Change in Racial and Ethnic Residential Inequality in American Cities, 1970 to 2000[*]

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Abstract

Scholars interested in racial and ethnic residential inequality frequently focus on intercensal change in levels of segregation. However, prior scholarship has not estimated effects of theoretically important variables on changes in segregation conceptualized as a growth curve over a relatively long period of time. In this paper we use hierarchical linear modeling techniques (HLM) to estimate linear growth in residential inequality for a sample of U.S. cities from 1970 to 2000. In these models, repeated observations of metropolitan areas (MAs) are nested within those MAs. The results provide estimates of three indicators of residential inequality in 2000 (Index of Dissimilarity, Isolation Index, and Index of Net Difference) and the MA-level predictors of those indicators. In addition, HLM enables the estimation of 1970 to 2000 change, as well as the predictors of that change. We find that although Blacks continue to be more segregated than either Asians or Latinos, Blacks have experienced substantially greater declines than either of the other two groups. We estimate that if 1970 to 2000 trends continue, Latinos will overtake Blacks as the most residentially segregated and stratified race-ethnic group by the end of the current decade.

Scholars interested in measuring and explaining the persistence of racial and ethnic residential inequality frequently focus on temporal change in levels of segregation (e.g., Van Valey, Roof, and Wilcox 1977; Massey and Denton 1987; Farley and Frey 1994; Lewis Mumford Center 2001; Adelman 2004; Fischer et al. 2004; Logan, Stults, and Farley 2004). Scholarship in this tradition has provided important information about the extent to which segregation has persisted or eroded over time, and occasionally about the effects of city-level variables on changes in segregation (e.g., Farley and Frey 1994; Logan et al. 2004). However, a common limitation of these studies is that they compare results for a large number of individual cities, or averages from a group of cities, between two censuses. Prior research has not attempted to estimate effects of theoretically important variables on change in segregation conceptualized as growth curves over time. The advantages to the growth curve approach are twofold. First, analyzing change over a number of U.S. censuses is likely to yield more robust estimates of trends than comparisons between two censuses. Second, change over time can be described more parsimoniously by estimating one parameter (a growth curve) than multiple parameters representing change between successive pairs of censuses.

In this paper we use hierarchical linear modeling techniques (HLM) to estimate linear growth in segregation between Whites and Asians, Blacks, and Latinos[1] for a sample of U.S. cities from 1970 to 2000. In these models, repeated observations of metropolitan areas (MAs) are nested within those MAs. The results provide up-to-date measures of three indicators of segregation in 2000 and the MA-level predictors of those indicators. In addition, HLM enables the estimation of 1970 to 2000 change in segregation, as well as the predictors of that change. In the process, we test hypotheses about the causes of static and dynamic variation in the levels of segregation experienced by American Whites, Blacks, Asians, and Latinos.

[1] we use the terms "White," "Black," and "Asian" to refer to non-Latino White, Black, and Asian individuals, respectively. We follow Rubinowitz and Rosenbaum (2000) in capitalizing "White" and "Black" to underscore the point that, like Asians and Latinos, American Blacks and Whites share salient ethnic and cultural characteristics.

Data, Measures, and Methods

Data

The data for this study come from the 1970 through 2000 U.S. censuses, concatenated in the Neighborhood Change Database (NCDB). The NCDB was developed by the Urban Institute in collaboration with GeoLytics, Inc. (GeoLytics, Inc. 2003). A unique feature of the NCDB is that all census tracts[2] from 1970 to 1990 are matched to consistent census 2000 boundaries. The benefit to researchers of this geographical matching is that comparisons of segregation indexes over time are not hampered by systematically changing boundaries of the units that contribute to the calculations of those indexes or their predictors. More specifically, analyses that match census 2000 tracts to earlier census boundaries suffer upward biases in levels of the Index of Dissimilarity, whose values vary inversely with the size of the geographic units used to compute the index (Adelman 2004). Typically this is because racial and ethnic groups tend to cluster in smaller areal units, such as block groups, within larger areal units, such as census tracts (Farley 1993; Allen and Turner 1995). However, reaggregating census tracts that have split from, say, 1970 to 2000, would likely yield a similar effect, albeit in the reverse direction. In other words, using non-normalized tract boundaries would likely yield downwardly biased estimates of segregation in 1970 through 1990.

The units of analysis are 331 metropolitan areas (MAs) that were defined in the 2000 census. In general, MAs are urbanized areas of at least 50,000 inhabitants, and include a “central county” and “outlying counties” that have close economic and social relationships with the

[2] The census Bureau defines census tracts as “small, relatively permanent statistical subdivisions of a county… [with] between 2,500 and 8,000 persons and, when first delineated, are designed to be homogeneous with respect to population characteristics, economic status, and living conditions” (U.S. Bureau of the census 1992, appendix A). While tracts may not perfectly replicate the subjective definitions citizens have of their “neighborhoods” (Lee and Campbell 1997; Campbell et al. 2002), many researchers have used tracts as the best available proxy (e.g., White 1987; Jargowsky 1997; South and Crowder 1997; Quillian 1999). Moreover, if subjective deviations are distributed randomly across individuals there would be no bias in measures of “neighborhood” characteristics (see Sampson, Morenoff, and Earls 1999).

central county (Office of Management and Budget (OMB) 2000). The majority of the MAs (258) are Metropolitan Statistical Areas (MSAs), which are more or less "stand-alone" urban centers, such as Kalamazoo-Battle Creek, MI or New Orleans, LA. An additional 73 MAs are Primary Metropolitan Statistical Areas (PMSAs), which are nested within Consolidated Metropolitan Statistical Areas (CMSAs). Examples of PMSAs include Gary, IN and Chicago, IL (nested within the Chicago-Gary-Kenosha CMSA) and San Francisco and Oakland, CA (nested within the San Francisco-Oakland-San Jose CMSA) (see OMB 2000 for further details).

Following Logan et al. (2004), we restrict analyses of White-minority group segregation to MAs with at least 2,500 or an over-representation of each group, taken individually. Thus, we use 127 MAs to estimate White-Asian segregation, 253 MAs to estimate White-Black segregation, and 207 MAs to estimate White-Latino segregation. Data on a number of MAs were unavailable for 1970 because they were not defined as MAs then. In these MAs we estimated 1970 to 2000 change on the basis of change from 1980 to 2000 (see *Methods* below). Logan et al. (2004) present weighted statistics, arguing that, for example, "if mean indexes of black-white segregation are intended to describe the typical extent of segregation for blacks, these indexes should be weighted by the relative size of the black population" (p. 6). In the present analysis, we use unweighted statistics to estimate effects of MA-level characteristics, including percent minority, on MA-level levels of residential inequality. Both types of analysis are useful—the former yields information about the experiences of the typical minority group member, and the latter about the typical metropolitan area.

Measures

Dependent variables. There is an old, somewhat contentious debate over how residential inequality ought to be measured. Following a decade or so of discussion in the *American Sociological Review*, Duncan and Duncan (1955) concluded that the Index of Dissimilarity (*D*) was the best measure of residential segregation when conceptualized as evenness of population distribution. *D* is a measure of segregation between two mutually exclusive groups and can be interpreted as the percentage of one group or the other that would have to change neighborhoods in order for each neighborhood in a city to have the same composition of the two groups as the city as a whole. The formula for *D* between Whites and race-ethnic group *X* is

$$D_{WX} = \frac{1}{2}\left(\sum_{j=1}^{J}\left|\frac{w_j}{W} - \frac{x_j}{X}\right|\right)100, \tag{1}$$

where w_j is the population of Whites in tract *j*; *W* is the total MA population of Whites; x_j is the population of group *X* in tract *j*; and *X* is the total MA population of group *X*.

As pointed out by Massey and Denton (1988, pp. 282-283), defining segregation simply in terms of unevenness, and as a result measuring segregation solely with *D*, “masks considerable underlying complexity, ... for groups may live apart from one another and be ‘segregated’ in a variety of ways.” The primary alternative to *D* in the segregation literature is the family of Exposure or Isolation Indexes (*P**). When conceptualized as isolation, *P** is interpreted as the average percentage of members of a particular race-ethnic group in a city’s neighborhoods. The formula for P^* for race-ethnic group *X* is

$$P^*_{XX} = \left(\sum_{j=1}^{J}\left[\frac{x_j}{X} \times \frac{x_j}{t_j}\right]\right)100, \tag{2}$$

where x_j and *X* are as defined in equation (1), and t_j is the total population of tract *j*.

*P** is sensitive to the proportion of such groups in a city. For example, if a race-ethnic group only comprises 5 percent of the population of a city, group members will be much more likely to live in neighborhoods with many members of other groups (and thus experience a much lower *P**) than if it comprises 50 percent of the population. However, it still could be the case that these 5 percent live in only a handful of neighborhoods, and are therefore “segregated” in the sense of not evenly distributed throughout the city. For this reason, scholars generally present both *D* and *P** indices in published papers, to get at two sides of the multi-faceted phenomenon of segregation. Although many other indexes of segregation now exist, we have chosen *D* and *P** for their familiarity and ease of interpretation.

In addition, Timberlake (2002) recently applied Lieberson's Index of Net Difference (*ND*) (Lieberson 1975) to calculate levels of and changes the extent to which Whites experience more *advantaged* neighborhood contexts than Blacks, Latinos, and Asians. Timberlake draws the distinction between two types of residential inequality. *Residential segregation* is a nominal-level concept that captures the extent to which two groups tend to live in different neighborhoods. *Residential stratification* is an ordinal-level concept that captures the extent two which two groups tend to live in neighborhoods with different levels of socioeconomic status. He argues that "examining the extent to which majority group members dominate the highest status residential locations requires a measure of stratification, such as the index of net difference" (Timberlake 2002, p. 253).

As defined in equation (3) below, *ND* is interpreted as the difference between two probabilities: (1) the probability that a randomly selected White lives in a higher-ranking neighborhood than a randomly selected member of group *X* and (2) the probability that a randomly selected member of group *X* lives in a higher-ranking neighborhood than a randomly selected White. For example, a White-Black ND score of 50 indicates that the chance that the average White lives in a higher status neighborhood than the average Black is 50 percentage points higher than the chance that the average Black lives in a higher status neighborhood than the average White. The formula for *ND* between Whites and race-ethnic group *X* is

$$ND_{WX} = \left(\sum_{j=1}^{J} \left[\frac{w_j}{W} \right] CX_j - \sum_{j=1}^{J} \left[\frac{x_j}{X} \right] CW_j \right) 100 , \qquad (3)$$

where w_j, W, x_j, and X are as defined in equation (1), CX_j is the cumulative proportion of group X in tracts ranked below tract j; and CW_j is the cumulative proportion of Whites in tracts ranked below tract *j*. We rank neighborhoods by the proportion of residents in poverty, which has been of considerable interest to scholars in recent years, and is highly correlated with other measures of neighborhood socioeconomic status (Hwang and Murdock 1998; Harris 1999).

Independent variables. Following the examples of Farley and Frey (1994), Crowder (1997), and Logan et al. (2004), we measure several variables at the MA level. In models that predict the 2000 level of segregation and those that predict change from 1970 to 2000, we include the census region of the MA. In the models in Table 3 predicting 2000 levels of segregation, we include the log of population size and percentage of each minority group to account for two well-known ecological relationships; namely, larger cities and cities with larger minority populations tend to be more segregated. We include the percentage of foreign born to account for the possibility that immigrants tend to settle in ethnic residential enclaves. We also measured the percentage of each MA's residents that are elderly, in college dormitories, and in the armed forces to capture three types of MA "functional specialization:"[3] retirement, university, and military communities, respectively (Farley and Frey 1994; Logan et al. 2004). We also account for the ratio of the average inflation-adjusted income of race-ethnic minorities to Whites, in order to control for effects of income inequality (and changes in that inequality) on residential segregation patterns.

Finally, it is important to include measures of housing supply because processes of racial integration and turnover depend deeply on the availability of housing both in neighborhoods undergoing transition and in neighborhoods into which departing residents can move. Put simply,

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[3] Farley and Frey (1994) and Logan et al. (2004) place MAs into more or less (but not entirely) mutually exclusive functional specialization categories, using dummy variables to indicate MAs that are at least one standard deviation above the mean on one (or sometimes two) of these characteristics. We use quasi-continuous variables arguing that if, for example, percent elderly or in the military both have effects on levels of residential inequality, they ought to be entered into regression models as simultaneous characteristics of the same MA, in order to understand their independent effects. We have not yet been able to obtain measures of the other functional specialization categories in the two above-mentioned articles: "durable goods manufacturing," "non-durable goods manufacturing," and "government."

cities with extremely tight housing markets may exhibit low levels of neighborhood mobility of any sort, and thus little change in segregation over time. Farley and Frey (1994) find that new housing constructed between 1980 and 1989 was significantly associated with lower levels of segregation in 1990. Logan et al. (2004) find a similar relationship in 2000. Similarly, South and Crowder (1997, 1998) find that housing availability is strongly related to mobility between various types of neighborhoods. However, they also find that vacancy rates are negatively associated with Black mobility out of Black neighborhoods. They speculate that when much of the housing availability exists in Black neighborhoods, then slack housing markets alone cannot provide an avenue for Black residential mobility.

In addition, the effects of housing availability on residential segregation may vary by whether the housing in minority neighborhoods is simply vacant, and therefore less likely to attract integrating Whites, or whether it is new construction, which is more likely to attract new residents. Thus, we follow Crowder (1997) in constructing two housing supply variables: the standardized MA-level correlations between tract percentage minority, and new housing construction and housing vacancy rates (see Table 1). We expect that cities with high positive correlations between tract percent minority and vacancy rates will be more segregated than cities with negative or lower positive correlations, and that cities with high positive correlations between tract percent minority and new housing construction will be less segregated than cities with negative or lower positive correlations.

In the models in Table 4 predicting 1970 to 2000 change in segregation, we include a dummy variable scored 1 if the MA-specific growth trajectory was estimated without 1970 data. We also include measures of MA-level annualized rates of change in the variables listed above. For each MA, these rates of change *r* follow one of the following two formulae:

$$r_{1970,2000} = \frac{1}{30}\left(\frac{\left[\sum_{t=1970}^{2000} \ln\left(\frac{Z_{t+10}}{Z_t}\right) PY_{t,t+10}\right]}{PY_{1970,2000}}\right)100 \tag{4a}$$

or

$$r_{1980,2000} = \frac{1}{20}\left(\frac{\left[\sum_{t=1980}^{2000} \ln\left(\frac{Z_{t+10}}{Z_t}\right) PY_{t,t+10}\right]}{PY_{1980,2000}}\right)100\,, \tag{4b}$$

where Z is a MA-level characteristic measured in census years t and $t + 10$, $PY_{t,t+10}$ are person-years lived between census years t and $t + 10$, and $PY_{1970,2000}$ and $PY_{1980,2000}$ are person-years lived between 1970 or 1980 and 2000, respectively (Preston, Heuveline, and Guillot 2001, p. 12; Heuveline 2004). Equation (4a) is used for all MAs with valid data from 1970 to 2000 on all variables. Equation (4b) is used for (1) MAs that were not defined in 1970, (2) measuring change in minority:White income ratios, because race-ethnic group-specific income data were not collected in 1970, and (3) change in the correlation between percent minority and new housing construction, because 1960 data were not available to calculate 1960 to 1970 change in housing supply.

Person-years are estimated with the following formula:

$$PY_{t,t+T} = \frac{(N_{t+T} - N_t)T}{\ln\left(\frac{N_{t+T}}{N_t}\right)}\,, \tag{5}$$

where T is the length of the intercensal period (either 10, 20, or 30 years), and N_t and N_{t+T} are the population of each MA in census year t and $t + T$, respectively (Preston et al., p. 15). Thus, equations (4a) and (4b) yield annualized rates of change in MA characteristic Z, weighted by decade-specific rates of change to account for variations in the timing of growth (i.e., early or late) over the 30- (or 20-) year period.

Descriptive Statistics

Descriptions and means of all variables used in the analysis are presented in Table 1, broken down by race-ethnic group. In terms of the dependent variables, note the familiar findings that Blacks are the most segregated group from Whites, Asians the least, and Latinos in between. Independent variables of interest include growth rates in minority population. Note that in cities with sufficient Asian population for analysis, the Asian population has grown at an astounding average annual rate of 2.3 percent from 1970 to 2000. By contrast, the Black population has increased at about one-third of one percent per year in the 252 MAs used in the analysis of White-Black residential inequality. Latino population growth is intermediate, averaging about 1.3 percent per year in 207 MAs. Note also the housing supply variables. On average in 2000, vacant housing was more likely to be located in areas with higher Black and Hispanic populations than Asian populations. However, these correlations have declined over time, suggesting that vacant housing is becoming more evenly spread across White and race-ethnic neighborhoods. There was also a moderately strong positive correlation between tract percent Asian and new housing construction, and a negative relationship between tract percent Black and new housing construction in 2000. Furthermore, these correlations were becoming more positive for Asians and more negative for Blacks. That is, from 1970 to 2000, new housing became increasingly likely to be constructed in neighborhoods with higher percentages of Asian residents, and less likely to be constructed in areas with high Black concentrations. Thus, as expected, both housing supply variables point toward higher levels of White-Black segregation than White-Asian segregation.

(Table 1 about here)

Methods

Hierarchical linear modeling (HLM). In this paper we use HLM to estimate linear growth models to investigate trajectories of change in MA-level segregation over time. The HLM growth model is desirable because of its treatment of multiple observations of MAs as nested within MAs. One benefit of this design is that HLM is robust to varying numbers of observations within MAs. Thus, the missing data on a number of MAs in 1970 does not pose particular problems for HLM. As recommended by Raudenbush and Bryk (2002, p. 163), we use the linear growth model because of the small number of observations (3 or 4) on each MA. These growth models are one of many types of “intercepts-and slopes-as outcomes models,” in which segregation in 2000 (intercepts) and MA-level growth in segregation (slopes) are estimated for each MA using level-1 data (repeated observations of MAs). These intercepts and slopes become outcomes at level 2 to be modeled as a function of MA-level characteristics (see Raudenbush and Bryk 2002, pp. 80-85). In this analysis the level-1 model is specified as

$$Y_{tj} = \beta_{0j} + \beta_{1j}(CENSUS)_{tj} + r_{tj}, \qquad (6)$$

where Y_{tj} is segregation in census year t in MA j, β_{0j} is segregation in 2000 in MA j, β_{1j} is the average decadal change in segregation from 1970 to 2000 in MA j, and r_{tj} is a level-1 disturbance. We code the *CENSUS* variable -3 for the 1970 census, -2 for the 1980 census, -1 for the 1990 census, and 0 for the 2000 census. In so doing, the intercepts (the β_{0j}) estimated in equation (6) can be interpreted as the predicted level of segregation for city j in 2000. The *CENSUS* slopes, (the β_{1j}) can be interpreted as growth from 1970 to 2000 in segregation per decade. Thus, for city j, if β_0 were 50.0 and β_1 were -5.0, it would mean that that city had declined an average of 5 points per decade from a predicted level of 65 in 1970 to a predicted level of 50 in 2000.

At level 2, the β_{0j} and β_{1j} become outcomes to be modeled as a function of MA-level characteristics. Examples of level-2 models to be fit are

$$\beta_{0j} = \gamma_{00} + \gamma_{01}(LNMAPOP)_j + \gamma_{02}(PCBLACK)_j + ... + \gamma_{011}(SOUTH)_j + u_{0j} \tag{7a}$$

$$\beta_{1j} = \gamma_{10} + \gamma_{11}(\Delta MAPOP)_j + \gamma_{12}(\Delta PCBLACK)_j + ... + \gamma_{112}(NO70)_j + u_{1j} \tag{7b}$$

where, because the level-2 covariates are grand-mean centered (i.e., each MA-level variable Z_k is centered around the overall sample average $[Z_{kj} - Z_{k\cdot}]$), γ_{00} is the covariate-adjusted average level of segregation in 2000 for the sample of MAs, γ_{01} to γ_{011} are effects of MA-level characteristics measured in 2000 on segregation in 2000, γ_{10} is the covariate-adjusted average decadal change in segregation from 1970 to 2000 for the sample of MAs, γ_{11} to γ_{112} are effects of change in MA-level characteristics from 1970 to 2000 (except for the "region" dummy variables) on change in segregation from 1970 to 2000, and u_{0j} and u_{1j} are level-2 random effects.

Findings

Within- and Between-MA Variance

The first step in my analysis is to assess the amount of variation in the dependent variables that exists within and between MAs. Table 2 presents estimates of within-MA variance (σ^2), and between-MA variance (τ_{00}) derived from one-way ANOVA models in HLM (see Raudenbush and Bryk 2002, pp. 68-75). Figures in the bottom row are intraclass correlation coefficients (ρ), or the percentage of variance eligible to be explained at the MA-level, derived from the following formula (Raudenbush and Bryk 2002, p. 24):

$$\rho = \frac{\tau_{00}}{(\tau_{00} + \sigma^2)} \tag{8}$$

The figures in Table 2 indicate that most of the variance in MA-levels segregation is between-MAs, ranging from 57 percent in the case of Asian *D* to 89 percent in the case of Latino *P**. This reflects numerous previous findings that residential inequality has not changed dramatically over time within MAs (Van Valey et al. 1977; Farley and Frey 1994; Logan et al.

2004); thus, most of the variation from census-to-census exists between MAs. Accordingly, we expect there to be much more between-MA variation in the intercepts (2000 levels of residential inequality) than in the slopes (1970 to 2000 change in inequality).

(Table 2 about here)

Average Residential Inequality in 2000 and 1970 to 2000 Change

Figures 1 to 3 present average growth trajectories from 1970 to 2000 in the three measures of residential inequality. The data for these figures come from random-coefficient models estimated in HLM (Raudenbush and Bryk 2001, pp. 75-80), in which the model depicted in equation (6) above is estimated at level 1. At level 2, models are fit without level-2 covariates, yielding unadjusted estimates of γ_{00} and γ_{10}, that is, unadjusted by MA-level characteristics. As noted above, due to the way the *CENSUS* variable was coded, γ_{00} is interpreted as the average level of residential inequality in 2000. Values for 1970 to 1990 are derived from the following equation:

$$\hat{\bar{Y}}_{2000-T} = \gamma_{00} - n(\gamma_{10}), \quad (9)$$

where T is the length of the intercensal period (10, 20, or 30 years), $\hat{\bar{Y}}_{2000-T}$ is the estimated average level of residential inequality for all MAs in year 2000 – T, and n is the number of census prior to 2000. If average segregation has declined over time, then γ_{10} will be negative, and thus can be interpreted as average decline from 1970 to 2000. In equation (9), this negative trajectory (times the number of censuses prior to 2000) is subtracted from γ_{00}, yielding values for 1970 to 1990 that are higher than γ_{00}.

Figure 1 shows that average White-Black D has declined steadily from 1970 to 2000, from an average of about 69 in 1970 to an average of about 54 in 2000. White-Asian D has also declined over the 30-year period by about 3 points per decade, leading to a 2000 average level of about 38. Over the past three decades, Asians have gone from being slightly more segregated than Latinos to being slightly less segregated, as White-Latino *D* has increased by an average of about one-half of a point per year, to a 2000 level of about 42. Figure 2 shows similar results for Blacks in terms of isolation, with average *P** indexes declining from about 44 in 1970 to about 33 in 2000. *P** has increased for both Asians and Latinos during the period, likely reflecting growing numbers of immigrants from the two groups. Immigration would likely affect ethnic isolation in two ways: first, since *P** is sensitive to the MA minority proportion, these indexes could increase simply by virtue of growth in minority population brought about by immigration. In addition, Asian and Latino immigrants may tend to settle in preexisting ethnic enclaves, thereby increasing the overall average proportion minority in those neighborhoods.

(Figure 1 about here)

(Figure 2 about here)

As with the previous figures, Figure 3 shows that Black residential disadvantage relative to Whites has declined steadily over time, to a 2000 level of about 50, meaning that across MAs, the probability that a randomly selected White resident lives in a neighborhood with less poverty than a randomly selected Black resident is 50 percent higher than the reverse probability. This inequality in probabilities has declined about 5 percentage points per year, from a 1970 average of about 65. By contrast, Latino *ND* has increased from a 1970 average of about 29 to a 2000 average of about 39. Thus, the Black-Latino gap in *ND* has declined from about 37 points in 1970 to about 11 points in 2000. Finally, White-Asian *ND* has remained fairly constant from 1970 to 2000. Although Asians are only slightly less residentially *segregated* (*D*) than Latinos, they are considerably less residentially *stratified* (*ND*).

(Figure 3 about here)

The results from this analysis indicate that although Blacks continue to experience higher levels of residential inequality relative to Whites than do Asians or Latinos, they have experienced substantial declines in all three measures. From 1970 to 2000, average White-Black residential inequality declined 21 percent in *D*, 25 percent in *P**, and 24 percent in *ND*. By contrast, Asians have experienced a decline of 19 percent in *D*, a 214 percent increase in *P**, and virtually no change in ND. For Latinos, the equivalent changes are increases of 4 percent, 86 percent, and 36 percent. In the unlikely event that such linear trends continue in the future, White-Latino residential inequality would surpass White-Black inequality in 2011 in terms of *D*, 2008 in terms of *P**, and 2007 in terms of *ND*. By contrast, White-Asian inequality would surpass White-Black inequality in 2041 in terms of *D*, 2022 in terms of *P**, and 2037 in terms of *ND*.

Determinants of MA-level Residential Inequality

The trajectories depicted in Figures 1 to 3 are averages across all MAs; however, there may be substantial between-MA variation in both 2000 levels of residential inequality and change over time. The models in Tables 3 and 4 investigate whether that static and dynamic variation is systematically related to MA-level characteristics (fixed effects), or whether it is largely due to unmeasured MA-specific characteristics (random effects). Tables 3 and 4 present fixed effects, robust standard errors (in parentheses), and random effects from HLM intercepts- and slopes-as-outcomes models. In these models, the β_{0j} and β_{1j} from equation (6) are modeled as a function of MA-level characteristics in models like the ones depicted in equation (7).

Because all covariates have been grand-mean centered, the intercepts can be interpreted as covariate-adjusted mean levels of residential inequality in 2000 (γ_{00}) and 1970 to 2000 change per decade in segregation (γ_{10}) for all MAs. The coefficients in Table 3 can be interpreted as variation in MA-level residential inequality in 2000 associated with a one unit change in the independent variables. Total MA population has been logged, so its coefficient is interpreted as the effect of a one percent change in MA population. Minority:White income ratio, $\rho_{\text{\%minority group,}}$

$_{\text{\% vacant housing}}$, and $\rho_{\text{\%minority group, new housing}}$ have been standardized, so their coefficients are interpreted as effects of one standard deviation changes. The coefficients on the change variables (denoted with “Δs”) in Table 4 can be interpreted as effects of one percent per year changes Finally, in both Tables 3 and 4 the coefficients on the “region” dummy variables are interpreted as increments or decrements to the intercepts for the included regions relative to western MAs.

A word of caution regarding the interpretation of standard errors is in order before proceeding. As noted by Grodsky and Pager (2001), most analysts using HLM have samples of level-1 and level-2 units (e.g., a sample of students nested within a sample of schools). However, in this paper we analyze repeated measures from a census of MAs with a sufficient number of cases for analysis, which roughly corresponds to the population of MAs with sufficiently large numbers of minority residents to enable reliable MA-level estimation. That is, the standard error estimates provided by HLM5 assume some kind of probabilistic sample; however, no probability sampling design was used. Thus, we follow Grodsky and Pager (2001, p. 552) in recommending that standard errors in Tables 3 and 4 be interpreted as “estimates of parameter dispersion contaminated by measurement error.” In other words, smaller standard errors indicate more consistent effects on MA-level residential inequality. Accordingly, instead of using the conventional alpha levels of 0.01 or 0.05, we denote relatively consistently measured effects with an asterisk, to indicate that the coefficient is at least twice its standard error.

Residential inequality in 2000. As shown in Figures 1 to 3, the group-specific intercepts in Table 3 indicate a clear ordering of race-ethnic groups on the three measures of residential inequality. For each dependent variable, the covariate-adjusted mean levels of inequality in 2000 are highest for Blacks and lowest for Asians, with Latinos in between. For the most part, the effects of MA population and the percentage of each minority group conform to past findings. For log MA population, the pattern of effects mirrors the overall race-ethnic hierarchy, with population size exerting the strongest effects for Blacks and weakest for Asians, with the effect for Latinos in between. Controlling for overall population size, MA percent Black has no discernible effect on White-Black *D*. With this exception, higher percentages of each focal race-ethnic group predict higher levels of segregation for that group. That is, for example, higher percentages of Latinos predict higher levels of segregation for Latinos. In addition, higher percentages of Asians appear to have a mitigating effect on Black segregation as measured by D and Black residential stratification (ND). Note that in the models predicting Black inequality on these measures, the "% non-Latino Asian" coefficients are negative and large relative to their standard errors. Percent foreign born has few appreciable effects, perhaps in part due to its correlation with percent Asian and percent Latino.

The functional specialization variables also conform to the findings of past research, with Blacks and Latinos experiencing higher levels of segregation in MAs with higher percentages of elderly residents. For Blacks, residential inequality is lower in MAs with higher populations of college students in university housing, also true for Latino residential stratification (*ND*). All three groups experience lower inequality in MAs with higher percentages of residents in the armed forces, though these effects on *D* and *P** are small relative to their standard errors for Latinos.

(Table 3 about here)

With the exception of White-Asian *D*, effects of minority:White income ratio are appreciable, particularly for Latinos. A one standard deviation increase in average Latino:White income ratio is associated with reductions of about 5 points in *D*, nearly 3 points in *P**, and more than 10 points in *ND*. Given that *ND* uses tract-level poverty in the calculations, it is not surprising that higher levels of income equality between Whites and race-ethnic minorities are associated with lower levels of residential stratification. It is impossible to determine from these findings the mechanism that links income equality and lower levels of residential inequality. One possibility is that when enough race-ethnic minorities achieve high enough incomes, they are able to purchase residence in less segregated neighborhoods. Another is that low-income Whites may be constrained in their ability to “flee” neighborhoods undergoing integration. Whatever the mechanism, however, these findings suggest that income inequality between Whites and race-ethnic minorities may be more implicated in residential inequality than has previously been acknowledged (Massey and Denton 1993, pp. 84-88).

Both sets of housing supply coefficients are generally in the predicted direction; however, the correlations between percent minority and vacant housing tend to be small. These coefficients only substantially predict higher levels of residential stratification for Asians and Latinos. As suggested by Crowder (1997), this indicates that when a substantial supply of vacant housing is located in areas with high proportions of race-ethnic minorities, then opportunities for residential mobility alone cannot provide an avenue for increased residential integration. High MA-level correlations between percent minority and new housing construction are larger, relatively more consistently measured, and uniformly negative. This indicates that when new housing is built in neighborhoods with more race-ethnic minorities, residential inequality tends to be lower. This may only be a temporary “gentrification” effect, in which inner-city neighborhoods are rehabilitated by developers to attract young White professionals. If so, then this static relationship between new housing construction in minority areas and lower segregation would not be replicated in dynamic analyses. This is because gentrifying areas frequently experience a kind of “reverse turnover,” in which poorer race-ethnic minorities are priced out of the housing market in gentrifying areas. Nevertheless, the evidence indicates that there is at least the possibility that the development of inner-city housing markets may lead to reductions in urban residential segregation.

As for regional differences, the effects of Midwestern and northeastern location are large and consistent for Blacks. For example, relative to western MAs, Midwestern MAs are about 15, 18, and 12 points higher in terms of *D*, *P**, and *ND*, respectively. Findings for Latinos are similar, except that regional differences in isolation are small. For Asians, western MAs feature lower levels of segregation as measured with *D* and slightly higher levels of isolation. Asians in western MAs also experience higher levels of residential disadvantage than Asians in the South.

1970 to 2000 change in residential inequality. Table 4 presents covariate-adjusted MA-average trajectories of change in residential inequality (the intercepts, γ_{10}) and effects of annualized rates of change in the independent variables on those trajectories. As shown in Figures 1 to 3, White-Black residential inequality has been declining since 1970 by an average of about 5 points in *D* and *ND*, and about 4 points in *P**. In contrast, Asian *D* has been declining, *P** has been increasing, and *ND* has been holding more or less constant, while all three measures of residential inequality have been increasing for Latinos.

In terms of predictors of change, the findings in Table 4 may be most noteworthy for their lack of a coherent pattern, with a few exceptions. For Asians, cities with growing elderly populations have seen increasing levels of White-Asian residential inequality. Increasing numbers of college students has led to a decrease in Asian segregation as measured by *D*, while increasing shares of Asians has perhaps somewhat mechanically led to increasing *P**.

For Blacks, two consistent findings emerge. First, cities experiencing population growth have experienced declines in segregation. This may largely consist of newer cities in the South and West undergoing significant growth. Second, cities with increasing correlations between tract percent Black and new housing construction are experiencing increasing levels of segregation. This may indicate the difference between the static and dynamic effects of new housing construction in areas with large proportions of Blacks—in the cross-section, such cities appear to have lower levels of segregation; however, over time, such cities may simply experience re-segregation. The only consistent regional effect for Blacks is that White-Black *D* has declined more in the West than in the other regions.

(Table 4 about here)

Finally, Latinos have experienced increasing levels of residential inequality in cities with increasing proportions of Latinos. Latinos also seem to have converted rising income equality with Whites into lower levels of residential inequality. In fact, for all race-ethnic groups, cities with increasing income equality between minority groups and Whites have seen reductions in residential stratification (*ND*). Latinos have also experienced greater declines in residential inequality in the Midwest and the South, relative to the West.

Random effects. Two noteworthy points emerge from an inspection of the random effects presented in Tables 3 and 4. First, note that there is more variation in 2000 levels of residential inequality than in 1970 to 2000 change. This finding is consistent with an interpretation of segregation as having had historical roots that were strongly linked to ecological variables such as city size and percent minority. That is, segregation was built on a foundation of ecological variation, leading to dramatic variation in static levels of segregation. That original variation persists, and is observable in the large amount of variation in 2000 levels of residential inequality. Support for the ecological origins of segregation also comes from the high level of level-2 variance that is explained by the models (see the bottom row of Table 3). Quite large proportions of between-MA variance are explained by these relatively simple models, indicating that segregation, as a static characteristic of cities, is rather well captured by ecological variables. On the other hand, variation in 1970 to 2000 segregation is rather low, and less well predicted by the model. This suggests that other processes not captured by the model have led to rather uniform changes across cities. For Blacks, a likely candidate appears to be changes in White racial attitudes, and in racism more generally. A gradual and rather monolithic shift in attitudes toward Blacks, perhaps due to cohort replacement over time, could explain the steady and uniform decline in White-Black segregation over time, and therefore the relatively low level of between-MA variation captured by the ecological model.

Conclusion

In this paper we argued that measuring change in residential inequality between Whites and race-ethnic minorities as MA-level growth curves is a useful way of conceptualizing the statics and dynamics of residential inequality. Most dramatically, this method shows that White-Latino residential inequality is rapidly converging with White-Black inequality on three separate indicators. We noted that if 1970 to 2000 trends continue, Latinos will overtake Blacks as the most segregated race-ethnic group by the end of the present decade. It is difficult to say whether this represents good or bad news. On the one hand, recent trends indicate that White resistance to living with African Americans continues to erode over time, though Logan et al. (2004) report that the rate of decline appears to be slowing. Given that Whites have not typically shown the same antipathy toward Latinos as toward Blacks, perhaps the increase in Latino segregation will turn out to be fueled mostly by high levels of immigration, and therefore rather short-lived, given Latinos' demonstrated ability to assimilate into American society. On the other hand, if levels of segregation for Latino immigrants get too high, this may result in a slowing down of the typical process of Latino assimilation. Put simply, large barrios of first generation immigrants may prove more difficult to "escape" than the smaller, more heterogeneous (with respect to nativity) ethnic enclaves of the past.

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Table 1. Descriptions and Means of Variables Used in the Analysis, by Race-Ethnic Group

Variables	Description	2000 Asian	2000 Black	2000 Latino	Change 1970 to 2000[a] Asian	Change 1970 to 2000[a] Black	Change 1970 to 2000[a] Latino
Dependent variables (level 1, or "within-MA level")							
Index of dissimilarity (D_{WX})	Percent of members of group *X* (or Whites) that would have to change census tracts to achieve an even distribution of both groups across census tracts.	38.3	54.8	42.8	--	--	--
Isolation index (P^*_{XX})	Percentage of own-group residents in census tract of average member of group *X* .	9.2	33.8	23.5	--	--	--
Index of Net Difference (ND_{WX})	Difference between (1) the probability that a randomly selected White lives in a higher-SES neighborhood than a randomly selected member of group *X* ; and (2) the reverse probability	13.3	50.8	39.0	--	--	--
Independent variables (level 2, or "MA level")							
Population characteristics							
MA population	Total MA population in 100,000 (logged in Table 3)	14.1	8.3	9.8	0.56	0.49	0.58
% non-Latino Asian	Percent non-Latino Asian	5.1	3.2	3.8	2.28	2.37	2.32
% non-Latino Black	Percent non-Latino Black	11.9	13.4	11.0	0.44	0.33	0.47
% Latino	Percent Latino	13.6	9.4	14.0	1.26	1.33	1.25
% foreign born	Percent foreign born	11.6	7.6	9.8	1.03	0.99	0.98
% elderly	Percent of the population over age 65	11.6	12.6	12.2	0.32	0.38	0.34
% university	Percent of the population in college dormitories	0.9	1.0	0.8	-0.21	-0.13	-0.19
% military	Percent of total labor force in the Armed Forces	1.6	1.5	1.7	-1.54	-1.21	-1.34
Minority:White income ratio	Ratio of minority group household income to White household income, adjusted for inflation (standardized in Table 3)	1.01	0.67	0.74	0.16	0.06	0.03
Housing supply							
$\rho_{\text{\%minority group, \% vacant housing}}$	MA-level correlation of tract percentage minority group and tract percentage vacant housing (standardized in Table 3)	0.08	0.23	0.17	-0.39	-0.20	-0.35
$\rho_{\text{\%minority group, \% new housing}}$	MA-level correlation of tract percentage minority group and inter-censal change in number of housing units (standardized in Table 3)	0.27	-0.17	0.01	0.76	-0.49	0.00
Region							
Midwest	Census region	0.18	0.23	0.17	--	--	--
Northeast		0.20	0.17	0.19	--	--	--
South		0.29	0.46	0.36	--	--	--
West		0.33	0.13	0.27	--	--	--
No 1970 population	MA not defined in 1970	0.07	0.12	0.11	--	--	--

Notes : Level-1 *N* is 437 for Asians, 996 for Blacks, and 799 for Latinos. Level-2 *N* is 127 for Asians, 252 for Blacks, and 207 for Latinos.

[a] Annualized rates of change from 1970 to 2000, except for minority:White income and $\rho_{\text{\%minority group, \%new housing}}$, which are annualized rates of change from 1980 to 2000.

Table 2. HLM Estimates of Within- and Between-MA Variance in the Dependent Variables

	Dependent Variables								
	Index of Dissimilarity (D_{WX})			Isolation Index (P^*_{XX})			Index of Net Difference (ND_{WX})		
	Asian	Black	Latino	Asian	Black	Latino	Asian	Black	Latino
Within-MA variance (σ^2)	35.8	65.0	22.0	15.8	56.7	38.7	77.8	102.4	86.8
Between-MA variance (τ_{00})	48.3	129.3	109.1	51.0	382.6	301.7	165.3	242.2	317.4
Intraclass correlation coefficient (ρ)	0.57	0.67	0.83	0.76	0.87	0.89	0.68	0.70	0.79

Notes : Level-1 *N* is 437 for Asians, 996 for Blacks, and 799 for Latinos. Level-2 *N* is 127 for Asians, 252 for Blacks, and 207 for Latinos. Figures derived from one-way ANOVA with random effects models estimated in HLM5 (see Raudenbush and Bryk 2002, pp. 68-75). The format for this table was inspired by Lee and Smith (1995).

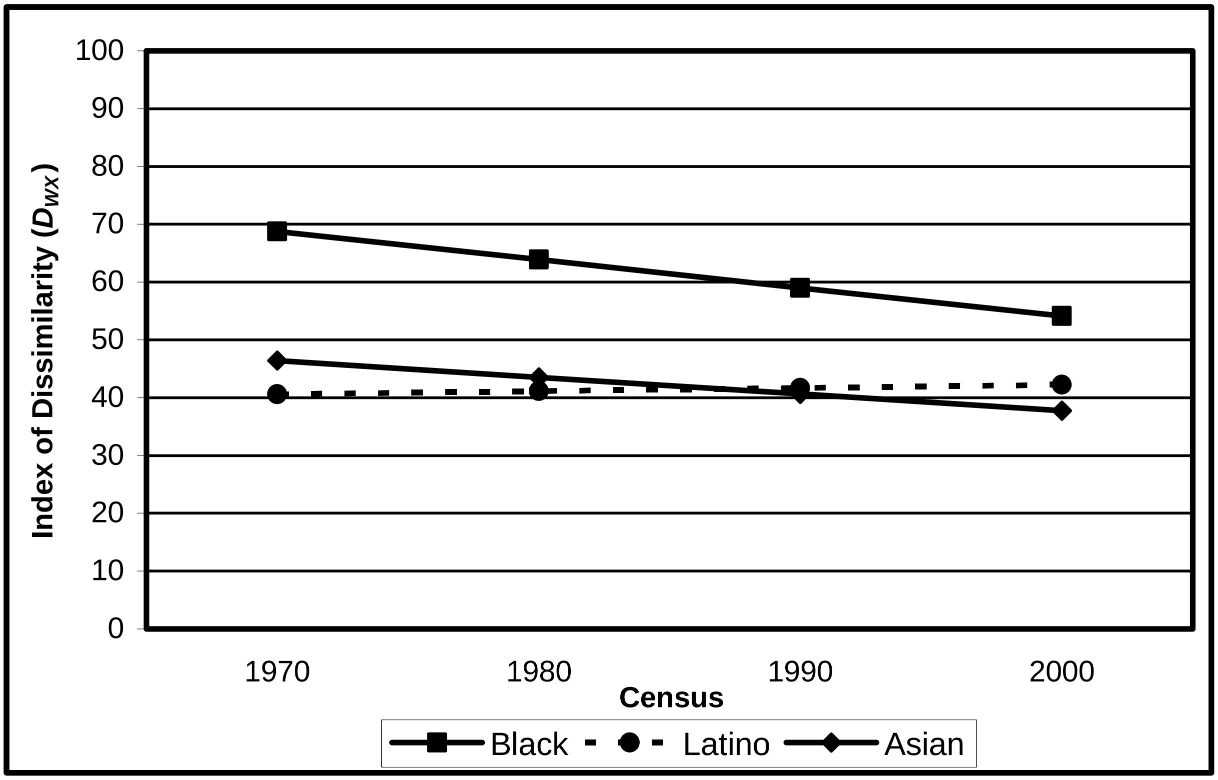

Figure 1. HLM Estimates of Average 1970 to 2000 Change in Residential Inequality (D_{WX}), by Race-Ethnic Group

Notes: Level-1 *N* is 437 for Asians, 996 for Blacks, and 799 for Latinos. Level-2 *N* is 127 for Asians, 252 for Blacks, and 207 for Latinos. Figures derived from random-coefficient models estimated in HLM5 (see Raudenbush and Bryk 2001, pp. 75-80). For each race-ethnic group, data for 2000 based on the γ_{00} (the MA-average intercepts), and figures for 1970 to 1990 estimated from the γ_{10} (the MA-average *CENSUS* slopes).

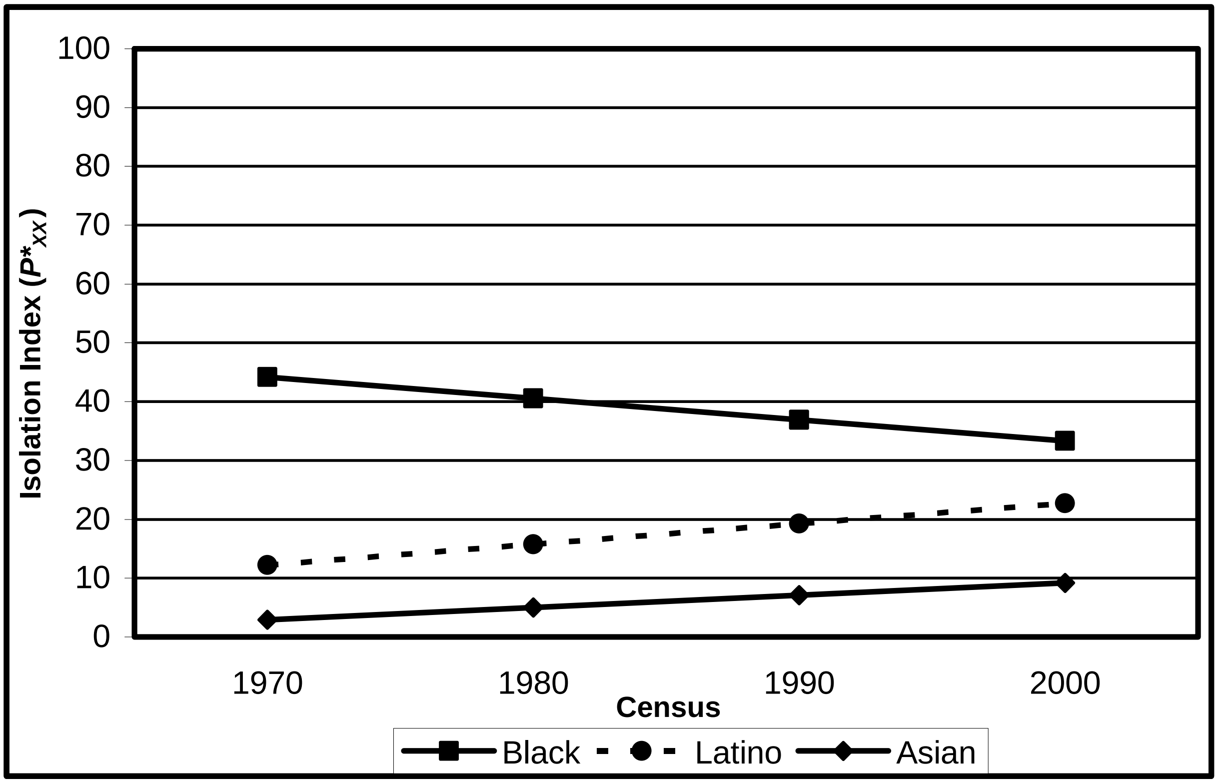

Figure 2. HLM Estimates of Average 1970 to 2000 Change in Residential Inequality (P^*_{XX}), by Race-Ethnic Group

Notes: Level-1 *N* is 437 for Asians, 996 for Blacks, and 799 for Latinos. Level-2 *N* is 127 for Asians, 252 for Blacks, and 207 for Latinos. Figures derived from random-coefficient models estimated in HLM5 (see Raudenbush and Bryk 2001, pp. 75-80). For each race-ethnic group, data for 2000 based on the γ_{00} (the MA-average intercepts), and figures for 1970 to 1990 estimated from the γ_{10} (the MA-average *CENSUS* slopes).

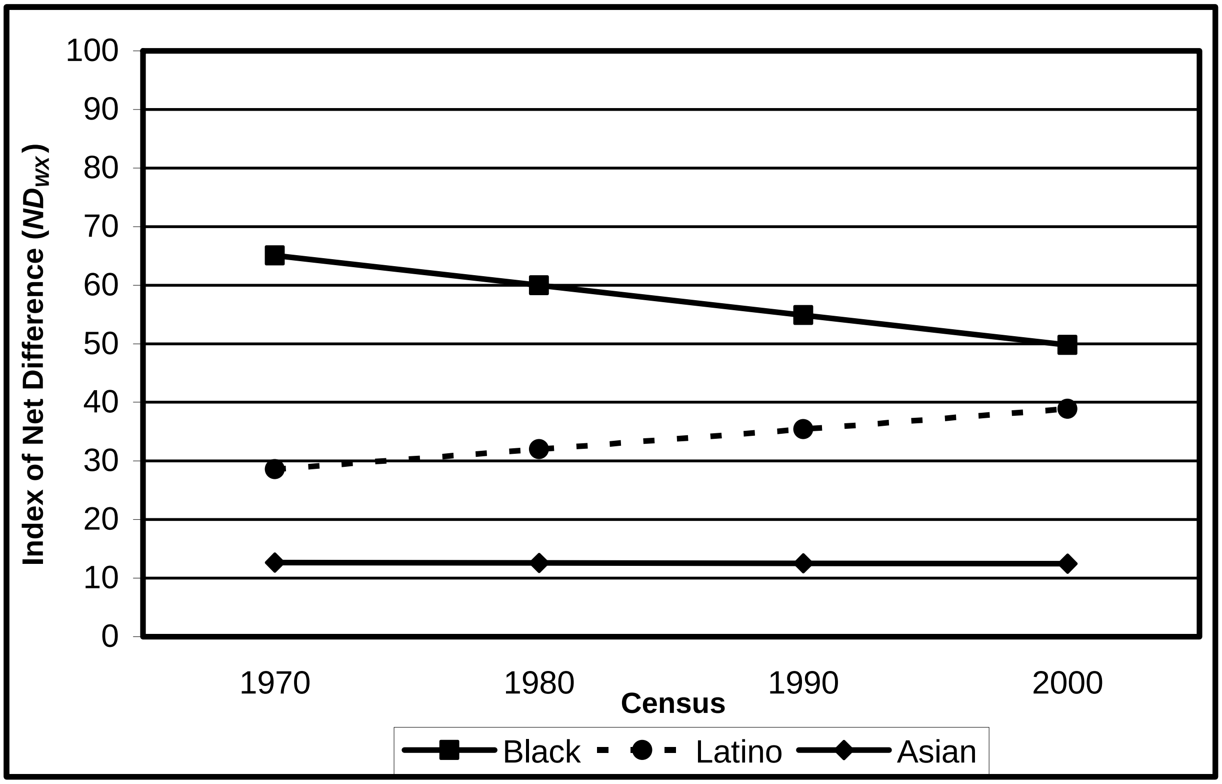

Figure 3. HLM Estimates of Average 1970 to 2000 Change in Residential Inequality (ND_{WX}), by Race-Ethnic Group

Notes: Level-1 *N* is 437 for Asians, 996 for Blacks, and 799 for Latinos. Level-2 *N* is 127 for Asians, 252 for Blacks, and 207 for Latinos. Figures derived from random-coefficient models estimated in HLM5 (see Raudenbush and Bryk 2001, pp. 75-80). For each race-ethnic group, data for 2000 based on the γ_{00} (the MA-average intercepts), and figures for 1970 to 1990 estimated from the γ_{10} (the MA-average *CENSUS* slopes).

Table 3. HLM Estimates of Fixed Effects, Robust Standard Errors (in Parentheses), and Random Effects of MA-Level Characteristics on Residential Inequality in 2000

	Index of Dissimilarity (D_{wx})			Isolation Index (P^*_{xx})			Index of Net Difference (ND_{wx})		
Parameter	Asian	Black	Latino	Asian	Black	Latino	Asian	Black	Latino
Fixed effects									
Intercept, γ_{00}	37.75 *	54.07 *	42.25 *	9.22 *	33.33 *	22.76 *	12.45 *	49.78 *	38.92 *
	(0.52)	(0.45)	(0.43)	(0.22)	(0.48)	(0.37)	(0.77)	(0.54)	(0.55)
Log MA population, γ_{01}	1.30	5.30 *	2.57 *	0.48 *	5.84 *	1.74 *	-1.54	3.79 *	1.38 *
	(0.75)	(0.52)	(0.47)	(0.24)	(0.60)	(0.36)	(0.99)	(0.65)	(0.66)
% non-Latino Asian, γ_{02}	0.29 *	-0.11 *	-0.06	1.07 *	-0.02	-0.01	0.17 *	-0.48 *	-0.04
	(0.11)	(0.05)	(0.07)	(0.05)	(0.06)	(0.03)	(0.08)	(0.11)	(0.07)
% non-Latino Black, γ_{03}	0.21 *	0.06	0.21 *	0.09 *	1.36 *	0.03	0.18	0.25 *	0.09
	(0.08)	(0.07)	(0.06)	(0.03)	(0.08)	(0.04)	(0.11)	(0.08)	(0.09)
% Latino, γ_{04}	0.09	0.01	0.26 *	0.04	-0.04	1.08 *	0.14	-0.01	0.43 *
	(0.08)	(0.06)	(0.04)	(0.03)	(0.05)	(0.03)	(0.09)	(0.08)	(0.06)
% foreign born, γ_{05}	-0.28 *	0.19 *	-0.04	0.00	0.14	-0.11	0.12	0.12	0.03
	(0.11)	(0.09)	(0.08)	(0.06)	(0.11)	(0.06)	(0.14)	(0.13)	(0.13)
% elderly, γ_{06}	-0.13	0.77 *	0.54 *	-0.11	0.78 *	0.23 *	-0.01	1.02 *	0.74 *
	(0.24)	(0.14)	(0.13)	(0.07)	(0.18)	(0.11)	(0.26)	(0.18)	(0.19)
% university, γ_{07}	0.05	-1.64 *	-0.31	0.01	-0.91 *	0.16	0.97	-2.81 *	-2.74 *
	(0.52)	(0.36)	(0.42)	(0.21)	(0.33)	(0.28)	(0.82)	(0.59)	(0.68)
% military, γ_{08}	-0.52 *	-0.27 *	-0.15	-0.12 *	-0.10	-0.09	-0.78 *	-0.59 *	-0.72 *
	(0.23)	(0.12)	(0.13)	(0.05)	(0.11)	(0.06)	(0.26)	(0.14)	(0.15)
Minority:White income ratio, γ_{09}	0.91	-2.08 *	-4.99 *	-0.50 *	-1.57 *	-2.78 *	-6.52 *	-6.37 *	-10.27 *
	(0.68)	(0.54)	(0.60)	(0.23)	(0.62)	(0.42)	(0.95)	(0.72)	(0.81)
$\rho_{\text{\%minority group, \% vacant housing}}$, γ_{010}	0.47	0.96 *	0.42	-0.01	0.80	-0.06	2.46 *	0.71	1.67 *
	(0.63)	(0.46)	(0.52)	(0.16)	(0.59)	(0.32)	(0.78)	(0.62)	(0.67)
$\rho_{\text{\%minority group, \%new housing}}$, γ_{011}	-2.72 *	-3.20 *	-3.03 *	-0.69 *	-2.66 *	-1.26 *	-5.43 *	-3.76 *	-5.09 *
	(0.64)	(0.57)	(0.58)	(0.17)	(0.56)	(0.37)	(0.87)	(0.68)	(0.73)
Midwest, γ_{012}	4.80 *	14.53 *	5.14 *	-0.10	17.66 *	-2.32	2.68	11.89 *	8.87 *
	(2.33)	(1.92)	(1.55)	(0.83)	(2.03)	(1.32)	(3.19)	(2.34)	(2.17)
Northeast, γ_{013}	3.76	12.94 *	8.71 *	0.18	9.26 *	1.42	4.22	9.17 *	6.92 *
	(2.29)	(1.90)	(1.58)	(0.87)	(1.94)	(1.51)	(2.96)	(2.57)	(2.05)
South, γ_{014}	3.11	6.52 *	0.07	-2.37 *	9.82 *	-2.77 *	-6.34 *	-1.04	-2.67
	(2.14)	(1.73)	(1.50)	(0.80)	(1.71)	(1.11)	(2.83)	(2.25)	(1.92)
Random Effects									
Variance component, τ_{00}	23.7	46.8	33.4	4.5	56.8	26.3	43.0	58.1	40.8
% of level-2 variance explained[a]	46.1	69.9	75.5	94.4	84.9	93.1	77.5	80.1	87.9

Notes : All covariates have been grand-mean centered. Level-2 N is 127 for Asians, 252 for Blacks, and 207 for Latinos. * indicates coefficient is at least twice the size of its standard error.

[a] Compared to a random-coefficients model, i.e., a level-1 model with the *CENSUS* variable as a covariate, and a level-2 model with no covariates.

Table 4. HLM Estimates of Fixed Effects, Robust Standard Errors (in Parentheses), and Random Effects of MA-Level Characteristics on 1970 to 2000 Change in Residential Inequality

	Index of Dissimilarity (D_{WX})			Isolation Index (P^*_{XX})			Index of Net Difference (ND_{WX})		
Estimate	Asian	Black	Hispanic	Asian	Black	Hispanic	Asian	Black	Hispanic
Fixed effects									
Intercept, γ_{10}	-2.88 *	-4.90 *	0.55 *	2.13 *	-3.62 *	3.52 *	-0.12	-5.08 *	3.50 *
	(0.23)	(0.19)	(0.17)	(0.15)	(0.22)	(0.16)	(0.41)	(0.27)	(0.26)
Δ MA population, γ_{11}	0.85	-1.82 *	-0.35	0.05	-3.99 *	0.18	2.57 *	-3.34 *	-2.96 *
	(0.83)	(0.60)	(0.54)	(0.46)	(0.86)	(0.35)	(1.05)	(1.04)	(0.83)
Δ % non-Latino Asian, γ_{12}	0.86	-0.23	-0.04	0.78 *	0.22	-0.31	0.21	0.00	-0.62
	(0.50)	(0.24)	(0.35)	(0.30)	(0.28)	(0.19)	(0.64)	(0.33)	(0.42)
Δ % non-Latino Black, γ_{13}	-0.35	-0.19	0.28	0.13	2.50 *	-0.53 *	0.45	0.17	0.70
	(0.48)	(0.44)	(0.24)	(0.28)	(0.60)	(0.19)	(1.03)	(0.78)	(0.36)
Δ % Latino, γ_{14}	-0.83	0.44	1.02 *	-0.65	0.49	1.97 *	1.77 *	0.98	3.89 *
	(0.50)	(0.37)	(0.35)	(0.32)	(0.43)	(0.23)	(0.63)	(0.53)	(0.45)
Δ % foreign born, γ_{15}	0.16	0.33	0.91 *	0.75	-0.69	0.42	1.02	0.14	0.93
	(0.71)	(0.43)	(0.37)	(0.48)	(0.48)	(0.31)	(0.90)	(0.58)	(0.52)
Δ % elderly population, γ_{16}	3.09 *	0.05	0.12	0.84	0.74	-1.20 *	4.07 *	1.18	1.75
	(0.83)	(0.93)	(0.56)	(0.46)	(1.00)	(0.44)	(1.35)	(1.48)	(1.57)
Δ % university population, γ_{17}	-0.64 *	-0.04	0.11	-0.02	-0.47	-0.11	-0.16	-0.68	0.05
	(0.28)	(0.22)	(0.18)	(0.11)	(0.27)	(0.12)	(0.37)	(0.40)	(0.34)
Δ % military population, γ_{18}	-0.13	-0.13	0.19 *	-0.11	0.14	-0.13	-0.56 *	-0.11	-0.12
	(0.13)	(0.12)	(0.08)	(0.07)	(0.23)	(0.08)	(0.20)	(0.20)	(0.23)
Δ minority:White income ratio, γ_{19}	0.49	-1.36	-3.08 *	-0.69	0.58	-0.49	-6.86 *	-4.60 *	-7.13 *
	(0.71)	(0.88)	(0.63)	(0.39)	(1.20)	(0.40)	(1.23)	(1.54)	(1.10)
$\Delta\rho_{\text{%minority group, % vacant housing}}$, γ_{110}	0.00	-0.07	-0.30 *	-0.12	0.18	-0.11	0.34	0.10	-0.17
	(0.13)	(0.15)	(0.10)	(0.09)	(0.21)	(0.07)	(0.18)	(0.22)	(0.14)
$\Delta\rho_{\text{%minority group, %new housing}}$, γ_{111}	-0.12	0.22 *	0.09	0.04	0.24 *	0.03	-0.21 *	0.40 *	0.11
	(0.07)	(0.07)	(0.06)	(0.04)	(0.08)	(0.04)	(0.11)	(0.15)	(0.07)
Midwest, γ_{112}	-0.94	1.76 *	-1.55 *	-0.79	-1.04	-1.97 *	1.91	-1.70	-1.78 *
	(0.86)	(0.81)	(0.62)	(0.51)	(1.03)	(0.50)	(1.34)	(1.45)	(0.87)
Northeast, γ_{113}	-0.67	3.39 *	0.67	-0.12	-0.49	0.24	2.92	-0.94	-1.29
	(0.94)	(0.94)	(0.76)	(0.57)	(1.16)	(0.61)	(1.73)	(1.59)	(1.05)
South, γ_{114}	-1.39	1.87 *	-1.46 *	-1.93 *	0.19	-2.11 *	-0.28	-2.22	-1.64 *
	(0.70)	(0.65)	(0.55)	(0.46)	(0.88)	(0.50)	(1.23)	(1.12)	(0.77)
No 1970 population, γ_{115}	0.95	-0.11	-1.27	-0.29	-0.68	-1.56 *	-1.39	-0.18	-3.38 *
	(1.07)	(0.81)	(0.78)	(0.40)	(1.08)	(0.48)	(1.16)	(1.05)	(1.17)
Random Effects									
Variance component, τ_{11}	1.7	8.0	4.3	2.2	11.1	4.2	7.5	12.6	6.3
% of level-2 variance explained[a]	40.5	21.3	39.1	32.0	31.4	47.5	50.3	31.0	66.0

Notes : All covariates have been grand-mean centered. Level-2 N is 127 for Asians, 252 for Blacks, and 207 for Latinos. Change variables (Δ) are annualized rates of change from 1970 to 2000, except for Δ minority:White income and $\rho_{\text{%minority group, %new housing}}$, which are annualized rates of change from 1980 to 2000.

[a] Compared to a random-coefficients model, i.e., a level-1 model with the *CENSUS* variable as a covariate, and a level-2 model with no covariates.