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Quantifying Separate and Unequal: Racial-Ethnic Distributions of Neighborhood Poverty in Metropolitan America

Theresa L. Osypuk, SD SM [Assistant Professor]¹, Sandro Galea, MD DrPH [Professor]², Nancy McArdle, MPP [Research Analyst]³, and Dolores Acevedo-Garcia, PhD, MPA-URP [Associate Professor]⁴

¹ Robert Wood Johnson Foundation Health & Society Scholar; The University of Michigan; 1214 South University, 2nd Floor; Ann Arbor, MI 48104.

² Department of Epidemiology; University of Michigan School of Public Health; Ann Arbor, MI.

³ Department of Society, Human Development, & Health; Harvard School of Public Health; Boston, MA.

⁴ Department of Society of Society, Human Development, & Health; Harvard School of Public Health; Boston, MA.

Abstract

Researchers measuring racial inequality of neighborhood environment across metropolitan areas (MAs) have traditionally employed segregation measures, yet such measures are limited for incorporating a third axis of information, including neighborhood opportunity. Using Census 2000 tract-level data for the largest U.S. MAs, we introduce the interquartile-range overlap statistic to summarize the substantial separation of entire distributions of neighborhood environments between racial groups. We find neighborhood poverty distributions for minorities overlap only 27% with those for whites. Further, the separation of racial groups into neighborhoods of differing poverty rates is strongly correlated with racial residential segregation. The overlap statistic provides a straightforward, policy-relevant metric for monitoring progress towards achieving more equal environments of neighborhood opportunity space.

Keywords

Concentrated poverty; Neighborhood; Neighborhood poverty; Race/ethnicity; Racial inequality; Geography of opportunity; Residential segregation

Congress passed the Housing Act of 1949 (1949) declaring the “goal of a decent home and a suitable living environment for every American family”. However this goal has still not been attained. As a result of racial segregation, class segregation, and urban sprawl, American metropolitan areas exhibit an uneven “geography of opportunity” (Briggs 2005; Galster and Killen 1995; Ihlanfeldt 1999; Pastor 2001), i.e. patterns of racial/ethnic inequality within metropolitan areas that affect access to opportunity neighborhoods. This unequal geography is concerning because individuals' place of residence influences their opportunities and life outcomes.

Please address correspondence to Theresa L. Osypuk, Northeastern University, Bouvé College of Health Sciences, 360 Huntington Avenue, 316 Robinson, Boston, MA 02115; e-mail: tosypuk@neu.edu.
Current contact information: Northeastern University, Bouvé College of Health Sciences, 360 Huntington Avenue, 316 Robinson, Boston, MA 02115, ph: 617-373-3667, fax 617-373-2968, tosypuk@neu.edu

Equality of individual opportunity derives from the larger opportunity structure, within which individuals interact. Galster and Killen (1995: 9) define ‘the opportunity structure’ as “the panoply of markets, institutions, and systems that act on and convert personal attributes into outputs affecting social advancement”. For instance, the metropolitan opportunity structure affecting youth includes housing, mortgage, and labor markets; local political, criminal justice, social service delivery, and educational systems; and local social networks (Galster and Killen 1995). Opportunity is envisioned as an input for well-being and social advancement— that all populations should have access to communities with good schools, public services, and economic prospects (Briggs 2005). Although the conventional notion of equal opportunity overlooks the geographic dimensions (Galster and Killen 1995), the reality is that these goods – for example in employment and education (Cutler and Glaeser 1997) – are patterned spatially within metropolitan America (Pastor 2001).

Racial segregation is one important contributor to this unequal geography of opportunity. The spatial separation of populations along racial/ethnic lines, and to a lesser extent along economic lines, is a key feature of the social organization of US urban areas (Massey 2001). Racial residential segregation remains high in the US, especially for blacks versus whites, although Hispanics and Asians also experience moderate segregation from whites (Iceland, Weinberg, et al. 2002). Decades of federal, state, and local housing policies and decisions have contributed to racial residential segregation and concentration of poverty by funding urban renewal and slumclearance programs that displaced stable, minority neighborhoods, by siting public housing in impoverished areas, by subsidizing suburban development at the outskirts of population centers, and by enacting exclusionary housing ordinances (Briggs 1997; Galster 1988). Other factors have contributed to racial residential segregation (Acevedo-Garcia, Lochner, et al. 2003; Galster 1988) including housing discrimination that minorities encounter when attempting to rent, purchase, or finance housing (Turner, Ross, et al. 2002; Yinger 1995); the preferences of each group to live in certain types of neighborhoods (Clark 1986) (including white avoidance of black neighborhoods and black avoidance of all-white neighborhoods in anticipation of racial hostility (Yinger 1995)); and the lower socioeconomic status and housing affordability among minorities compared to whites (and therefore economic segregation) (Clark 1986; Galster 1988). One important consequence of residential segregation is the concentration of poverty among minorities, or the pattern that impoverished blacks are likely to live in high-poverty neighborhoods (Fischer 2003; Massey 2001; Massey and Fischer 2000). The costs of such unequal geographies of opportunity are high. For example, the literature on neighborhood effects is documenting that growing up or living in a high-poverty neighborhood may negatively influence social, economic, and/or health outcomes (Brooks-Gunn, Duncan, et al. 1997; Ellen and Turner 1997; Kawachi and Berkman 2003; National Research Council 2002; Orr, Feins, et al. 2003).¹

Although a vast body of work has documented the patterns of racial segregation and concentrated poverty in U.S. metropolitan areas, it may enhance policy relevance to operationalize the extent of racial/ethnic inequality in a way that permits regular monitoring of access to opportunity neighborhoods. The aim of this paper is to provide a straightforward operationalization of the geography of opportunity that would allow quantifying the actual range of neighborhood environments available to different racial/ethnic groups, as well as quantifying how separate and unequal this range is between racial/ethnic groups. Examining differences across metro areas is a first step toward identifying factors associated with a more equal or unequal geography of opportunity, including policies that could potentially reduce inequality. The extent to which the range of neighborhoods for different racial/ethnic groups

¹Although the strongest evidence that poor neighborhoods adversely affect health outcomes derives from the Moving to Opportunity (MTO) experiment, much neighborhood-health evidence is limited for deducing causation to internal validity threats. Notably, MTO found null effects for employment and earnings (Orr, Feins, et al. 2003).

may be vastly different within and across metropolitan areas may provide stronger support for an argument of separate and unequal opportunity spaces.

The average, the tail, and the distribution of neighborhood opportunity

The geography of opportunity is often indicated by residential racial or class segregation statistics (Briggs 2005). Segregation indices (e.g. (Iceland, Weinberg, et al. 2002)) provide a useful and straightforward metric for understanding the extent to which people of different groups share the same neighborhoods, as well as the spatial nature of this separation within the metropolitan area. However the method of calculating segregation indices is limited for incorporating inequality across a third axis of information like neighborhood quality.^{2,3} Other methods have been employed for describing neighborhood quality by racial group, such as calculations of means, or of proportions of those above a certain threshold of neighborhood poverty (the tail of the distribution). However, as we will argue, these methods may be more limited for illustrating the degree to which neighborhood quality differs between racial groups, compared to a method that incorporates information on the entire distribution of neighborhood quality.

The Mean

Prior work has documented that *on average* neighborhood environment is worse for minorities vs. whites. For example, the exposure measure has been employed by demographers to denote the average neighborhood environment of a certain group (Logan 2002; Massey and Fischer 2000). The exposure measure has several strengths, including avoiding arbitrary definition of poor and non-poor neighborhoods, using all information on a group's distribution across income categories and neighborhoods, and summarizing the mean neighborhood poverty rate for any subgroup of interest (e.g. using Lieberman's P* isolation index to estimate the % poverty neighborhood of the typical poor person) (Massey and Fischer 2000). However, its utility for summarizing differential neighborhood opportunity for different groups relies on the extent to which the mean in the metropolitan area represents the distribution of neighborhood poverty for different groups. This critique is not something unique to exposure measures, but to any statistic of central tendency.

According to classic statistics, the mean is a primary order statistic of a distribution: its location. The mean has several attractive properties for probability theory, which relates to why it is so frequently employed. The variance is a second-order statistic; it improves the description of the distribution when used in conjunction with the mean (Rosner 2000). If a distribution displays a wide degree of dispersion, the mean on its own may be less informative for summarizing the distribution, compared to a distribution with narrow dispersion. Indeed, there is some emerging evidence that the variance in outcomes is substantially broader for minorities, and narrower for whites (Acevedo-Garcia, Osypuk, et al. 2003; Osypuk, Kawachi, et al. 2006). Given this evidence, a measure of central tendency (like the exposure measure) might be a more accurate or appropriate measure of neighborhood context for whites than for minorities.

Aside from how well the mean represents two distributions with different variances, the variance is informative for the comparison of two groups. Often the variance is used only insofar as it informs comparisons of the mean, e.g. for calculating the standard error of the mean, or for ensuring assumptions are not violated with methods based on the mean (e.g.

²Virtually all studies of economic segregation examine it stratified by race/ethnicity, and racial segregation is often calculated within SES groups (Hanson 2000). Calculating segregation indices for subsets of the population masks important patterns since a good deal of the population is omitted from or ignored in the analysis (St. John and Clymer 2000).

³Although neighborhood poverty reflects economic segregation, our intention here is to operationalize neighborhood quality.

homoskedasticity in regression analyses). However, the variance can also be used to tell whether the distributions themselves are similar or different, in terms of how well two distributions can be distinguished or discriminated from each other. For many continuous exposures of interest, even if the means differ, the distributions of two groups will completely overlap on the exposure – it's just that the distribution of the exposure is shifted slightly worse in one group compared to the other. Therefore, although the *average* exposure is worse for one group, the prediction utility of the exposure value for discriminating between two groups is limited by this large amount of overlap. Conversely, if the two means not only differ, but also the majority of the observations for each group fall on either side of a division, then two distributions are substantially separate, and this allows the two groups to be well discriminated by the exposure factor. Sociologically, this separation of distributions may provide more compelling evidence of separate contexts than would a comparison of means.

Extending this argument to neighborhood environments, although the exposure measure illustrates that on average two groups differ on a neighborhood characteristic, it does not incorporate the variance that would help illustrate to what extent a person's location in the distribution on the neighborhood characteristic would discriminate or differentiate between two groups. Indeed, the exposure measure has been critiqued for its utility as a measure of segregation because it does not incorporate dispersion (James and Taeuber 1985). If the distributions of two racial/ethnic groups substantially overlap with respect to their neighborhood environment, then a comparison of means is a poor indicator of unequal neighborhood environments, since many people of both racial groups live in the same type of neighborhood. The substantive separation of the distribution of neighborhood quality by race/ethnicity would illustrate not only that average context differs (as the exposure statistic provides), but that the two groups experience a vastly unequal context across the range of neighborhoods (which is something a mean cannot provide without dispersion). Therefore, for a continuous measure of neighborhood quality, a measure of distribution dispersion in conjunction with the mean would help us understand to what extent *entire populations* of minorities and whites live in same or different types of neighborhoods in the metropolitan area, and whether they live in comparable types of neighborhoods (opportunity neighborhoods), more than a mean alone would. However, with few exceptions (Jargowsky 1997; Massey and Fischer 2000), limited work has analyzed the variance of neighborhood environments across metropolitan areas as of substantive interest.⁴

The Tail

Aside from using a mean to evaluate the racial inequality in neighborhood poverty, other researchers have used proportions, by creating cutoffs of 20%, 30%, or 40% (Galster, Quercia, et al. 2003; Jargowsky 1997; Kingsley and Pettit 2003) of those in poverty to estimate the proportion of a group living in high poverty neighborhoods – in other words, those in the tail of the neighborhood poverty distribution.⁵ There may be several disadvantages to using thresholds to identify high poverty neighborhoods. For example, any cutoff is arbitrary (Massey and Fischer 2000), since the distribution of neighborhood poverty is continuous and unimodal, not bimodal with “low poverty” and “high poverty” thresholds clearly defined (Jargowsky 1997). Additionally, implicit in the category created by a universally-applied cutoff (e.g. like 20% neighborhood poverty) is that it signifies the same construct of a disadvantaged neighborhood, regardless of the metro area, and regardless of the mean or distribution of

⁴Massey and Fischer (2000) do discuss variance, but as a methodological nuisance, and their focus is concentrated poverty, not neighborhood poverty.

⁵Still other researchers have identified deprived neighborhoods relative to the MA mean – e.g. (Booza, Cutsinger, et al. 2006), which allows controlling for extraneous factors that vary between MAs that may confound the estimation of poverty, e.g. cost of living. One drawback may be that every area will include some tracts that are defined as deprived, regardless of absolute conditions. Although in a prior draft we explored relative measures, the variation across metro areas was compelling.

neighborhood poverty for any given metropolitan area. Some research does suggest a threshold of high poverty neighborhoods with certain social outcomes (Galster 2002; Jargowsky 1997). If threshold effects exist, then using that cutpoint could strengthen one's analysis. However, there are many possible effects of neighborhood poverty on different outcomes, which may have different thresholds. Therefore identifying one cutoff for one threshold may be too restrictive.

Additionally, some have criticized that too much social science attention has focused on the poor and poor neighborhoods, omitting focus on the affluent (Massey 1996). For example, affluent neighborhoods may be more predictive of children's developmental outcomes than impoverished neighborhoods (Brooks-Gunn, Duncan, et al. 1997). Yet even then, a focus on the tail does not illuminate the range of opportunity to which most people are exposed. Moreover, rich and poor neighborhoods inhabit the two ends of the neighborhood economic distribution. Our focus on the range of neighborhoods in terms of the universe of existing opportunity space is meant to direct attention not only to minorities who disproportionately inhabit high-poverty neighborhoods, but also to whites who disproportionately inhabit low-poverty ones: two sides of a coin, that are not adequately measured by focusing on either tail alone. Additionally, we direct attention to the central 50% of the neighborhood poverty distributions to operationalize the opportunity space of populations, while many past studies have focused on the ends of the distributions.

Employing either the mean or a proportion of neighborhood poverty may be more limited than focusing on the distribution for policy or intervention purposes. For example, since exposure measures produce an “average” neighborhood as the summary statistic, such a neighborhood may not actually exist. Therefore, this precludes identifying, mapping, studying in detail, or intervening on such neighborhoods, whereas such processes can be done with threshold measures, or with frequency-based distributional methods, since each neighborhood is classified clearly in the data (Jargowsky 1997). However, even if such neighborhoods are identified with threshold measures, this essentially isolates the high-risk tail of the distribution from the rest of the distribution, which may affect intervention efficacy. Geoffrey Rose theorizes that more effective prevention of adverse outcomes may be achieved by intervening on the entire population (a population-based approach), than intervening on only the high-risk tail of a distribution (Rose 1985). With a population-based approach, the goal is to shift the entire distribution in the better direction, which includes the tail. If we apply this reasoning to neighborhoods, intervening only on the neighborhoods in the high-risk tail of the distribution to address adverse environments there affecting other social outcomes may be limited since the structural causes of neighborhood poverty as a whole are not affected. Interventions to reduce or prevent the effects of high poverty neighborhoods may be more effective if they affect the entire distribution of neighborhood poverty, for example by affecting regional factors like economic conditions, income inequality, availability of rental housing in suburban areas, or housing discrimination (Galster, Quercia, et al. 2003; Massey 2001), instead of intervening on high poverty neighborhoods only (e.g. neighborhood revitalization interventions).

The Distribution and Distribution Overlap

We sought to overcome some of the limitations of means and proportions for characterizing racial inequality in neighborhood environments. In this manuscript, two of our objectives were to characterize the *distribution* of neighborhood poverty within metropolitan areas, and to characterize the *racial disparities in these distributions*. We sought to do this within the framework of the geography of opportunity (Briggs 2005; Galster and Killen 1995; Ihlanfeldt 1999; Pastor 2001). To determine the opportunity space for individuals, instead of focusing on the mean or the high risk tail of high-poverty neighborhoods, we focus on the central 50% of the distribution of neighborhood poverty for each racial group within each metropolitan area.

We therefore define the opportunity space for a given racial/ethnic group as the interquartile range (IQR) of the neighborhood poverty distribution for that group, i.e. actual neighborhood environments where the central half of the population of that group lives. The values of the lower and upper bound of the IQR are the 25th and 75th percentiles of the distribution, and the *difference* between the upper and lower bounds of the IQR is a measure of the spread for the middle 50% of the distribution. For example, if for a given metro the opportunity space (IQR) for whites is given by neighborhoods with poverty rates between 3% and 7%, this would mean that half of the white population of that metro area lives in a neighborhood where between 3% and 7% of households live in poverty. Additionally, 25% of the white population lives in neighborhoods with poverty rates lower than 3%, and another 25% of whites live in neighborhoods with poverty rates higher than 7%. While many measures of dispersion exist (standard deviation, variance, coefficient of variation, IQR), we chose the IQR to characterize dispersion because it uses percentiles for its definition, and is therefore invariant to the absolute size of the median or mean. Moreover, it focuses on the middle of the distribution, aligning conceptually with our notion of an opportunity space.

After defining this opportunity space for each racial group, we then *compare* the opportunity space available to different racial/ethnic groups to see whether two groups share the opportunity space, by comparing whether and by how much the IQR for two groups overlaps. We call this number the IQR Overlap Statistic (IQR-OS), and it is calculated by subtracting the upper (third) quartile for one group from the lower (first) quartile for another group. (See Figure 1). For example, if in the metro area we used as an example above, Hispanics had an opportunity space (IQR) of neighborhood poverty from 9% to 20%, the IQR-OS would be given by the difference between the third quartile for whites (7%) and the first quartile for Hispanics (9%), or $7 - 9 = -2$. A negative value of the statistic denotes that the neighborhood opportunity spaces for the two groups do not overlap – less than 25% of each distribution overlaps the distribution of the other group. In other words, there is some overlap among the neighborhoods with the highest poverty rates for whites and among the lowest poverty rates for Hispanics, but the middle part (opportunity space) of the distributions for whites and Hispanics do not overlap at all.

Objectives and Summary

In this manuscript, we pursue three main objectives: (1) To characterize the neighborhood opportunity space for various racial/ethnic groups by using a measure that captures both the values of the central 50% of the distribution and distributional spread; (2) To quantify the degree of separateness of race/ethnic specific neighborhood poverty distributions and neighborhood opportunity spaces in the largest 100 metro areas; (3) To assess the association between the extent of separateness in racial/ethnic neighborhood poverty distributions and other metropolitan area factors such as residential segregation. To carry out these objectives, we introduce the interquartile range overlap statistic (IQR-OS), a measure of distributional overlap to characterize the degree of separateness (i.e. overlap) of two groups' distributions on a continuous measure of neighborhood poverty.

As hypothesized, our analysis finds considerably worse neighborhood opportunity space (IQR) for blacks and Hispanics, compared to whites. There is also substantial separation, or non-overlap, of neighborhood poverty distributions (on the IQR-OS) between whites and minorities. We find that on average, only 27% of the worst tail of the white distribution of neighborhood poverty overlaps the other 73% of the minority distributions of neighborhood poverty. We find considerably larger dispersion (over 2.5 times larger) in neighborhood poverty among minorities, than among whites, indicating that statistics relying on the mean may be more informative or meaningful for whites. We lastly find that in highly segregated metro areas, there is less racial overlap in the distributions of neighborhood poverty, both before and after adjusting for other measures of metropolitan context. The IQR-OS and segregation

are strongly correlated, providing evidence of *why* racial residential segregation matters – the vastly worse neighborhood quality environments within which minorities reside compared to whites in US metropolitan areas.

METHODS

Data

We used Census 2000 tract-level data from the Summary Files 1 and 3, packaged in the Neighborhood Change Database (NCDB) (Geolytics 2003). In this analysis, we used census tracts as the lower unit of analysis as a proxy for neighborhoods. To pursue a nation-wide study of neighborhoods, we needed to apply a criterion for data that is readily available; we therefore defined neighborhoods as census tracts in agreement with prior literature on residential segregation and poverty concentration (Jargowsky 1997; Jargowsky 2003; Massey and Denton 1988). Also in line with prior work, we examined neighborhoods within metropolitan statistical areas (MAs) and Primary MAs, since they approximate housing and labor markets (Jargowsky 2003), and we restricted our analysis to the largest 100 metropolitan areas (Booza, Cutsinger, et al. 2006; Kingsley and Pettit 2003). We excluded tracts with zero population (215 tracts), and tracts with less than 500 population (458 tracts, 1.2% tracts, 0.6% of population).

Variables and Measures

Neighborhood Poverty—We operationalized neighborhood opportunity by a deprivation measure – the proportion of people in the tract below the official poverty line in 1999, or % poverty, or alternately, the *neighborhood poverty rate*.⁶ This variable was derived by Geolytics from Census 2000 SF-3 Table 87. Although neighborhood poverty captures only one aspect of the multidimensional concept of neighborhood deprivation and is thus just one possible proxy for neighborhood disadvantage, we employed it here because it is straightforward and therefore easy to interpret, is often employed by others, and prior literature has demonstrated how neighborhood poverty is associated with a range of detrimental outcomes (Ellen and Turner 1997).

Race/Ethnicity—To examine race-specific neighborhood poverty distributions, we applied 4 different weights to the tract-level measure of proportion of population in poverty, based on the tract-level counts of the total population, and of each racial/ethnic group, to calculate measures of central tendency and distribution. The total tract population was derived from SF-1 Table P1, and the tract racial/ethnic counts were derived from SF-1 Table P4, for the largest three racial/ethnic groups in the US: Non-Hispanic (NH) whites alone, Non-Hispanic blacks alone, and Hispanics (of any race). In this manuscript, white refers to NH white, and black to NH black. We did not analyze Asians or Native Americans because of their small and unbalanced population sizes across MAs.

Exposure indices—First, we calculated an exposure index of the mean neighborhood poverty rate in which the average person of each racial group resides in each metropolitan area. Exposure measures have been employed by demographers to measure segregation (exposure of one racial group to another, the interaction index) (Massey and Denton 1988). Additionally, exposure measures have been applied to measure one group's exposure to a neighborhood characteristic (e.g. a neighborhood condition exposure index) (Galster and Mikelsons 1995; Logan 2002; Massey and Fischer 2000). The formula, as shown in Equation 1, is calculated as a weighted average of the neighborhood poverty for each group in each metro area. It is

⁶Our term “neighborhood poverty rate” should not be confused with the term employed by Jargowsky (1997), which was a MA-level measure for the % total population residing in tracts >40% poverty (p.20). Our term coincides with Jargowsky's term “poverty rate” (p. 9).

interpreted as the neighborhood poverty rate experienced by the average member of a given racial/ethnic group.

Neighborhood Condition Exposure Index.

$$bE_c = \sum_{i=1}^n \left[\left(\frac{b_i}{B} \right) (C_i) \right]$$

where i =tract; b_i =number of a certain group (e.g. blacks) in tract i ; B = Total population of a certain group (e.g. blacks) in the metropolitan area, or the sum of all b_i ; C_i =a tract-level summary measure (proportion, mean, median, etc.), e.g. % poor. (Galster & Mikelsons 1995)

We built upon the exposure mean as a statistic of central tendency to provide also statistics of distribution spread. We calculated exposures for quartiles of the neighborhood poverty distribution for the entire population and for each racial group. The IQR of neighborhood poverty is the central 50% of the distribution of neighborhood poverty located between the 1st and 3rd quartile.

IQR-Overlap Statistic—Derived from the race-specific exposure measures above, we developed a measure of overlap between the white and minority 50% of the distributions of neighborhood poverty in each MA, which we call the Interquartile Range Overlap Statistic (IQR-OS). We subtracted the minority 1st quartile from the white 3rd quartile to determine the amount of IQR overlap between two MA race-specific distributions of neighborhood poverty.⁷ Negative values for this statistic denote that the white and minority IQRs of neighborhood poverty within an MA *do not* overlap (or, less than 25% of each distribution overlaps the other). Positive values denote that the white and minority IQRs *do* overlap (e.g. more than 25% of each distribution overlaps the other).⁸ The interpretation of a zero IQR overlap statistic value is that 25% of each distribution overlaps the other, or in other words, 75% of the minority population lives in neighborhoods with higher poverty rates than 75% of the whites in that MA. Notably, the value of zero is not neutral. The absolute value of the IQR-OS indicates the number of percentage points of IQR (non)overlap on the % neighborhood poverty scale, or the number of points by which the minority 1st quartile was separated from the white 3rd quartile. See Figure 1 for a heuristic of three different (hypothetical) MAs with three different racial IQR overlap statistics for neighborhood poverty.

Distributional Overlap measure—We calculated a secondary measure of the extent of overlap of two racial/ethnic neighborhood poverty distributions that is nonparametric and frequency-based.⁹ Using the percentiles of the race-specific neighborhood poverty distributions, we determined the point in the two distributions where the proportion of the sample of each group was balanced on either side. This is the point in the distribution where the % of the white sample in the high-poverty (right) tail equaled the % of the minority sample in the low-poverty (left) tail.^{10,11} The theoretical range of this statistic is 0-50%, where zero indicates no overlap, and 50 indicates complete overlap.

⁷The determination of which group to use for the 3rd and 1st quartiles for calculating the IQR-OS is determined by comparing medians and by which variable direction is “good”. Since low values are good, and the median for whites is better than minorities, the 3rd quartile is used from the white distribution and the 1st quartile from the minority distribution.

⁸An assumption for this method is that the minority distribution is shifted worse than the white distribution; the assumption holds for our analysis.

⁹This measure of overlap is secondary to the IQR-OS for our analyses, since the IQR-OS is a more appropriate indicator for comparing the opportunity space of the central half of the populations for racial groups.

¹⁰As with the IQR-OS, the order of the two racial distributions matters for calculation of the distributional overlap measure.

¹¹Note that this distributional overlap measure does not indicate the amount of overlap occurring in the joint distribution of neighborhood poverty for the two groups. Our measure calculates the percent of overlap occurring in each distribution compared to the other.

Analytic Methods

Correlation and Regression Analyses—We focus our bivariate and multivariate analyses on the IQR-OS measure given the focus of the paper on the opportunity space for the central 50 percent of the populations. Using SAS 8.1, we first calculated spearman correlations between the minority-white neighborhood poverty IQR overlap statistic, and other MA race-specific variables. We then executed a multiple linear regression with IQR-OS regressed on metropolitan racial residential segregation and demographic variables, stratified by race/ethnic group (Black-White IQR-OS, or Hispanic-White IQR-OS), and examined the two segregation measures in separate models. We selected our independent variables following Logan's analysis of metropolitan inequality and residential segregation (Logan, Stults, et al. 2004), and tested racial residential segregation (dissimilarity and isolation), the size and growth of each minority group, group income and poverty levels, nativity, minority suburbanization, age of housing stock, and regional differences. Specific variables and coding are detailed in Table 4. (Measures derived from Census 2000 data (Lewis Mumford Center 2001)).

Graphing—Using R Software 2.3.1, we graphed our results with boxplots and density line graphs. One set of boxplots depicts two levels of distributions in parallel boxplot graphs: the distribution of neighborhoods within metro areas, and the distribution of metro areas within the US. The boxplot methods used the 1st and 3rd quartiles of race-specific metropolitan distributions of neighborhood poverty for the top and bottom lines of each box. The median of neighborhood poverty for each MA was marked by a heavy line in the center of the box. The boxplots were ordered each time by the median MA neighborhood poverty rate for each group. We also graphed parallel boxplots depicting two racial groups simultaneously within each MA, to display the degree of racial IQR overlap within MAs. These graphs were ranked by the MA IQR-OS. We drew a dotted line at 20% neighborhood poverty as an anchor for comparisons across graphs to denote one threshold for high neighborhood poverty (Galster 2002; Galster, Quercia, et al. 2003). We graphed density curves to depict the continuous distributions of the population across neighborhood poverty for the entire population by race; density curves may be conceptualized as smoothed histograms (Rosner 2000).

RESULTS

Our final sample size was $n=38,855$ tracts in 100 MAs, which housed over 173 million population. Table 1 displays the average neighborhood poverty environment for each racial group, based on the exposure measure. The average American in the largest 100 MAs lives in a neighborhood that is 11.8% poor based on the mean, or 7.8% poor based on the median.

On average, the neighborhood poverty rate for whites (median 5.8%) is lower than for the total population, as expected. Blacks and Hispanics have a distribution of neighborhood poverty that is over 2.5 times wider and shifted substantially worse than whites. For example, the median neighborhood poverty for blacks across the nation is 17.5%, and the black IQR is 9.0 to 28.7, an IQR of 20 points (compared to the IQR of 7 points for whites).

Average Differences in Neighborhood Environment by Metro Area

The distribution of neighborhood poverty for the total population varied substantially by MA. For instance, Middlesex NJ had the lowest median neighborhood poverty rate (the left-most boxplot in Figure 2a), at 3.3%, with an IQR of 4.0 percentage points (1st quartile of 2.2% and 3rd quartile of 6.2%). However, in McAllen TX – the MA with the highest median poverty rate – the typical (median) resident lives in a neighborhood with 38.3% poverty, with an IQR of 19.8 points. The other feature apparent in Figure 2 is that the variance (IQR) of neighborhood poverty is strongly positively correlated with the median ($\rho=0.66$, $p<.0001$).

Average Differences in Neighborhood Environment by Race/ethnicity and by MA

Figures 2b-2d illustrate race/ethnic-specific neighborhood poverty distributions by MA. The leftmost observation in Figure 2b illustrates that the MA where whites are exposed to the lowest median poverty rate is Middlesex NJ (3.0%). The lowest and highest medians of neighborhood poverty by race were: Middlesex (3.0%) and McAllen (26.0%) for Whites, Middlesex (4.9%) and McAllen (34.7%) for blacks, and Baltimore (6.4%) and McAllen (39.6%) for Hispanics.

When comparing Figures 2b-2d, the neighborhood poverty distributions for whites have lower medians everywhere, and smaller IQRs (in all but one instance), compared to the distributions for blacks and Hispanics, and this was confirmed by numeric comparisons of statistics across MAs (not shown). For instance, in Akron, the IQR is 6 percentage points for whites, versus 21 points for blacks, and 16 points for Hispanics. Therefore, blacks and Hispanics live in a much broader range of neighborhood poverty environments than whites across these 100 largest US metro areas.

Separateness of Racial/Ethnic Neighborhood Poverty Distributions

In Table 2, we present the IQR Overlap Statistic and the Distributional Overlap measure results nationally and by MA ranked several ways. On average for these MAs, the IQR of whites barely overlaps the IQR of blacks for neighborhood poverty. The IQR-OS equals 1.22 for black-white and 1.16 for Hispanic-white percentage point overlap of neighborhood poverty. This translates into 27% of each minority distribution overlapping the whites'. However there was variability across the nation. The MAs with the least amount of IQR-OS overlap in neighborhood poverty were Buffalo (-10.2), Gary (-10.0), Milwaukee (-7.6), Toledo (-6.0), and Detroit (-5.1) (Column 2). The places with the lowest distributional overlap between blacks and whites with respect to neighborhood poverty were Gary (12.8%), Milwaukee (14.4%), Buffalo (15.2%), Newark (16.1%), and Detroit (17.2%) (Column 3). For Hispanic-white overlap, the most unequal IQROS MAs were Providence (-6.3), Hartford (-3.4), Newark (-2.7), New Haven (-2.6), and Springfield (-1.5) (Column 4). On the distributional overlap measure for Hispanics vs. whites, the most unequal MAs were Providence (19.4%), Newark (20.9%), Hartford (21.4%), Springfield (22.8%), and New Haven (22.9%) (Column 5). The two measures (IQR-OS and % distributional overlap) were strongly positively correlated (blacks .97, $p < .0001$, Hispanics .85, $p < .0001$).

There was relatively little overlap between minorities and whites for neighborhood poverty in the majority of MAs. As Column 2 shows, in 32 MAs, or one-third of MAs, the black and white neighborhood poverty IQRs do not overlap. Seventy-two MAs had an overlap of 3 points or less between the black and white IQR of neighborhood poverty, and 84 MAs had overlap of 5 points or fewer. Therefore the degree of black-white IQR overlap was nil or small for the vast majority of the largest 100 MAs. Only 11 of these MAs had no IQR overlap between Hispanics and whites, and 70 MAs had less than 5 points of Hispanic-white overlap.

Graphs

Figure 3 depicts the distribution of actual neighborhood poverty values using density curves. Figure 3a depicts the neighborhood poverty values (density) for all 3 racial/ethnic groups. The black and Hispanic distributions are very similar, and different from that of whites. In Figure 3a, the solid black line denotes a tall-thin distribution of neighborhood poverty for whites, indicating that the vast majority of whites in the US live in low-poverty neighborhoods. The broad-short distributions with heavy right tails for minorities denoted by the dashed lines indicate that minorities are more likely to live in higher poverty neighborhoods, and their distributions are much broader. Figures 3b and 3c depict the densities for two groups (white, minority) with the quartiles and IQR-OS marked with vertical lines; these figures denote the small amount of IQR overlap in neighborhood poverty between minorities and whites.

Figures 4a and 4b illustrate the racial non-overlap of many of the IQRs of neighborhood poverty with boxplots. The two boxes in the same vertical column indicate two race-specific neighborhood poverty distributions for the same MA, ranked by the IQR-OS. For example in Figure 4a, the leftmost column indicates the black and white distributions (IQRs) of neighborhood poverty for Buffalo, NY. The black-outline box (with no fill) is the white IQR, and the gray-filled box is the black IQR. This figure illustrates the non-overlap of IQRs if the white box (denoted by the solid black line) is hollow, (e.g. as we see for Buffalo and for MAs on the left). One-third ($n=32$) of MAs display nonoverlapping IQRs (a visual depiction of Table 2 Column two) between blacks and whites. The higher medians and much wider IQRs for minorities (vs. whites) are also apparent in these figures (4a and 2b-2d). For example, in one-third of MAs, the median neighborhood poverty for blacks is above the 20% threshold, whereas the median for whites is never above this threshold. Indeed the white 3rd quartile is only above 20% in only 4 of 100 MAs. So in most MAs, the vast majority of whites live well below the high-poverty threshold, although this is not the case for blacks.

Associations between Separateness of Neighborhood Poverty Distributions and Metropolitan Area Segregation and Poverty

Correlation analysis—The correlation analyses (Table 3 first column) demonstrate that MAs with higher racial/ethnic separation of neighborhood poverty distributions (MAs scoring low on the IQR overlap measure) were higher for racial residential segregation. Spearman correlations were very high for IQR-OS with dissimilarity scores (black-white dissimilarity = $-.83$, $p<.001$; hispanic-white dissimilarity = $-.80$, $p<.001$), and with black isolation ($\rho = -.66$, $p<.001$), although lower for Hispanic isolation ($\rho = -.38$, $p<.001$). The IQR-OS was also positively correlated between minority groups ($\rho = 0.34$, $p<.001$). The moderate magnitude of this correlation suggests however different patterns by racial/ethnic minority group across the US, so that areas that have large non-overlap for blacks (vs. whites) may be areas that have only moderate non-overlap for Hispanics (vs. whites).

MAs with more racial overlap in neighborhood poverty had lower medians and smaller variance for minority neighborhood poverty and higher median and larger variance for white neighborhood poverty. MAs with more racial overlap in neighborhood poverty distributions were also more likely to have smaller absolute populations of minorities (not shown), smaller proportions of minorities, higher minority suburbanization, and lower proportions of older housing.

Multiple linear regression analyses—The associations between higher racial residential segregation and lower neighborhood poverty overlap maintained in the presence of other metropolitan demographic and income variables. For example, a 10-point increase in black-white dissimilarity was associated with a 2.14 point decrease in neighborhood poverty overlap between blacks and whites (Table 3, Model 1). The coefficients for black isolation (Model 2) and Hispanic-white dissimilarity (Model 3) were comparable in magnitude to that of black-white dissimilarity, although the coefficient for Hispanic isolation (Model 4) was about 29% smaller. The segregation regression coefficients were all negative and replicate the correlation analyses.

DISCUSSION

Although limited prior work has situated neighborhood quality and racial inequality within a distributional framework, such an approach emphasizes the vast racial/ethnic imbalance of distributions of neighborhood environment in a way that may be more powerful than means or proportions. Our analysis yields three principal findings: (1) the distributions of neighborhood poverty are substantially separate between racial minorities and whites

indicating separate neighborhood opportunity spaces; (2) this separation of neighborhood context is strongly associated with residential segregation; and (3) minorities exhibit a much larger amount of variation in neighborhood context than do whites. We will discuss these findings in turn.

Substantial Racial/Ethnic Separateness of Neighborhood Poverty Distributions

First, not only do Blacks and Hispanics exhibit considerably worse average (mean) neighborhood environment compared to whites (consistent with prior studies) (Logan 2002; Massey and Fischer 2000), but we found that the central 50 percent of the black and Hispanic populations (IQRs) also face a considerably worse neighborhood opportunity space than whites, indicated by the limited overlap of neighborhood poverty between whites and minorities in terms of this opportunity space. On average across these 100 largest MAs, the minority and white distributions each overlapped each other only 27%, indicated by an IQR-OS that barely exceeds zero. In fully one-third of these metro areas, the black and white IQRs did not overlap for neighborhood poverty. These results indicate insubstantial overlap of neighborhood opportunity spaces between minorities and whites, indicating a much different, considerably worse universe of neighborhood quality.

Traditional applications of the exposure statistic employ the mean, which may be limited for understanding the extent to which the entire distribution is different between two groups, since two places may have the same mean but very different distributional spread. For example, in both Syracuse and Buffalo, blacks live on average in neighborhoods with 28.6 % poverty (the exposure measure mean). But the IQR of neighborhood poverty is over 50% higher for Syracuse (28.4) as compared with Buffalo (17.1). Due to the differential black spread, combined with the distributions for whites, Buffalo attains the most unequal IQR-OS of white-black neighborhood poverty, whereas Syracuse falls in the middle. Alternately, two places may have very different means of neighborhood poverty but still overlap substantially. For example, in Bakersfield the neighborhood poverty mean for blacks is 23%, compared to 15% for whites. But there is high overlap (IQR-OS=8.5) due to the larger than normal dispersion for both racial groups.

Segregation

Second, although the patterns on average indicate separate neighborhood environments by race, there was considerable variation across metropolitan areas, and this variation was strongly correlated with residential segregation, before and after adjusting for metropolitan covariates. As argued by Massey & Fischer (Massey and Fischer 2000), in the presence of low racial segregation, few residents live in high-poverty neighborhoods. But as segregation increases, the numbers of neighborhoods and residents in high-poverty neighborhoods increase. These patterns may be driven by income generation and neighborhood sorting (economic and racial residential segregation)(Jargowsky 1997).

Although prior demographic literature has found that average neighborhood environments are worse for minorities (based on exposure measures) (Logan 2002; Massey and Fischer 2000), and although segregation literature finds that minorities live in separate neighborhoods than whites (e.g. unevenness) (Iceland, Weinberg, et al. 2002), and that blacks exhibit simultaneously higher income and racial segregation than other groups (Fischer 2003), the overlap statistics provide straightforward metrics for monitoring *why* racial segregation matters. Our measure may therefore be considered a more specific type of segregation index – one that combines MA racial separation with a specific neighborhood characteristic. It can be applied to any continuous neighborhood characteristic to assess other dimensions of neighborhood quality than just % poverty.

One compelling finding was that metro areas can exhibit a very good universe for one group but a horrible universe for another – indicated in metros with lack of distributional overlap, where the minority distribution of neighborhood poverty exceeds recognized thresholds for negative social outcomes (e.g. above 20%). This between-racial-group variation within place suggests the potential for change. So even if the distribution of neighborhood poverty were fixed within any given MA (in absolute terms, perhaps because of certain forces generating higher metropolitan poverty), this does not preclude addressing the vast racial/ethnic imbalance in neighborhood poverty within MAs (the relative inequalities). In fact, from a policy perspective, the relative inequality within metropolitan areas may be more addressable than the inequality between metro areas, since a range of good-opportunity neighborhoods does exist in most metro areas – it's just that whites are disproportionately residing in them, and minorities are not.

Larger Variance in Neighborhood Opportunity Space for Minorities

Third, we find much larger variation (IQRs over 2.5 times wider) in neighborhood environments for minorities, and conversely much tighter distributions for whites. Given the incredible variation in environment experienced by minorities across different places, point estimates of “average” environment might therefore be more meaningful for whites than they are for minorities – a methodological rationale to incorporate variance. However, the variation is meaningful substantively, to inform for whom place matters most. Larger variation among minorities indicates that which specific MA within one lives seems to matter much more for minorities than for whites, in terms of neighborhood quality. For minorities, some MAs have vastly better opportunity spaces than others, whereas anywhere whites live seems to be relatively good (small variance around a good mean). For example, the best 10 metro areas for blacks based on the lowest median neighborhood poverty rate all fell below 10%; whereas in the 10 worst metro areas for blacks, the median neighborhood poverty was above 25%. These are substantial differences. Our correlation analyses indicated that when minorities are more likely share the same neighborhood opportunity space (high IQR-OS values), the typical (absolute) neighborhood environment is better for minorities, compared to typical environments when overlap is nil.

Of course it is important to situate this relative variation (among blacks) in a racial/ethnic comparison, noting that relatively speaking, the vast majority of whites still live in better neighborhood environments than the vast majority of minorities in the vast majority of areas. For example, in fully one-third of metro areas, over half of the black population lives in neighborhoods with poverty rates exceeding recognized thresholds for adverse social outcomes (e.g. 20%) (Galster 2002). On the other hand, only one MA displayed a white median of neighborhood poverty above this threshold, and only 4 MAs displayed the third quartile of white neighborhood poverty above this threshold. So in most cases, whites lived well below this threshold.

Larger variation for minorities compared to whites has been documented for cross sectional outcomes at the metropolitan and state levels (Acevedo-Garcia, Osypuk, et al. 2003; Osypuk, Kawachi, et al. 2006), and also for temporal patterns. For example, Galster et al. found that white neighborhoods were much more likely to exhibit stable neighborhood poverty rates over a 10-year period compared with black and Hispanic neighborhoods (Galster, Quercia, et al. 2003). Some literature suggests that larger variance may result from a group with increased vulnerability to external insult. “A system on the boundary of its tolerance along any dimension ... is more vulnerable to small differences in circumstance along any dimension” (Schmalhausen 1949)(p.276), and this leads to higher variance in outcomes (Galea, Ahern, et al. 2005; Levins and Lopez 1999). So an exposure that may have a small effect on a

population that is not living “on the edge”, may have a large effect on more vulnerable populations – those in household or neighborhood poverty.

Policy implications

Identifying vulnerable populations has important policy implications. A population's vulnerability (e.g. being more or less susceptible or resilient) may interact with an external insult to produce a certain adverse outcome in the first place, as well as to allow effective recovery from an adverse outcome should the outcome occur. If an effect of some external insult (e.g. a hurricane, or the exposure to a certain infectious disease) only emerges in the presence of vulnerability, then the effect may be able to be prevented (e.g. by certain policies) by either preventing the external insult, or by decreasing the vulnerability of the population. For example, the social science literature on disasters notes that social vulnerability exacerbates the effects of and recovery from a natural disaster like a hurricane or earthquake, powerfully illustrated with the impact Hurricane Katrina on the poor, black New Orleans population (Cutter and Emrich 2006). Although the vulnerability of a place includes its physical infrastructure or governmental response, it also includes the composition of its population. Indeed, population socioeconomic composition may be a powerful indicator of social vulnerability (Cutter and Emrich 2006); however we contend it is not only this absolute level of vulnerability, but the relative vulnerability – inequality – that matters.

Focusing on a specific type of neighborhood such as high-poverty neighborhoods versus examining the entire distribution of neighborhood poverty speaks to different policy implications. Preventing detrimental outcomes may be better achieved by working towards shifting the entire distribution than by focusing on the high-risk end of the distribution (i.e. high-poverty neighborhoods) (Rose 1985). One type of intervention to alleviate negative effects of neighborhood poverty targets only high-poverty neighborhoods, many of which are predominantly minority, versus interventions that improve minority access to the full spectrum of neighborhoods across the entire metro area. However a focus on the entire distribution of neighborhood poverty, as we do in this paper, is consistent with forces that shape racial/ethnic inequality in metropolitan America. For example, the fragmentation of governance and resulting exclusionary land-use regimes in metropolitan areas operates across the entire range of municipalities to reduce housing options for low income and minority populations (Pendall 2000).

Segregation statistics provide one metric for understanding whether different racial groups live in the same neighborhoods. Yet while neighborhood racial/ethnic integration may be one avenue for achieving better neighborhood environments for minorities, the real priority is to create access for all to communities of opportunity, for good services, amenities, and environments (Briggs 2005). Therefore, calculating MA-specific estimates of the racial separateness of neighborhood opportunity spaces allows ranking places to highlight good areas and shame unequal areas, and track whether over time particular metros are making progress towards a more equal distribution of opportunity spaces, using a concrete measure of why segregation matters – namely, neighborhood poverty or other measures of neighborhood quality.

Rankings of best and worst places are quite appealing to the media and are often a motivating lever for policy makers. A low ranking may stimulate policy makers to take action to rectify the low ranking, while a high ranking may spur attention to the area to identify best practices. For example, after Oklahoma City was ranked as one of the fattest cities in the nation, the mayor undertook a campaign to reduce obesity (Associated Press 2008). Policy changes resulting from this low ranking included adding 300 miles of sidewalks to encourage walking, and building new gyms in schools for children to increase physical activity (Mott 2008).

Likewise, our measures of overlap may be important for benchmarking and monitoring progress towards social goals and stimulating policy to improve access to opportunity neighborhoods. Addressing the adverse effects of neighborhood poverty will likely involve explicitly altering the distribution of where impoverished people live, in addition to place-based efforts to improve the detrimental context of high-poverty neighborhoods (Katz 2004). Concentrated poverty neighborhoods are a housing market phenomenon, although they are not widely recognized as such (Yinger 2001). Therefore, improving access of minorities to lower-poverty neighborhoods within MAs is a function of housing affordability (Joint Center for Housing Studies 2006), of the presence of and access to affordable housing in low-poverty areas including the zoning in such areas for permitting construction of multifamily units (Pendall 2000), as well as preventing, prosecuting, and redressing housing discrimination (Yinger 2001). Alleviating poverty concentration therefore requires increasing the supply of affordable housing in suburban jurisdictions, scaling up access of minorities to housing mobility policies and rental assistance policies (Goering, Feins, et al. 2003), as well as diminishing discriminatory barriers that limit the presence of minority families in those communities (Joint Center for Housing Studies 2006).

LIMITATIONS

This paper provides a cross sectional snapshot of neighborhood poverty distributions by MA and racial/ethnic group in year 2000. However, a considerable number of neighborhoods moved in and out of poverty from 1990 to 2000 (Kingsley and Pettit 2003); moreover neighborhoods and their residents are constantly churning and changing. Future analyses should examine how distributional characteristics of neighborhood poverty (the dispersion) as well as the racial/ethnic distributional overlap of populations change across time, and covary with other aspects of metropolitan change (e.g. income inequality, job growth, economic and racial residential segregation, population composition, housing policies). The factors influencing changes in the distribution may operate differently than factors influencing the base rate.

There are many differences between metropolitan areas that may explain or understate the absolute differences in the neighborhood poverty distribution. For instance, since official poverty calculations do not take housing costs into consideration, areas with higher poverty (and therefore higher neighborhood poverty) rates are partially reflecting higher rent burdens and housing costs. Although some recommend a correction for geographic price variation, the calculation understates housing price differences. Implementing such an adjustment would likely increase the neighborhood poverty rate in large metropolitan areas, so since we did not implement any adjustment here, our analyses likely underestimate neighborhood poverty on an absolute scale (Yinger 2001).

Since we wished to characterize the universe of the distribution for entire racial/ethnic groups, we did not focus on subgroups – e.g. socioeconomic subgroups (the poor vs. non-poor). Given that an important policy topic regards the concentration of the poor in high-poverty neighborhoods, future analyses should examine the racial/ethnic (non)overlap among the poor (or other socioeconomic groups) across neighborhood poverty, and to examine increases and decreases across time, to confirm findings of prior concentrated poverty studies (Jargowsky 1997; Massey and Fischer 2000), and to focus explicitly on the racial/ethnic aspect of neighborhood concentrated poverty.

CONCLUSION

In conclusion, this analysis found that not only is the average neighborhood poverty environment worse for the average black or Hispanic person compared to whites, but we also

find that the racial/ethnic distributions in neighborhood environment barely overlap, and that this lack of overlap is strongly associated with racial residential segregation. In fact, the IQR-OS may be employed as another type of residential segregation statistic. Not only do minorities disproportionately inhabit high-poverty neighborhoods, but whites disproportionately inhabit low-poverty ones. This separate distribution of neighborhood environment may provide a compelling argument for the implications of residential segregation for equal access to opportunity neighborhoods. Our findings support a clear geography of inequality in neighborhood opportunity spaces and thus opportunity structure that is strongly patterned by race/ethnicity across metropolitan areas.

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Biographies

Theresa L. Osypuk is an Assistant Professor at Northeastern University Bouvé College of Health Sciences. Dr. Osypuk is a social epidemiologist researching how place matters for racial disparities in social outcomes including health, specifically in relation to housing markets, residential segregation, and neighborhoods. Her recent publications include two articles in *American Journal of Epidemiology*, and an article in *Health Affairs*, discussing the impact of racial residential segregation on health disparities.

Sandro Galea is a Professor of Epidemiology at the University of Michigan School of Public Health. Dr. Galea's research focuses on the social and economic determinants of population health, the epidemiology of mental health and substance misuse, and the consequences of disasters and mass trauma. Dr. Galea's most recent book is *Macrosocial Determinants of Population Health*.

Nancy McArdle is an author and researcher with expertise in analyzing housing and population trends, and changing patterns of racial change and segregation. She received her Masters in Public Policy from Harvard's Kennedy School of Government and worked as a research analyst with the Joint Center for Housing Studies, Harvard University. She is a contributing author to the forthcoming book, *21st Century Color Lines: Exploring the Frontiers for America's Present and Future*.

Dolores Acevedo-Garcia is an Associate Professor of Society, Human Development, and Health at the Harvard School of Public Health. Dr. Acevedo-Garcia has a doctoral degree in public policy and demography. Her research interests include the effect of social determinants (e.g. residential segregation, immigrant integration) on health disparities, especially along racial and ethnic lines, and the role of non-health policies (e.g. housing policies, immigrant policies) in reducing those disparities.

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Figure 1.
Illustration of the IQR Overlap Statistic of Neighborhood Poverty for 3 Hypothetical Metro Areas.

Fig 2a. TOTAL POPULATION

Fig 2b. WHITES

Figure 2.
Boxplots: Metropolitan Distributions (IQRs) of Neighborhood Poverty, for total population and by racial/ethnic group.

Fig 3a. White, Black, & Hispanic

Fig 3b. Black & White

Figure 3.

Density Graphs: Distributions of Neighborhood Poverty by Race/Ethnicity, 100 Largest MSAs.

NOTE: We used kernel density estimation with a Gaussian smoothing kernel: a smoothing technique to estimate the relative probabilities of each neighborhood poverty value.

Figure 4.
Boxplots: White and Minority Group IQR Overlap of Neighborhood Poverty for 100 Largest
MAS, ranked by the IQR-OS.

Table 1

Exposure Measures for National Average Neighborhood (Tract) Poverty, for Total Population, and by Racial Group. 100 Largest Metropolitan Areas. 38855 tracts.

Neighborhood % Poverty, 1999								
	N population	Mean	Minimum	1st Quartile	Median	3rd Quartile	Maximum	IQR
TOTAL POPULATION	173,365,372	11.77%	0.00%	4.05%	7.81%	15.95%	100.00%	11.91%
NH WHITE	109,547,002	8.09%	0.00%	3.30%	5.77%	10.20%	100.00%	6.91%
NH BLACK	25,150,369	20.12%	0.00%	8.98%	17.46%	28.74%	100.00%	19.76%
HISPANIC	27,390,113	18.88%	0.00%	9.04%	16.68%	26.49%	100.00%	17.46%

Table 2

Racial/Ethnic Overlap of Neighborhood Poverty: 2000, largest 100 MSAs.

Column 1: Ranked Alphabetically				Column 2: Ranked by Black-White IQR-OS				Column 3: Ranked by Black-White % overlap				Column 4: Ranked by Hispanic-White IQR-OS				Column 5: Ranked by Hispanic-White % overlap			
White-Black		White-Hispanic		White-Black		White-Hispanic		White-Black		White-Hispanic		White-Black		White-Hispanic		White-Hispanic			
MA name	IQR-OS	% overlap	IQR-OS	% overlap	MA name	IQR-OS	% overlap	MA name	IQR-OS	% overlap	MA name	IQR-OS	% overlap	MA name	IQR-OS	% overlap	MA name		
Average for 100 MAs	1.2	27.2	1.2	27.1															
Akron	-0.6	24.4	5.5	43.6	Buffalo		-10.2	Gary		12.8	Providence		-6.3	Providence			Providence		
Albany	-0.4	24.3	4.6	33.9	Gary		-10.0	Milwaukee		14.4	Hartford		-3.4	Newark			Newark		
Albuquerque	6.7	41.7	4.2	34.8	Milwaukee		-7.6	Buffalo		15.2	Newark		-2.7	Hartford			Hartford		
Allentown	3.3	29.4	-1.2	23.2	Toledo		-6.0	Newark		16.1	New_Haven		-2.6	Springfield			Springfield		
Ann Arbor	2.5	31.9	3.6	39.3	Detroit		-5.1	Detroit		17.2	Springfield		-1.4	New_Haven			New_Haven		
Atlanta	2.0	30.4	2.6	32.4	Newark		-4.6	Youngstown		18.6	Allentown		-1.2	Allentown			Allentown		
Austin	4.0	32.6	3.8	32.6	Youngstown		-4.3	Chicago		18.8	Milwaukee		-1.0	Boston			Boston		
Bakersfield	8.5	39.0	4.3	28.8	Sarasota		-4.1	Sarasota		19.6	Boston		-0.8	Milwaukee			Milwaukee		
Baltimore	1.1	26.9	4.1	40.2	New_Haven		-3.9	New_Haven		20.3	New_York		-0.2	Bergen			Bergen		
Baton_Rouge	0.0	24.7	6.7	40.7	Rochester		-3.5	Toledo		20.4	Bergen		-0.1	New_York			New_York		
Bergen	-0.8	22.8	-0.1	24.3	St_Louis		-2.8	Rochester		20.5	Chicago		0.0	Chicago			Chicago		
Birmingham	-1.0	22.6	6.0	41.1	Chicago		-2.8	St_Louis		20.8	Philadelphia		0.2	Philadelphia			Philadelphia		
Boston	-1.1	22.4	-0.8	23.2	Philadelphia		-2.5	Grand Rapids		21.4	Orange_County		0.5	Orange_County			Orange_County		
Buffalo	-10.2	15.2	1.6	27.4	Grand Rapids		-1.8	Philadelphia		21.8	Cleveland		1.0	Cleveland			Cleveland		
Charleston	2.8	32.4	6.0	43.5	West_Palm_Beach		-1.4	Cleveland		22.0	Ventura		1.0	Los_Angeles			Los_Angeles		
Charlotte	2.0	31.6	2.8	33.3	Boston		-1.1	Boston		22.4	Middlesex		1.0	Rochester			Rochester		
Chicago	-2.8	18.8	0.0	25.0	Birmingham		-1.0	Birmingham		22.6	Rochester		1.0	Ventura			Ventura		
Cincinnati	0.3	26.7	5.2	43.4	Cleveland		-1.0	Bergen		22.8	Los_Angeles		1.1	Phoenix			Phoenix		
Cleveland	-1.0	22.0	1.0	26.4	Louisville		-0.9	West_Palm_Beach		22.8	San_Jose		1.3	Buffalo			Buffalo		
Columbia	5.3	34.7	7.1	48.4	Bergen		-0.8	Louisville		23.9	Dallas		1.3	Dallas			Dallas		
Columbus	2.5	27.7	6.3	40.2	Little_Rock		-0.6	Kansas_City		24.1	Nassau		1.4	Houston			Houston		
Dallas	3.0	31.2	1.3	28.0	Akron		-0.6	Memphis		24.1	Harrisburg		1.5	San_Antonio			San_Antonio		

Column 1: Ranked Alphabetically					Column 2: Ranked by Black-White IQR-OS				Column 3: Ranked by Black-White % overlap				Column 4: Ranked by Hispanic-White IQR-OS				Column 5: Ranked by Hispanic-White % overlap			
		White-Black		White-Hispanic		White-Black		White-Black		White-Black		White-Hispanic		White-Hispanic		White-Hispanic				
MA name	IQR-OS	% overlap	IQR-OS	% overlap	IQR-OS	MA name	IQR-OS	MA name	% overlap	MA name	IQR-OS	MA name	% overlap	MA name	IQR-OS	MA name	% overlap			
Dayton	-0.1	24.6	6.0	44.9	-0.6	Memphis	-0.6	Albany	24.3	Buffalo	1.6	Bakersfield	28.8							
Denver	2.4	30.7	1.9	29.6	-0.4	Albany	-0.4	Akron	24.4	Gary	1.6	Middlesex	28.9							
Detroit	-5.1	17.2	2.6	33.3	-0.4	Kansas_City	-0.4	Little_Rock	24.4	Phoenix	1.7	Denver	29.6							
El Paso	14.3	46.0	8.0	33.6	-0.2	Mobile	-0.2	Dayton	24.6	Houston	1.7	San_Jose	30.1							
Fort_Lauderdale	1.9	28.5	6.9	47.2	-0.2	Hartford	-0.2	Hartford	24.6	Minneapolis	1.8	Fresno	30.2							
Fort_Worth	3.3	33.1	2.0	30.4	-0.2	New_Orleans	-0.2	Baton_Rouge	24.7	Grand Rapids	1.8	Fort_Worth	30.4							
Fresno	5.3	29.2	5.3	30.2	-0.1	Dayton	-0.1	Mobile	24.8	Denver	1.9	Harrisburg	30.4							
Gary	-10.0	12.8	1.6	30.6	0.0	Baton_Rouge	0.0	New_Orleans	24.8	Greensboro	2.0	Gary	30.6							
Grand Rapids	-1.8	21.4	1.8	30.6	0.0	Harrisburg	0.0	Nassau	25.2	Sarasota	2.0	Grand Rapids	30.6							
Greensboro	1.8	31.0	2.0	31.6	0.0	Springfield	0.0	Wichita	25.2	Fort_Worth	2.0	Omaha	30.8							
Greenville	4.0	35.3	5.7	39.9	0.1	Nassau	0.1	Harrisburg	25.3	San_Antonio	2.4	Sarasota	31.3							
Harrisburg	0.0	25.3	1.5	30.4	0.1	Wichita	0.1	Springfield	25.3	San_Francisco	2.4	Greensboro	31.6							
Hartford	-0.2	24.6	-3.4	21.4	0.2	Omaha	0.2	Jersey_City	25.6	Omaha	2.5	Minneapolis	31.6							
Honolulu	7.5	49.4	7.1	43.3	0.3	Oakland	0.3	Oakland	25.7	Detroit	2.6	Oklahoma_City	32.1							
Houston	1.7	27.8	1.7	28.0	0.3	Cincinnati	0.3	Omaha	25.7	Atlanta	2.6	Nassau	32.3							
Indianapolis	0.9	26.7	3.5	33.0	0.6	Syracuse	0.6	Syracuse	25.8	Oakland	2.6	Wichita	32.3							
Jacksonville	1.3	28.3	5.9	48.0	0.7	Minneapolis	0.7	Pittsburgh	26.1	Monmouth	2.7	Atlanta	32.4							
Jersey_City	0.7	25.6	4.6	34.9	0.7	Jersey_City	0.7	Tulsa	26.2	Washington	2.8	Austin	32.6							
Kansas_City	-0.4	24.1	3.0	33.4	0.9	Pittsburgh	0.9	Cincinnati	26.7	Salt_Lake_City	2.8	Tucson	32.6							
Knoxville	2.3	29.2	6.7	43.3	0.9	Indianapolis	0.9	Indianapolis	26.7	Charlotte	2.8	Oakland	32.7							
Las_Vegas	6.3	38.0	4.8	35.2	0.9	Tulsa	0.9	Providence	26.7	West_Palm_Beach	2.9	Indianapolis	33.0							
Little_Rock	-0.6	24.4	4.6	38.2	1.0	Richmond	1.0	Minneapolis	26.8	Kansas_City	3.0	San_Diego	33.0							
Los_Angeles	1.6	27.0	1.1	26.5	1.1	Baltimore	1.1	Baltimore	26.9	Wilmington	3.0	Charlotte	33.3							
Louisville	-0.9	23.9	5.4	42.7	1.2	San_Francisco	1.2	Los_Angeles	27.0	Wichita	3.3	Detroit	33.3							
McAllen	18.8	39.8	8.2	34.7	1.3	Jacksonville	1.3	Miami	27.0	Nashville	3.4	Kansas_City	33.4							
Memphis	-0.6	24.1	4.1	35.3	1.3	Providence	1.3	Columbus	27.7	Seattle	3.5	El_Paso	33.6							
Miami	1.7	27.0	8.7	42.0	1.5	Monmouth	1.5	Houston	27.8	Indianapolis	3.5	Albany	33.9							

Column 1: Ranked Alphabetically					Column 2: Ranked by Black-White IQR-OS			Column 3: Ranked by Black-White % overlap			Column 4: Ranked by Hispanic-White IQR-OS			Column 5: Ranked by Hispanic-White % overlap		
MA name	White-Black		White-Hispanic		White-Black		White-Black		White-Black		White-Hispanic		White-Hispanic		White-Hispanic	
	IQR-OS	% overlap	IQR-OS	% overlap	MA name	IQR-OS	MA name	% overlap	MA name	IQR-OS	MA name	IQR-OS	MA name	% overlap	MA name	% overlap
Middlesex	2.0	36.0	1.0	28.9	Los_Angeles	1.6	New_York	28.0	Richmond	3.6	Salt_Lake_City	3.6	Salt_Lake_City	33.9		
Milwaukee	-7.6	14.4	-1.0	24.0	Miami	1.7	San_Francisco	28.0	Ann Arbor	3.6	West_Palm_Beach	3.6	West_Palm_Beach	34.2		
Minneapolis	0.7	26.8	1.8	31.6	Houston	1.7	Jacksonville	28.3	Austin	3.8	Nashville	3.8	Nashville	34.4		
Mobile	-0.2	24.8	6.7	48.6	Tampa	1.8	Tampa	28.4	Baltimore	4.1	Washington	4.1	Washington	34.4		
Monmouth	1.5	28.8	2.7	36.6	Greensboro	1.8	Fort_Lauderdale	28.5	Youngstown	4.1	Wilmington	4.1	Wilmington	34.6		
Nashville	2.1	29.2	3.4	34.4	Fort_Lauderdale	1.9	Monmouth	28.8	Memphis	4.1	McAllen	4.1	McAllen	34.7		
Nassau	0.1	25.2	1.4	32.3	Middlesex	2.0	Richmond	28.9	Albuquerque	4.2	Albuquerque	4.2	Albuquerque	34.8		
New_Haven	-3.9	20.3	-2.6	22.9	Charlotte	2.0	Fresno	29.2	San_Diego	4.3	Jersey_City	4.3	Jersey_City	34.9		
New_Orleans	-0.2	24.8	7.9	41.8	Atlanta	2.0	Knoxville	29.2	Raleigh	4.3	Richmond	4.3	Richmond	34.9		
New_York	2.8	28.0	-0.2	24.5	Nashville	2.1	Nashville	29.2	Bakersfield	4.3	Stockton	4.3	Stockton	34.9		
Newark	-4.6	16.1	-2.7	20.9	Tacoma	2.1	Orlando	29.3	Tacoma	4.4	Las_Vegas	4.4	Las_Vegas	35.2		
Norfolk	3.5	32.8	5.5	42.7	Knoxville	2.3	Allentown	29.4	Scranton	4.5	Memphis	4.5	Memphis	35.3		
Oakland	0.3	25.7	2.6	32.7	Denver	2.4	Atlanta	30.4	Portland	4.5	Syracuse	4.5	Syracuse	35.3		
Oklahoma_City	5.5	33.0	6.4	32.1	Ann Arbor	2.5	Denver	30.7	Little_Rock	4.6	Sacramento	4.6	Sacramento	35.4		
Omaha	0.2	25.7	2.5	30.8	Columbus	2.5	Greensboro	31.0	Albany	4.6	Raleigh	4.6	Raleigh	35.8		
Orange_County	4.6	38.3	0.5	26.1	Orlando	2.6	Dallas	31.2	Toledo	4.6	Youngstown	4.6	Youngstown	35.8		
Orlando	2.6	29.3	4.7	40.5	San_Jose	2.6	Sacramento	31.3	Jersey_City	4.6	San_Francisco	4.6	San_Francisco	35.9		
Philadelphia	-2.5	21.8	0.2	25.5	Seattle	2.6	Charlotte	31.6	Orlando	4.7	Riverside	4.7	Riverside	36.2		
Phoenix	5.4	34.1	1.7	27.2	Washington	2.7	Ann Arbor	31.9	Las_Vegas	4.8	Monmouth	4.8	Monmouth	36.6		
Pittsburgh	0.9	26.1	7.2	44.4	New_York	2.8	Seattle	32.3	Vallejo	4.9	Seattle	4.9	Seattle	37.7		
Portland	3.5	33.2	4.5	38.7	Wilmington	2.8	Charleston	32.4	St_Louis	4.9	Tulsa	4.9	Tulsa	37.9		
Providence	1.3	26.7	-6.3	19.4	Charleston	2.8	Austin	32.6	Cincinnati	5.2	Toledo	5.2	Toledo	38.1		
Raleigh	4.2	35.9	4.3	35.8	Dallas	3.0	Wilmington	32.6	Fresno	5.3	Little_Rock	5.3	Little_Rock	38.2		
Richmond	1.0	28.9	3.6	34.9	Scranton	3.2	Norfolk	32.8	Syracuse	5.4	Scranton	5.4	Scranton	38.2		
Riverside	8.5	38.8	6.9	36.2	Sacramento	3.3	Oklahoma_City	33.0	Louisville	5.4	Tampa	5.4	Tampa	38.4		
Rochester	-3.5	20.5	1.0	26.6	Fort_Worth	3.3	Fort_Worth	33.1	Tampa	5.5	Portland	5.5	Portland	38.7		
Sacramento	3.3	31.3	5.8	35.4	Allentown	3.3	Portland	33.2	Akron	5.5	Tacoma	5.5	Tacoma	38.8		

Column 1: Ranked Alphabetically										Column 2: Ranked by Black-White IQR-OS				Column 3: Ranked by Black-White % overlap				Column 4: Ranked by Hispanic-White IQR-OS				Column 5: Ranked by Hispanic-White % overlap							
White-Black					White-Hispanic					White-Black					White-Hispanic					White-Black					White-Hispanic				
MA name	IQR-OS	% overlap	IQR-OS	% overlap	MA name	IQR-OS	% overlap	IQR-OS	% overlap	MA name	IQR-OS	% overlap	MA name	IQR-OS	% overlap	MA name	IQR-OS	% overlap	MA name	IQR-OS	% overlap	MA name	IQR-OS	% overlap					
St_Louis	-2.8	20.8	4.9	42.2	Portland	3.5		Tacoma	33.7	Norfolk	5.5		Vallejo	5.5		Vallejo	5.5		Vallejo	5.5		Vallejo	5.5						
Salt_Lake_City	3.5	35.8	2.8	33.9	Norfolk	3.5		Washington	33.9	Greenville	5.7		Ann Arbor	5.7		Ann Arbor	5.7		Ann Arbor	5.7		Ann Arbor	5.7						
San_Antonio	6.6	37.5	2.4	28.3	Salt_Lake_City	3.5		Stockton	34.0	Sacramento	5.8		Greenville	5.8		Greenville	5.8		Greenville	5.8		Greenville	5.8						
San_Diego	5.1	36.1	4.3	33.0	Austin	4.0		Phoenix	34.1	Jacksonville	5.9		Baltimore	5.9		Baltimore	5.9		Baltimore	5.9		Baltimore	5.9						
San_Francisco	1.2	28.0	2.4	35.9	Greenville	4.0		Scranton	34.4	Charleston	6.0		Columbus	6.0		Columbus	6.0		Columbus	6.0		Columbus	6.0						
San_Jose	2.6	38.1	1.3	30.1	Raleigh	4.2		Columbia	34.7	Dayton	6.0		Orlando	6.0		Orlando	6.0		Orlando	6.0		Orlando	6.0						
Sarasota	-4.1	19.6	2.0	31.3	Ventura	4.5		Greenville	35.3	Birmingham	6.0		Baton_Rouge	6.0		Baton_Rouge	6.0		Baton_Rouge	6.0		Baton_Rouge	6.0						
Scranton	3.2	34.4	4.5	38.2	Orange_County	4.6		Salt_Lake_City	35.8	Columbus	6.3		Birmingham	6.3		Birmingham	6.3		Birmingham	6.3		Birmingham	6.3						
Seattle	2.6	32.3	3.5	37.7	San_Diego	5.1		Raleigh	35.9	Stockton	6.4		New_Orleans	6.4		New_Orleans	6.4		New_Orleans	6.4		New_Orleans	6.4						
Springfield	0.0	25.3	-1.4	22.8	Fresno	5.3		Middlesex	36.0	Oklahoma_City	6.4		Miami	6.4		Miami	6.4		Miami	6.4		Miami	6.4						
Stockton	6.6	34.0	6.4	34.9	Columbia	5.3		San_Diego	36.1	Tulsa	6.6		St_Louis	6.6		St_Louis	6.6		St_Louis	6.6		St_Louis	6.6						
Syracuse	0.6	25.8	5.4	35.3	Phoenix	5.4		Tucson	36.9	Baton_Rouge	6.7		Louisville	6.7		Louisville	6.7		Louisville	6.7		Louisville	6.7						
Tacoma	2.1	33.7	4.4	38.8	Vallejo	5.4		San_Antonio	37.5	Mobile	6.7		Norfolk	6.7		Norfolk	6.7		Norfolk	6.7		Norfolk	6.7						
Tampa	1.8	28.4	5.5	38.4	Oklahoma_City	5.5		Knoxville	38.0	Knoxville	6.7		Honolulu	6.7		Honolulu	6.7		Honolulu	6.7		Honolulu	6.7						
Toledo	-6.0	20.4	4.6	38.1	Las_Vegas	6.3		San_Jose	38.1	Fort_Lauderdale	6.9		Knoxville	6.9		Knoxville	6.9		Knoxville	6.9		Knoxville	6.9						
Tucson	8.8	36.9	6.9	32.6	Stockton	6.6		Ventura	38.2	Tucson	6.9		Cincinnati	6.9		Cincinnati	6.9		Cincinnati	6.9		Cincinnati	6.9						
Tulsa	0.9	26.2	6.6	37.9	San_Antonio	6.6		Orange_County	38.3	Riverside	6.9		Charleston	6.9		Charleston	6.9		Charleston	6.9		Charleston	6.9						
Vallejo	5.4	43.8	4.9	39.1	Albuquerque	6.7		Riverside	38.8	Columbia	7.1		Akron	7.1		Akron	7.1		Akron	7.1		Akron	7.1						
Ventura	4.5	38.2	1.0	27.1	Honolulu	7.5		Bakersfield	39.0	Honolulu	7.1		Pittsburgh	7.1		Pittsburgh	7.1		Pittsburgh	7.1		Pittsburgh	7.1						
Washington	2.7	33.9	2.8	34.4	Riverside	8.5		McAllen	39.8	Pittsburgh	7.2		Dayton	7.2		Dayton	7.2		Dayton	7.2		Dayton	7.2						
West_Palm_Beach	-1.4	22.8	2.9	34.2	Bakersfield	8.5		Albuquerque	41.7	New_Orleans	7.9		Fort_Lauderdale	7.9		Fort_Lauderdale	7.9		Fort_Lauderdale	7.9		Fort_Lauderdale	7.9						
Wichita	0.1	25.2	3.3	32.3	Tucson	8.8		Vallejo	43.8	El Paso	8.0		Jacksonville	8.0		Jacksonville	8.0		Jacksonville	8.0		Jacksonville	8.0						
Wilmington	2.8	32.6	3.0	34.6	El Paso	14.3		McAllen	46.0	McAllen	8.2		Columbia	8.2		Columbia	8.2		Columbia	8.2		Columbia	8.2						
Youngstown	-4.3	18.6	4.1	35.8	McAllen	18.8		Honolulu	49.4	Miami	8.7		Mobile	8.7		Mobile	8.7		Mobile	8.7		Mobile	8.7						

Table 3
Analyses with Metropolitan Area Interquartile Range Overlap Statistic (IQR-OS) of Neighborhood Poverty Distributions. N=100 MAs.

	Black-White IQR-OS						Hispanic-White IQR-OS					
	Correlation with Black-White IQR-OS			Multiple Regression			Correlation with Hispanic-White IQR-OS			Multiple Regression		
	Rho	P	Beta	SE	P		Rho	P	Beta	SE	P	
	Model 1						Model 3					
	Model 2						Model 4					
Minority-White Dissimilarity ^	-0.83	***	-21.40	3.05	***	--	-0.80	***	-23.99	2.63	***	--
Minority Isolation ^	-0.66	***	--	--	--	-22.41	3.12	***	--	--	--	-15.14
Population size (log)	-0.02		0.64	0.28	*	1.03	0.30	**	-0.02	0.20		-0.77
% minority ^	-0.39	***	-5.02	3.19	***	20.66	5.47	***	1.44	1.52		13.65
Growth in minority population 1990-2000 ^	0.41	***	1.67	1.33		-1.03	1.42		0.00	0.23		-0.63
% suburban among minorities ^	0.21	*	0.74	0.92		1.47	0.93		0.80	0.56		1.10
% foreign born	0.40	***	-1.12	3.04		0.55	3.07		5.29	1.81	**	7.61
% housing units built before 1990	-0.49	***	2.34	4.40		-2.16	4.36		-0.18	2.25		-9.00
Region: northeast	NA		-0.86	0.60		-1.75	0.64	**	-0.76	0.56		-0.88
Region: south	NA		-0.40	0.70		-0.74	0.72		-0.24	0.49		-0.35
Region: west	NA		-2.29	0.95	*	-3.65	1.05	***	-0.40	0.47		-0.40
% population below poverty	0.21	*	59.49	17.47	**	16.26	18.53		4.16	9.23		-6.82
% of minority population below poverty ^	-0.40	***	-28.93	11.47	*	-21.32	11.66	#	2.58	8.29		-2.41
Median income total population	-0.07		-0.48	0.68		-1.76	0.69	*	-1.14	0.66	#	-2.72
Median income, minorities ^	0.48	***	0.47	0.87		0.63	0.86		0.63	0.95		2.01
Neighborhood Poverty Median, Total population	0.44	***	--	--		--	--		--	--		--
Neighborhood Poverty IQR, Total population	0.17	#	--	--		--	--		--	--		--
Neighborhood Poverty Median, Whites	0.44	***	--	--		--	--		--	--		--

Black-White IQR-OS					Hispanic-White IQR-OS				
Correlation with Black-White IQR-OS		Multiple Regression			Correlation with Hispanic-White IQR-OS		Multiple Regression		
		Model 1					Model 3		
		Beta	SE	P			Beta	SE	P
		Rho	P				Beta	SE	P
Neighborhood Poverty IQR, Whites		0.48	***				--	--	--
Neighborhood Poverty Median, Minorities [^]		-0.50	***				--	--	--
Neighborhood Poverty IQR, Minorities [^]		-0.41	***				--	--	--

NOTES:

IQR-OS = Interquartile Range Overlap Statistic. MA=Metropolitan area. IQR=Interquartile Range. All proportion and segregation variables are coded from 0 to 1 (a one-point increase is interpreted as an increase 0-100%); Median income: 1-point increase is associated with a \$10,000 increase. % growth variables: 100% growth is coded as 1, 200% growth is coded as 2, etc. The log of MA population size ranges from 13.2 to 16.1. The reference group for the Region indicator variable is Midwest. Regression analyses are weighted by the MA population size. Neighborhood poverty median and IQR variables were not included in the regression analyses because the IQR-OS is a function of these numbers computationally. Higher values of IQR-OS indicate greater degree of overlap of neighborhood poverty distributions between racial/ethnic groups.

*** p<.001,

** p<.01,

* p<.05,

# p<.10

[^] “Minority” refers to blacks in Models 1-2, and refers to Hispanics in Models 3-4.