001. "Ethnic Diversity Grows, Neighborhood Integration Lags Behind." Report by the Lewis Mumford Center, April 3, 2001 (Revised December 18, 2001): <http://mumford1.dyndns.org/cen2000/WholePop/WPreport/MumfordReport.pdf>.

Metropolitan areas are officially defined by the Office of Management and Budget (OMB) as having a large population center (sometimes two or more) with a high degree of economic and social integration with adjacent communities. They must contain either a place with a minimum population of 50,000 or a Census Bureau-defined urbanized area and a total MA population of at least 100,000 (75,000 in New England).⁵

Defining Race and Hispanic Origin Groups

Measuring residential housing patterns requires choosing a reference group against which the housing patterns of other groups can be compared. We have chosen non-Hispanic Whites as the reference group—a common selection.⁶ For 2000 data, when individuals could report more than one race, we have chosen individuals who designated White *alone* as their racial classification, and did not choose Hispanic as their ethnicity. For each of the race/ethnicity analyses, we calculate the indexes using anyone who designated a racial or ethnic group *alone* or *in combination* with another group (or groups). We calculated indexes for African Americans, Hispanics, Asians and Pacific Islanders, and American Indians and Alaska Natives.⁷

Data

The data for this analysis were drawn from the Census 2000 Summary File 1 data giving population counts for all racial groups and for Hispanics by census tract as well as by block group for all MAs. There is no sampling error and conventional tests of significance do not

⁵ In this analysis, the nation's metropolitan areas (MAs) were based on Metropolitan Statistical Areas (MSAs) and Primary Metropolitan Statistical Areas (PMSAs) as defined by the Office of Management and Budget on June 30, 1999. Minor Civil Division-based MSAs and PMSAs were used in New England.

⁶ See Iceland, Weinberg, and Steinmetz (2002), and Massey and Denton (1988).

⁷ Asians and Pacific Islanders were combined into a single group in this analysis because of the very small number of Pacific Islanders in most metropolitan areas.

apply in this analysis because the base data are from the decennial census short form sent to all households.

Results

The housing pattern index scores produced in Table 1 are an average of index scores computed separately for American Indians and Alaska Natives, Asians and Pacific Islanders, Hispanics, and Blacks, for the 331 metropolitan areas in the US. The index scores are weighted by the group population with non-Hispanic Whites as the reference group. The weighted means for the four racial and ethnic groups we study produce measures that are moderately higher at the block-group level than at the tract level. A few indexes, mainly the absolute and relative centralization measures and the distance-decay interaction and the distance-decay isolation indexes, show little difference when calculated at the tract or block-group level. The absolute and relative concentration measures and the absolute clustering measure are also fairly similar. The relative clustering index, with no theoretical maximum or minimum (and a very large standard deviation), shows the largest difference between the two units of analysis.

(Table 1 here)

When indexes for each racial/ethnic group are examined separately, we tend to see similar patterns across groups in terms of the differences between tract and block group indexes (see Table 2). Most indexes have modestly higher housing pattern scores when measured at the block group level. Differences for all groups generally range from 0.00 to 0.06, with the exception of the relative clustering index, whose value for block groups is nearly twice the value for tracts.

The indexes that are most similar for all groups again include absolute and relative concentration, absolute and relative centralization, and distance decay interaction and isolation. For absolute clustering and spatial proximity, differences between block group and tract level indexes are greater for African Americans and American Indians and Alaska Natives than for Hispanics and Asians and Pacific Islanders.

(Table 2 here)

The weighted mean index scores for Blacks or African Americans, Hispanics or Latinos, and Asians and Pacific Islanders for the 58 largest MAs⁸ showed similar results (see Table 3). The difference in scores between tracts and block-groups was even smaller. Twelve of the 19 indexes have higher housing pattern scores at the block-group level than at the tract level with differences ranging from 0.00 to 0.03 with the exception of the relative centralization index having a difference of about 0.67.

(Table 3 here)

Conclusion

The residential housing pattern index scores are modestly higher when calculated for block groups than for tracts. These patterns hold for all racial/ethnic groups and most indexes, though there are some concentration, centralization, and clustering indexes where there are virtually no differences. The index most different is relative clustering. Differences are slightly smaller when examining the largest metropolitan areas, whose larger populations may make calculations less subject to random variations in residential patterns. The implication of higher evenness and exposure scores in particular is that, as might be expected, smaller units of analysis (block groups) tend to be modestly more homogeneous than larger ones (census tracts).

⁸ The 58 largest MAs have total populations of 1,090,000 or more.

Table 1. Medians and Weighted Means for Residential Housing Pattern Indexes for Metropolitan Areas, by Unit of Analysis: 2000

	Block-Group (2000)					Tract (2000)				
	Median	Weighted Mean	Weighted Standard Deviation	Minimum	Maximum	Median	Weighted Mean	Weighted Standard Deviation	Minimum	Maximum
Evenness Measures										
Dissimilarity (D)	0.569	0.568	0.138	0.139	0.861	0.536	0.541	0.143	0.105	0.846
Gini (G)	0.729	0.714	0.138	0.199	0.954	0.692	0.683	0.149	0.148	0.944
Entropy (H)	0.326	0.343	0.163	0.016	0.726	0.297	0.315	0.162	0.006	0.698
Atkinson with b=.1 (A1)	0.104	0.121	0.064	0.007	0.330	0.090	0.104	0.057	0.004	0.260
Atkinson with b=.5 (A5)	0.447	0.466	0.184	0.033	0.858	0.406	0.428	0.187	0.018	0.834
Atkinson with b=.9 (A9)	0.690	0.673	0.202	0.060	0.978	0.636	0.629	0.215	0.031	0.968
Exposure Measures										
Interaction (Pxy)	0.425	0.466	0.227	0.048	0.994	0.454	0.485	0.229	0.048	0.996
Isolation (Pxx)	0.575	0.534	0.227	0.006	0.952	0.546	0.515	0.229	0.004	0.952
Correlation ratio (V)	0.356	0.367	0.191	0.002	0.769	0.324	0.339	0.190	0.001	0.750
Concentration Measures										
Delta (DEL)	0.802	0.791	0.080	0.357	0.969	0.779	0.769	0.084	0.345	0.966
Absolute concentration (ACO)	0.899	0.830	0.166	0.105	0.991	0.893	0.834	0.164	0.143	1.756
Relative concentration (RCO)	0.657	0.538	0.391	-7.046	0.931	0.647	0.549	0.441	-13.102	0.934
Centralization Measures										
Absolute centralization (ACE)	0.727	0.700	0.167	-0.381	0.972	0.724	0.699	0.162	-0.476	0.962
Relative centralization (RCE)	0.241	0.234	0.187	-0.379	0.708	0.243	0.234	0.185	-0.361	0.698
Clustering Measures										
Absolute clustering (ACL)	0.288	0.313	0.286	-0.196	4.532	0.290	0.296	0.200	-0.668	0.895
Spatial Proximity (SP)	1.252	1.288	0.212	1.001	2.083	1.225	1.263	0.190	1.001	2.497
Relative clustering (RCL)	0.829	1.481	1.686	-0.373	27.312	0.425	0.826	1.260	-0.643	26.229
Distance decay interaction (DPxy)	0.525	0.548	0.221	0.048	0.996	0.525	0.549	0.221	0.048	0.997
Distance decay isolation (DPxx)	0.475	0.452	0.221	0.004	0.952	0.475	0.451	0.221	0.003	0.952

Note: All calculations use Census 2000 data. MSA/PMSAs defined as of 6/30/99. MSA/PMSAs are weighted by the minority group population. Residential housing pattern estimates were calculated for African Americans, Hispanics, Asians and Pacific Islanders, and American Indians and Alaska Natives and are weighted by the size of the group population. The reference group is non-Hispanic Whites.

Source: U.S. Census Bureau, Census 2000 Summary File 1.

Table 2. Weighted Means for Residential Housing Pattern Indexes for Metropolitan Areas, by Race and Unit of Analysis: 2000

	African American indexes		Hispanic indexes		Asian and Pacific Islander indexes		Amer Indian and Alaska Native indexes	
	Block-Group	Tract	Block-Group	Tract	Block-Group	Tract	Block-Group	Tract
Evenness Measures								
Dissimilarity (D)	0.669	0.640	0.534	0.509	0.436	0.411	0.373	0.333
Gini (G)	0.816	0.787	0.679	0.650	0.582	0.550	0.506	0.450
Entropy (H)	0.468	0.434	0.295	0.270	0.185	0.165	0.134	0.111
Atkinson with b=.1 (A1)	0.173	0.148	0.093	0.084	0.070	0.058	0.068	0.041
Atkinson with b=.5 (A5)	0.613	0.570	0.405	0.372	0.292	0.258	0.248	0.198
Atkinson with b=.9 (A9)	0.829	0.789	0.618	0.575	0.464	0.418	0.411	0.346
Exposure Measures								
Interaction (Pxy)	0.384	0.409	0.432	0.448	0.679	0.694	0.884	0.897
Isolation (Pxx)	0.616	0.591	0.568	0.552	0.321	0.306	0.116	0.103
Correlation ratio (V)	0.501	0.468	0.329	0.303	0.176	0.158	0.085	0.071
Concentration Measures								
Delta (DEL)	0.812	0.793	0.786	0.764	0.766	0.743	0.715	0.676
Absolute concentration (ACO)	0.880	0.881	0.758	0.768	0.880	0.876	0.900	0.882
Relative concentration (RCO)	0.646	0.658	0.485	0.494	0.567	0.588	-0.217	-0.261
Centralization Measures								
Absolute centralization (ACE)	0.723	0.722	0.691	0.689	0.683	0.683	0.621	0.611
Relative centralization (RCE)	0.290	0.290	0.205	0.204	0.203	0.202	0.064	0.067
Clustering Measures								
Absolute clustering (ACL)	0.402	0.360	0.321	0.318	0.116	0.116	0.048	0.061
Spatial Proximity (SP)	1.430	1.374	1.240	1.232	1.096	1.096	1.057	1.077
Relative clustering (RCL)	2.230	1.192	1.037	0.573	0.818	0.454	0.938	1.206
Distance decay interaction (DPxy)	0.497	0.499	0.496	0.498	0.736	0.736	0.922	0.923
Distance decay isolation (DPxx)	0.503	0.501	0.504	0.502	0.264	0.264	0.078	0.077

Note: All calculations use Census 2000 data. MSA/PMSAs defined as of 6/30/99. Residential housing pattern estimates are weighted by the size of the group population. The reference group is non-Hispanic Whites.

Source: U.S. Census Bureau, Census 2000 Summary File 1.

Table 3. Weighted Means for Residential Housing Pattern Indexes for the 58 Largest Metropolitan Areas, by Unit of Analysis: 2000

	Block-Group	Tract
Evenness Measures		
Dissimilarity (D)	0.599	0.576
Gini (G)	0.745	0.721
Entropy (H)	0.379	0.354
Atkinson with b=.1 (A1)	0.132	0.116
Atkinson with b=.5 (A5)	0.505	0.472
Atkinson with b=.9 (A9)	0.716	0.682
Exposure Measures		
Interaction (Pxy)	0.427	0.445
Isolation (Pxx)	0.573	0.555
Correlation ratio (V)	0.413	0.388
Concentration Measures		
Delta (DEL)	0.799	0.783
Absolute concentration (ACO)	0.854	0.857
Relative concentration (RCO)	0.620	0.639
Centralization Measures		
Absolute centralization (ACE)	0.725	0.730
Relative centralization (RCE)	0.264	0.263
Clustering Measures		
Absolute clustering (ACL)	0.356	0.340
Spatial Proximity (SP)	1.336	1.309
Relative clustering (RCL)	1.674	1.007
Distance decay interaction (DPxy)	0.517	0.517
Distance decay isolation (DPxx)	0.483	0.483

Note: All calculations use Census 2000 data. MSA/PMSAs defined as of 6/30/99. The 58 largest MSAs have total populations of 1,090,000 or more. Residential housing pattern estimates were calculated for African Americans, Hispanics, and Asians and Pacific Islanders, and are weighted by the size of the group population. The reference group is non-Hispanic Whites.

Source: U.S. Census Bureau, Census 2000 Summary File 1.