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Abstract

In the last few decades, the number of mixed-race households has increased substantially, raising questions about their impact on measures of neighborhood segregation. Specifically, this paper asks two questions: What is the sensitivity of neighborhood racial segregation measures to levels of household scale racial mixing? And what is the relationship between neighborhood racial diversity and the presence of mixed-race households? We answer these questions using confidential long form data from the 1990 US census, which provides information on household racial composition at the tract scale. The results show that racial mixing within households has meaningful effects on measurements of neighborhood segregation. Additionally, we find that mixed-race households have the greatest proportional share of neighborhood diversity in the least racially diverse neighborhoods. The conclusions offer some thoughts as to the role mixed-race households may play in future neighborhood desegregation. They also argue that better understandings of mixed-race household formation and residential location are essential for comprehending neighborhood segregation dynamics more fully.

Keywords: mixed-race households, residential segregation

INTRODUCTION

Every ten years following the release of a decennial census, social scientists busy themselves calculating measures of the residential segregation of US racial and ethnic groups. To some, the agonizingly slow declines in black-white residential segregation in recent decades - plus the recent increases in Asian-white and Latino-white segregation - demonstrate the persistence of housing market discrimination (e.g., Massey and Denton 1993; Yinger 1995; Logan, Stults, and Farley; 2004). Others argue that segregation today is more a matter of preference (e.g., Clark 2002). Regardless of how one interprets these trends, there is no doubt that neighborhood-based residential segregation is the dominant spatial barometer of US racial relations.

The neighborhood, however, is not the only scale at which scholars have assessed these relations. They have also gauged the extent of racial interaction within households, mostly by studying trends in mixed-race partnering (e.g., Bossard, 1932; Kalmijn 1993, Peach 1980; 1998; Qian 1999; Wong 1999;Qian 2002; Qian and Lichter 2005). This research shows that mixed-race partnering has become much more common in the last four decades. For instance, in 1960, just 0.4 percent of marriages crossed racial lines (US Bureau of the Census 1998). By 2000, that number had risen to 5.2 percent (author's calculations based on US Bureau of the Census 2003).[2] In several large metropolitan areas, these rates are much higher. San Diego's rate, for example, was 12.6 percent in 2000 (author's calculations based on US Bureau of the Census 2003). The increase in mixed-race partnering has three causes: first, the Supreme Court outlawed remaining state anti-miscegenation laws in 1967; second, public attitudes to mixed-race partnering have softened considerably; and third, immigration has generated much greater racial diversity in the US over the last 40 years (Root 2001; Wright et al. 2003).

Traditionally, the relationship between mixed-race partnering and residential segregation has been circumscribed to assessments of the effect of the latter on the former. In studies going back several decades, researchers have argued that high levels of residential separation between groups lead to low rates of partnering between them (e.g., Bossard 1932; Davie and Reeves 1939; Kennedy 1943; Abrams 1943; Clark 1952; Morgan 1981; Coleman and Haskey 1986; Lieberson and Waters 1988; Kalmijn and Flap 2001). The rationale for this hypothesis is simple: greater residential separation between groups means less contact between them – and fewer possibilities for the initiation of romance.

The assumption that residential segregation still matters for mixed-race partnership formation is hard to square with the evidence of rapidly rising rates of mixed-race marriage on the one hand, and slowly declining – or even increasing – levels of residential segregation on the other. The facts suggest that romantic encounters between groups must be flourishing because the possibilities for contact in non-residential space – such as work, school, and the internet - have increased substantially in recent decades (Houston et. al. 2005). All of this suggests that the effect of residential segregation on mixed-race household formation is now marginal. But it also raises the possibility that the reverse relationship is now in operation, whereby today's much greater numbers of mixed-race households affect levels of residential segregation. Marshaling evidence in support of this possibility is the goal of this paper.

To illustrate how racially mixed households could affect residential segregation consider the following hypothetical example. Imagine two neighborhoods, both 80 percent white and 20 percent black. In one neighborhood, all blacks share households with whites whereas the other has no mixed-race households. Current segregation approaches are blind to the differences between these neighborhoods, even though the structure of group relations in each place differs considerably. Crucially, segregation research cannot tell us how much the level of neighborhood segregation across these two neighborhoods is a function of household scale racial mixing. We address this deficiency by answering two specific questions in this paper: what is the magnitude of the effect of racial mixing at the household scale on levels of residential segregation in neighborhoods? And what is the relationship between neighborhood racial diversity and the presence of mixed-race households?

Before we turn to an empirical investigation of these questions, we discuss the important matter of why segregation analysis has not yet considered the effect of racial mixing within households. We will argue that there are two practical reasons for this: first, the very low rate of mixed-race partnering historically; and second, the absence of suitable household data to investigate household effects. But we will also argue that the absence of any consideration of mixed-race household effects was consistent with the racialized and gendered social norms of social research at the time at which segregation measurement first flourished.

WHY ARE MIXED-RACE HOUSEHOLDS EFFECTS ABSENT FROM RESIDENTIAL SEGREGATION ANALYSIS?

Chicago School sociologists of the 1920s produced the first conceptual framework to comprehend the racial and ethnic residential patchworks in US cities(e.g. Park 1925, Burgess 1925, cf. Sibley 1995 for an alternative view). However, the methods of segregation analysis as we would recognize them today were not introduced until the first decade after the Second World War when a vigorous discussion on the merits of different techniques occurred (e.g., Jahn, Schmitt, and Schrag 1947; Shevky and Williams 1949; Jahn 1950; Cowgill and Cowgill 1951; Bell 1953; Duncan and Duncan 1955). The index of dissimilarity emerged as the preferred method from these exchanges and its status went unchallenged for the next two decades. Then, in the mid-1970s, researchers started to questioned the interpretability of the dissimilarity measure, and advocated for a variety of increasingly sophisticated alternatives (e.g., Cortese, Falk, and Cohen 1976; Jakubs 1977; Falk, Cortese, and Cohen 1978; Massey 1978; Winship 1977, 1978; Sakoda 1981; Massey and Denton 1988). Geographers have joined these debates, proposing a number of

extensions to enhance the spatial properties of segregation measures (e.g., Jakubs 1981; Morrill 1991; Wong 1993, 2004). The index of dissimilarity still dominates, but instead of reigning supreme as it did in the past it now heads a growing pack of indexes designed to summarize different dimensions of segregation (for reviews, see White 1986; Massey and Denton 1988).

This straightforward rehearsal of some of the main technical innovations in segregation measurement tells a story of growing quantitative sophistication. It is, however, incomplete in the sense that it does not explain why analysts developed segregation methods in the first place, what prompted their development at that particular time, and what they intended their methods to measure. Of course, the development of segregation measurement, like any technology, is notable not only for what it includes as its object, but also for its exclusions. In this regard, one question about segregation measurement stands out for us: why has segregation research paid no attention to the effect of racial mixing within the home? As already noted, mixed-race marriages, and by extension mixed-race households, have been extensively investigated but in a manner which treats these unions as derivative of segregation, not as a micro scalar component *of* it.

Issues of scale have played in the foreground or background since the early days of segregation measurement. In a quarrel that continues today, some chose to measure segregation in census tracts while others advocated for smaller-sized blocks (e.g. Cowgill and Cowgill 1951; Cortese, Falk, and Cohen 1976; Wong 1997). The logic of the argument favoring smaller-sized units has appeal for it is consistent with a central geographical principle: people are more likely to interact with those who are close to them than those far away. Tracts, so the argument goes, are too large to capture the micro-geographies of movement that delimit the possibilities for inter-group contact. On its face,

there is no reason why the logic in this principle should stop at the block scale. Wong (1997), for example, has thought about the possibility of measuring segregation at the scale of land parcels. And Wu and Sui (2001, 2002) have begun to explore segregation at very fine scales by making assumptions about the micro-geographical distributions of groups from publicly available census data.

As far as we can tell, however, no one has considered the household as a micro extension of this scale hierarchy of segregation measurement. Holloway et al.'s (2005) investigation of the neighborhood segregation of mixed-race households comes closest to this analytical possibility, but it treats the household as the unit experiencing tract scale segregation rather than the unit in which segregation occurs. More importantly for this paper's purposes, no one has suggested that the segregation level within households, which is another way of describing the extent of racial mixing within households, could influence the level of neighborhood scale segregation.

Why has no one thought to measure racial mixing within households as a component of segregation? Lack of suitable household-scale data or, more accurately, the rarity of such data geocoded in census tracts or blocks, is part of the reason. The US Census Public Use Micro Samples (PUMS) allow the calculation of mixed-race partnering rates within a metropolitan area. These data, however, only locate households in PUMAs, areas of at least 100,000 people. In the scales most common in segregation analysis, blocks nest hierarchically in tracts, but in publicly available data households nest in neither. As such, publicly available household data are unmoored from the scale hierarchy that frames traditional residential segregation measurement.

If researchers had ready access to household data nested within this hierarchy they would probably calculate levels of racial mixing within

households and compare them to segregation observed in blocks and tracts. Recent segregation research by geographers on scale effects hints at this possibility (e.g., Wong 1993, 1997; Wong, Lasus, and Falk 1999). But would racial mixing within households garner as much attention as segregation at other scales even if appropriately geocoded household data was available? The answer to this question is probably no. When segregation measurement first developed, the infrequency of mixed-race households would have given segregation researchers of the 1940s little reason to consider household effects in neighborhood segregation analysis – even if they had suitable data. Although mixed-race households are much more common today, the path dependency from these earlier times is probably strong enough to retain the primary focus of segregation research on neighborhoods, regardless of the availability of geocoded household data.

While inadequate data and empirical rarity make sense as explanations for the absence of any consideration of mixed-race household effects on residential segregation, they are also our twenty first century rationalizations of decisions first made in a different time and social context. Five decades ago, researchers at the advent of segregation measurement did not refer to the rarity of mixed race households or the impossibility of measuring their effects with available data. For them, the household scale was simply off the map. In the 1940s and 1950s, it was not just that mixed-race households were scarce on the ground or unobservable in tract-level data; crucially, most people considered them socially unacceptable and, in many states, they were outlawed (Moran 2001; Root 2001; Kennedy 2003). At the time, legal restrictions on anti-miscegenation combined with moral proscriptions against interracial intimacies likely purged the idea of racially mixed households as a scale worthy of consideration in segregation analysis from most scholars' minds.

The prevailing view was that the street, or the neighborhood, was the only scale at which mixing between races could occur, at least in quantities sufficient to register on segregation measures.

While considerable antipathy toward neighborhood-scale integration was commonplace in the 1940s and 1950s, at least there were institutional signals that racial mixing at this scale was possible. It is surely no accident that the law came to enshrine the idea of public-scale mixing precisely in the era in which segregation measurement first flourished; initially through the Supreme Court's *Shelley vs. Kraemer* decision in 1948, which rejected the constitutionality of racial covenanting, followed by the rejection of the separate but equal principle in the 1954 *Brown vs. Board of Education* decision. The courts were not alone in blazing the trail. President Truman, for example, issued an executive order to desegregate the armed forces in 1948. Proscriptions on intimate mixing within households, however, were legal for almost another twenty years until the Supreme Court's *Loving vs. Virginia* decision in 1967 struck down remaining state anti-miscegenation laws.

As important as prevailing racial ideologies were for shaping the spatial focus of segregation measurement, the exclusion of the household scale from this type of analysis is about more than race. The household marks the divide between the private space of the home and the public space of the street. Some time ago, feminist geographers noted how this public-private distinction replicated itself in many forms of socio-spatial analysis, with negative consequences for our understandings of the geographies of women and gender relations (McDowell 1983, 1989; Bowlby and McDowell 1987; England 1991). This led to accusations that researchers all too often "stop at the front door" to the home, and therefore examined individuals in isolation from their domestic social relations (McDowell 1989, p 138). The ideas this debate

sparked still generate intellectual heat. A recent scholarly exchange in geography revisited the importance of domestic processes and households as a scale in social and political analysis (Marston 2000; Brenner 2001; Marston and Smith 2001; Jones, Marston, and Woodward 2005).

In its blindness to mixed-race households, residential segregation is a clear example of the public bias that feminist geographers have drawn attention to in social research. This blindness has limited insight into the way in which the private – through household formation and relations – affects assessments of segregation at the public scale of the neighborhood. Bowlby and McDowell (1987, p306) hinted at this idea when they wrote that "(g)ender relations and the institution of the family are of profound significance to all aspects of housing and residential segregation." Most importantly, it is through the prism of the home that racial understanding emerges, which is essential to understanding the household's position in racialized residential space (Hartigan 1997).

The practical consequences of ignoring the effects of mixed-race households on residential segregation were limited until recently because the numbers of such households was very small. As these numbers are now much larger, racial mixing at the household scale is likely to have some bearing on current levels of segregation in neighborhoods. Fortunately, new data makes it possible to conduct an analysis of residential segregation that assesses mixed-race household effects. The remainder of this paper makes use of these data to conduct a preliminary inquiry of these effects.

AN EMPIRICAL ANALYSIS OF MIXED-RACE HOUSEHOLDS AND NEIGHBORHOOD RESIDENTIAL SEGREGATION

Data and Methods

An investigation of mixed-race households and neighborhood-scale segregation requires data that both records the characteristics of individuals within households and is geocoded into small geographic units such as tracts. The 1990 US Census confidential long form data, a 1 in 6 sample of households, meets these requirements. These data are available for use in secure data facilities with Census Bureau approval. The Census Bureau will only publicly release empirical work derived from these data after a rigorous disclosure inspection designed to maintain the privacy of census respondents.

For the purposes of the analysis, we define a mixed-race household as any household that contains people claiming different races on the census, with races defined by the categories in effect in 1990. Approximately 2/3 of these households are headed by a mixed-race opposite sex partnered couple (married or cohabiting). The rest are a mixture of families who have adopted transracially, mixed-race same-sex couples, and housemates. We defined Latino as an additional "race-like" category, including in it all those who defined themselves as Hispanic/Latino on the ethnicity question regardless of their answer to the race question. As such, our racial six categories are white, black, Asian and Pacific Islander, American Indian, Other, and Latino.

The analysis restricts its inspection of the mixed-race household effect on residential segregation to 12 large metropolitan areas: Chicago, Dallas, Detroit, Houston, Los Angeles, Miami, New York, Philadelphia, San Diego, San Francisco, Washington DC – considered both separately and together. These 12 metropolitan areas come from a variety of regions and range widely in their racial compositions and mixed-race partnership rates. West coast metropolitan areas with large immigration populations have the highest rates

of mixed-race partnering. Metropolitan areas in the east and Midwest that have been largely untouched by immigration – and remain largely black-white in their racial composition – have the lowest rates of mixed-race partnership (Holloway et al. 2005). White-Latino headed households are the most numerous mixed-partnership combination in all 12 metropolitan areas; the second, third and fourth place positions vary by metropolitan area. We assess mixed-race household effects for the following five pairs of groups selected from the six most common mixed-race partnering combinations: white-black, white-Asian, white-black, black-Latino, black-Asian (see Holloway et al. 2005).[3]

This paper uses three methods to assess the effect of mixed-race households on residential segregation. The first examines the difference between two indexes of dissimilarity calculated at the census tract level. First, we calculate the index using all individuals from the two groups in question. Then we repeat the calculation using the same two groups having removed all mixed-race households that have members from the two groups.[4] For example, in the black-white case, we calculate a dissimilarity score between all blacks and whites, and then another dissimilarity score between blacks and whites excluding households in which blacks and whites live together. The difference between these scores reveals the effect of black-white mixing in households on the black-white neighborhood dissimilarity index. This index should be higher when it excludes mixed-race households. One way to benchmark and thus interpret the magnitude of the disparity between the two assessments is to compare the difference to the decadal change in tract-level dissimilarity between 1990 and 2000.[5] This way one can evaluate the mixed-race household effect relative to the ten-year trend in dissimilarity scores.

The second method is similar to the first but uses the exposure index instead of dissimilarity scores.[6] We calculate the exposure of one group to another both with and without the appropriate mixed-race households; the exposure index should be lower once mixed-race households are excluded. Exposure is an asymmetrical measure so we report this difference calculated for group x exposed to y, and for group y exposed to x. As with dissimilarity scores, this effect needs a benchmark for interpretation. Mirroring the procedure in the dissimilarity method, we gauge the mixed-race household effect relative to change in the tract level exposure of y to x (x to y) between 1990 and 2000.[7]

The third method makes use of the decomposition properties of the entropy index to measure the quantity of tract level diversity that comes from racial mixing within households. We are not the first researchers to use the entropy index to measure levels of diversity at multiple scales (e.g., Fischer et al. 2004; Wong 2004). However, we believe we are the first to extend its decomposition properties to the household scale. The decomposition treats the household scale as an enumeration unit; but it also offers the possibility of exploring the relationship between household-scale and neighborhood-scale diversity. It reveals the locations where racial diversity within households is most important for neighborhood diversity; that is, it suggests where increases in the number of mixed-race households are likely to have the greatest local impact on neighborhood segregation.

The entropy decomposition starts by ordering tract-level information on households (rows 1 through h) and races (columns 1 through k) into the following matrix:

Race Groups

Households	1	2	.	K	RTOT
1	X_{11}	X_{12}	.	X_{1k}	$\sum_k X_{1k}$
2	X_{21}	.	.	X_{2k}	$\sum_k X_{2k}$
.	.	.	.	.	.
H	X_{h1}	X_{h2}	.	X_{hk}	$\sum_k X_{hk}$
CTOT	$\sum_h X_{h1}$	$\sum_h X_{h2}$	.	$\sum_h X_{hk}$	$\sum_h \sum_k X_{hk}$

The individual cells X_{hk} refer to the number of people of race k in household h. The row totals (RTOT) tell us how many people are within each household. The column totals (CTOT) tell us how many are within each race. The entropy index for racial diversity within a tract, D(k), is:

$$D(k) = \sum_{k=1}^{K} p_{.k} * \ln(1/p_{.k}), \text{ where } p_{.k} = \sum_{h=1}^{H} X_{hk} \Big/ \sum_{h=1}^{H} \sum_{k=1}^{K} X_{hk} \quad ,$$

and k indexes racialized groups, and $p_{.k}$ is the fraction of a tract's population from group k (the . notation in $p_{.k}$ is shorthand for referring to marginals, which in this case are the probabilities calculated from the column totals) This index has a maximum value of ln(K).

This matrix contains other entropies. From the row totals there is the entropy in household size

$$D(h) = \sum_{h=1}^{H} p_{h.} \ln(1/p_{h.}), \text{ where } p_{h.} = \sum_{k=1}^{K} X_{hk} \Big/ \sum_{h=1}^{H} \sum_{k-1}^{K} X_{hk} \quad .$$

And there is the entropy of the cells within the matrix, D(h,k):

$$D(h,k) = \sum_{h=1}^{H} \sum_{k=1}^{K} p_{hk} \ln(1/p_{hk}), \text{ where } p_{hk} = X_{hk} \Big/ \sum_{h=1}^{H} \sum_{k-1}^{K} X_{hk} \quad .$$

With some manipulation one can see that D(h)=D(h,k) when there is no racial diversity within households. In this instance all the information in the rows of the matrix is captured by variation in the row totals. However, D(h,k)>D(h) if there is mixing within households because, in this instance, the cells of the matrix hold information not captured by the row totals.

We can construct an index of diversity using these three entropies. This index should yield an overall diversity index value equivalent to the conventional measure, D(k), calculated from the column marginals. It should also be decomposable into two additive elements – that which captures diversity due to mixing within households and that due to diversity net of mixing within households. Accordingly, we define *diversity due to mixing within households* as D(h,k)-D(h), which means we subtract the information in the row totals (household sizes) from the information in the cells themselves. The remainder is a measure of information within each row not captured by the row totals. This is zero if there is no intra-household racial mixing. And we can define *diversity net of mixing in households* as D(k)-[D(h,k)-D(h)], which says that we subtract the information due to mixing within households – in the square brackets – from the conventional measure of diversity or entropy of the column totals. The sum of these two measures equals D(k), or conventional tract level entropy.

In effect, the decomposition partitions tract diversity into that which exists within households – the private scale – and that which exists outside households or "on the street" – the public scale. We analyze the geography of this division by regressing the percentage of a tract's diversity due to mixing within households, [D(h,k)-D(h)]/D(k), on the value of tract diversity, D(k). If this relationship is insignificant then racial diversity within households is independent of tract diversity. If the percentage of tract diversity due to

household mixing decreases as tract diversity increases then racial mixing within households has the greatest share of tract diversity in low diversity tracts. Such a result would imply that mixed-race households are most important as a force for desegregation in the most segregated neighborhoods of a city. In the reverse case, when the percentage of diversity due to household mixing increases with tract diversity, mixed-race households are the largest share of neighborhood diversity where that diversity is greatest.

Dissimilarity Results

Table 1 summarizes the dissimilarity results. White-Black and Latino-Black segregation declined on average between 1990 and 2000 while white-Asian, white-Latino, and Asian-Latino residential segregation increased. As expected, the exclusion of mixed-race households yields an increase in the mean dissimilarity score for all five pairs. In the absence of mixed-race households, white-Asian and white-Latino segregation increases the most. Table 1 also shows that the mixed-race household effect as a percentage of the decadal change in dissimilarity ranges from a very large 333.33 percent for white-Asians down to a modest 20 percent for Latino-Asians. Figure 1 charts the mixed-race household effect and the decadal change in dissimilarity for the five pairs in each of the 12 metropolitan areas.

One should expect the removal of white-Latino pairs to produce the largest absolute increase in dissimilarity due to mixed-race household exclusion (9.2 points): white-Latino partnerships are by far the most numerous mixed-race household, accounting for over half of all mixed-race opposite-sex unions (Holloway et. al 2005). What is remarkable, however, is that the exclusion of white-Latino mixed-race households has an effect that is almost three times larger on average than the decadal change in the white-Latino dissimilarity

score. Figure 1 shows that the white-Latino household exclusion effect on dissimilarity is larger than the decadal change in white-Latino dissimilarity in all but three metropolitan areas (note that the range of the scale for the white-Latino chart is larger than for the other pairs to capture the magnitude of the effects in this case). Of these three metropolitan areas, Miami is perhaps the most interesting; it was the only major Latino metropolitan area in the 1990s to experience a *substantial decrease* in white-Latino dissimilarity. But Miami's increase in white-Latino dissimilarity in 1990 due to white-Latino household exclusion is almost of the same absolute magnitude as this decadal decrease.

The mixed-race household effect on white-Asian dissimilarity is second in absolute size to that for white-Latinos (5.0 points), but in relation to decadal change, it ranks first out of all mixed-race household combinations. It is no surprise, then, that in all 12 metropolitan areas the exclusion of white-Asian households has a much larger effect on white-Asian dissimilarity scores in 1990 than the reported change in white-Asian dissimilarity index during the 1990s.

The white-black and black-Latino cases are similar in the sense that the dissimilarity scores for these pairs declined in most metropolitan areas in the 1990s. The mixed-race household effect on white-black dissimilarity, however, is approximately double that for black-Latino dissimilarity, both in absolute terms and as a percentage of the decadal change in the index. Five metropolitan areas – Houston, Miami, New York, San Diego and San Francisco – actually recorded a larger black-white household effect on dissimilarity in 1990 than their change in white-black dissimilarity between 1990 and 2000. Thus, the numbers of black-white households are sufficient to exert substantial effects on black-white dissimilarity when gauged to decadal change in the

index. Finally, the Asian-Latino case records the smallest mixed-race household effect in both absolute terms and relative to the decadal change in dissimilarity.

Exposure Results

The dissimilarity index becomes unstable when small populations (such as some mixed-race household pairings) are distributed across a large number of enumeration units (Massey and Denton 1988). The exposure index does not have this problem and so perhaps provides a better test of the robustness of the effects of mixed-race households on tract-level racial segregation. Table 2 lists mean changes in exposure between 1990 and 2000, the mean effect of removing mixed-race households on exposure in 1990, and the mixed-race household effect as a percentage of the decadal change in exposure. Figure 2 plots the mixed-race household effect and the decadal change in exposure for each of the 12 metropolitan areas. Table 2 and Figure 2 report twice as many group comparisons as in the dissimilarity case because exposure is an asymmetrical measure. As a reminder, please note that the removal of mixed-race households in calculations of the exposure index should decrease the score – the opposite to the effect on dissimilarity.

Overall, the removal of mixed-race households has a smaller effect on exposure than dissimilarity relative to the decadal change in the values of these indexes. Specifically, the mixed-race household effect as a percentage of the decadal change in exposure ranges from six percent to 200 percent, with most values under 60 percent. As in the dissimilarity case, the white-Latino combination generates the largest mixed-race household exclusion effect: Latino exposure to whites drops by -4.7 points without white-Latino households; white exposure to Latinos falls by -2.0 points in the same

circumstance. These mixed-race household effects are smaller as a percentage of the decadal change in exposure than they are for the white-Latino dissimilarity index: 60 percent for Latino exposure to whites and 50 percent in the reverse case. Yet, they are still large enough to indicate that the mixed-race household effect for this group is a substantial component of neighborhood segregation.

In the three metropolitan areas with the largest Latino populations – Miami, New York and Los Angeles – the removal of white-Latino households has an effect equivalent to 60 percent or more of the decadal decline in Latino exposure to whites. But large Latino populations are no guarantee that the mixed-race household exclusion effect will be large relative to decadal change, as the same percentage in Dallas and Houston is 20 percent or less. Philadelphia, which has a small Latino population, is the only metropolitan area in which the exclusion of white-Latino households has a greater effect on Latino exposure to whites in 1990 than the decadal change. In contrast, there are five metropolitan areas in which the exclusion of white-Latino households has a larger effect on white exposure to Latinos in 1990 than the corresponding decadal change in this index: Detroit, Los Angeles, New York, San Diego and San Francisco.

The removal of white-Asian households reduces Asian exposure to whites by a mean of -1.3 points. In absolute terms, this is the third largest mixed-race household effect on exposure. In relative terms, however, it is only 14.29 percent of the average decadal decline – much smaller than the effect of mixed-race household exclusion relative to decadal change in white-Asian dissimilarity. This percentage varies among the set of metropolitan areas that have both substantial Asian populations and high rates of mixed-race partnering: high in San Diego and San Francisco but somewhat lower in Los

Angeles and New York. Different neighborhood geographies of Asian-white households in relationship to white and Asian populations between these two pairs of cities probably explain the differences in their manifestation of mixed-race household effects.

In comparison, the exclusion of white-Asian households yields an absolute reduction in white exposure to Asians of just -0.6 points – a drop less than half the magnitude of the mixed-race household effect on Asian exposure to whites. However, when compared to the decadal increase in white exposure to Asians, the fraction is more than double that for the Asian exposure to white case (30 percent compared with 14.29 percent). White exposure to Asians increased in all metropolitan areas in the 1990s – the opposite of what occurred to Asian exposure to whites. But white exposure to Asians is similar to the Asian exposure to whites case in the metropolitan geography of mixed-race household effects: San Diego and San Francisco experience the largest reductions in white exposure to Asians due to the exclusion of white-Asian households.

Black exposure to whites falls -1.1 points after excluding black-white households, which is a slightly smaller mixed-race household effect than for Asian exposure to whites. However, the black-white household effect is 57.89 percent of the decadal decline in black exposure to whites – a much larger fraction than the mixed-race household effect yields in the Asian exposure to whites case. White exposure to blacks falls by only -0.4 points after excluding black-white households – a much smaller drop than in the black exposure to whites case. But this small absolute decline is 50 percent of the value of the decadal change in white exposure to blacks. Thus, as with the mixed-race household effect on black-white dissimilarity, the exposure results indicate that

black-white household have a substantial effect on measures of black-white segregation.

In terms of metropolitan area differences, San Diego records the largest absolute decline in black exposure to whites after the removal of mixed-race households. This drop, however, is less than half of San Diego's decadal decline in the same index. Los Angeles and San Francisco catalog other large mixed-race household effects on black exposure to whites, with the effects in these two metropolitan areas actually larger than their decadal declines in black exposure to whites. Mixed-race household exclusion yields the largest absolute declines in white exposure to blacks in San Francisco and Washington, DC. San Diego, however, is the only metropolitan area in which the mixed-race household effect on white exposure to blacks is greater than the decadal change in white exposure to blacks.

Of the remaining two sets of pairs, mixed-race household exclusion causes larger absolute reductions in mean black to Latino/Latino to black exposure than mean Asian to Latino/Latino to Asian exposure. Moreover, these effects are also a larger percentage of the decadal change in exposure in the black to Latino/Latino to black cases than in the Asian to Latino/Latino to Asian cases. The mixed-race household effect as a percentage of the decadal change in Latino to black exposure is especially large and suggests that household scale mixing may be very important for increasing the exposure of Latinos to blacks. The reverse is not true: Latino-black households do not seem to play a substantial role in increasing the exposure of blacks to Latinos.

Decomposition Results

Table 3 lists the results of the decomposition procedure for both the individual metropolitan areas and them all combined (the last row). The two sets of columns of most interest are the ones listing summary statistics for tract diversity, D(k), and the percentage of diversity due to tract mixing (which is calculated for each tract as $100 \cdot [D(h,k)-D(h)]/D(k)$). We calculated these values using tracts with more than 50 people to ensure that the percentage of diversity due to tract mixing was not the result of mixed-race households living in sparsely populated tracts.

Mean tract diversity varies from a low of 0.308 in Detroit to a high of 0.837 in San Francisco. For reference purposes, D(k) has a theoretical maximum of 1.79 – which is the natural logarithm of the number of race categories. Thus, San Francisco's average tract diversity is just under half of the maximum, while Detroit's is less than a fifth of maximum possible diversity. Each metropolitan area, however, has considerable variation in tract diversity (indicative of spatial variation in residential segregation).

Our main attention, however, centers on the percent of tract diversity due to mixing in households. Like tract diversity, this percentage varies considerably by metropolitan area from a low of 5.9 percent in Atlanta to a high of 12.8 percent in San Diego, with a metropolitan area mean of 8.7 percent. In some tracts, however, household-scale racial mixing comprises a much higher fraction of diversity, with percentage shares over 50 percent for some tracts in Chicago, Dallas, and New York. Note also that metropolitan areas with the highest mean percentages of tract diversity due to mixing in households tend to have the highest mean tract diversity (e.g., San Francisco, San Diego, Miami and Los Angeles). However, Detroit, with the lowest mean tract diversity, also records one of the highest mean percentages of tract

diversity due to household mixing. Moreover, its maximum percentage of tract diversity due to household mixing (49.5 percent) is higher than in some metropolitan areas with much greater mean tract diversity. Thus the relationship between a metropolitan area's mean tract diversity and the role of household-scale mixing is not straightforward.

Unpacking these relationships requires investigation at the tract, not metropolitan, scale. Regressing the percentage of tract diversity due to mixing in households on two independent variables – first, overall tract diversity, D(k), and second, the percentage of mixed-race opposite-sex couples in a tract – provides a simple way of investigating the relationship between household scale mixing and neighborhood diversity. The first independent variable it tells us whether mixed-race households are a larger fraction of diversity in low or high diversity neighborhoods. The second independent variable measures how sensitive this fraction is to the percentage of mixed-race opposite couples in a tract. To explore the possibility that these effects may be non-linear we also include quadratic terms for both independent variables. We estimated this regression separately for each of the 12 metropolitan areas as well as a pooled version combining all the tracts. The estimations use mean centered independent variables; the intercept is thus an estimate of the percentage of diversity due to household mixing at mean values for tract diversity and percentage of mixed-race opposite couples. Table 4 lists the results.

The percentage of tract diversity due to mixing falls as tract diversity increases in all metropolitan areas and does so across all metropolitan areas, but at different strengths. The positive coefficients on $D(k)^2$ indicates that these declines attenuate as tract diversity increases. To no surprise, higher percentages of mixed-race opposite sex couples in a tract increase the

percentage of tract diversity due to household mixing. While increased mixed-race partnering will raise the percentage of a tract's diversity that comes from mixing within households it does so unevenly. In metropolitan areas with relatively high tract diversity, the coefficient tends to be closer to one, whereas in metropolitan areas with lower diversity it is a little larger. This suggests that increased mixed-race partnering in low diversity metropolitan areas will have a greater effect on the percentage of diversity due to mixing in households than in high diversity metropolitan areas. This interpretation is complicated by the quadratic term, which moderates the mixed-race opposite sex couple effect the most in low diversity metropolitan areas.

Figure 3 uses the regression results to plot the relationship between tract diversity and the percent of tract diversity due to mixing in households for four selected metropolitan areas and the pooled sample. These four metropolitan areas capture a wide range of types in this relationship, allowing us to visualize its dynamics clearly in a number of representative locations. We evaluated these regression plots at the mean value of percentage mixed-race opposite sex couples in a tract. Note that increase in this mean will displace the plotted curves up, whereas decreases shift it down; in neither case do the slopes alter.

Figure 3 makes it immediately clear that the highest percentage of tract diversity due to mixing within households exists at the lowest levels of tract diversity. To be precise, in tracts in which one group predominates about a fifth of the diversity derives from mixed-race households. Thus, experiences of difference in the most segregated tracts of large US metropolitan areas come disproportionately from mixed-race households. Household-scale mixing could be the leading edge of desegregation in these tracts or, more pessimistically, it

could be the less threatening and therefore acceptable configuration of diversity in the most segregated neighborhoods.

The percentage of tract diversity due to mixing in households declines as tract diversity increases but at a decreasing rate. In Los Angeles's case, the decline continues, albeit more gradually, through even the most diverse tracts. In contrast, other metropolitan areas, especially the least diverse and most segregated black-white places, evince a flex point after which the percent of tract diversity within households increases with tract diversity. Some caution is essential here, for these lower-diversity metropolitan areas have few highly diverse neighborhoods. Nevertheless, this does suggest that metropolitan areas that remain largely divided between black and white populations have a different diversity configuration than places that also have large Asian and Latino populations. This is consistent with Holloway et al.'s (2005) findings that black-white mixed-race families are unlike other mixed-race household combinations in that they are more likely to live in the most diverse neighborhoods and not gravitate to white- or black-dominated tracts, even when they have high incomes or are highly educated. These scholars suggested that this difference reflects the distinctive position of black-white mixing in mixed-race America.

CONCLUSIONS

The prevailing view of the relationship between residential segregation and mixed-race households is that the former constrains the latter through the limits that residential segregation places on the possibilities for mixed-race partnering. Thus far, nobody has entertained the possibility of the reverse relationship, in which increasing numbers of mixed-race households affect levels of neighborhood segregation. Today, the idea that residential

segregation drives mixed-race partnering rates does not have much empirical purchase (Houston et al. 2005). Yet, as our results show, there is considerable evidence in support of the reverse relationship. Specifically, the recent growth in mixed-race partnering has yielded sufficient numbers of mixed-race households to affect levels of residential segregation substantially. Thus, racial mixing at the scale of the household should be part of the explanation for levels of segregation in neighborhoods.

To be more precise, our empirical findings show that without racial diversity within households, neighborhood segregation in 1990 would have been markedly higher. Moreover, in many metropolitan areas, and for several pairs of groups, the exclusion of mixed-race households has a greater effect on segregation in 1990 than the decadal changes in segregation recorded between 1990 and 2000. Importantly, this result holds for black-white segregation, as well as other groups, meaning that mixed-race household effects on segregation are not restricted to groups with the highest mixed-race partnering rates.

The neighborhood diversity analysis begins to throw light on the intra-metropolitan geography of mixed-race household effects on residential segregation. It shows that mixed-race households tend to be the largest fraction of diversity in the most segregated neighborhoods of all metropolitan areas. This could be because mixed-race households are a less threatening combination of diversity in homogenous residential spaces. Alternatively, it may be that such households have a greater willingness to live in these spaces when one member of the household is a member of the dominant neighborhood group. In largely black-white cities, mixed-race households also contribute a disproportionately large share of diversity in the most diverse neighborhoods. This is consistent with previous research indicating a desire on the part of black-white households to blend into areas in which difference is the norm

(Holloway et al. 2005). Obviously, we need to explore the details of these intra-metropolitan dynamics and their variation across space in greater depth. The fundamental result, though, is that the geography of mixed-race household effects is uneven.

The empirical work made use of confidential census data from 1990, benchmarking mixed-race household effects in that year against 1990-2000 decadal changes in segregation. The next step is to access the same data from 2000 to calculate the contributions of the 1990s increase in mixed-race household formation, and specifically growth in mixed-race partnering, to the changes in segregation. What would segregation levels have been in 2000 if mixed-race household formation had not increased? And did the neighborhood geography of diversity change in response to this increase? The answers to these questions will give us precise estimates of the importance of household racial mixing to decadal changes in neighborhood scale residential segregation. And they will allow us to see how much projected future increases in mixed-race household formation will affect the structure of residential segregation in the decades to come.

This paper's findings, along with the anticipated results of future research on the above questions, should prompt inquiries about the role of mixed-race households in the dynamics of residential segregation. Current frameworks for understanding residential segregation dynamics rest exclusively on extensions to Schelling's (1971) famous residential preference model (e.g. Clark 1991). In essence, that model has agents of different groups choosing neighborhoods in which to live based on their preference for neighbors from different groups. But our research suggests that this model is incomplete in the sense that neighborhood segregation levels are likely to change as the fraction of the population living in mixed-race households changes. This effect will amplify over

time as mixed-race couples have children who by definition add new forms of hybrid diversity to their neighborhoods. It is entirely possible that some neighborhoods, and perhaps some cities, will experience more change in their residential segregation through growth in mixed-race households than any other mechanism.

From this perspective, investigations of residential segregation dynamics need to branch out and consider the processes affecting mixed-race household formation. To this end, research should investigate the places beyond neighborhoods where mixed-race partnerships seem likely to form and flourish (Houston et al. 2005). There are some extant studies to guide this research. Surveys in Europe back the notion that neighborhoods are unlikely venues for such romantic meetings (Bozon and Heran 1989, Kalmijn and Flap 2001). In the US, equal employment law has mandated the presence in the workplace of occupational equals from racially diverse groups, elevating the possibility of mixed-race partnership formation there (Estlund 2003). Maps of residential and workplace segregation confirm the idea that residentially segregated groups work in places where the prospects for encountering people from other groups are much greater than nearby home (Ellis, Wright, and Parks 2004). Of course, proximity to difference does not automatically generate the understandings necessary for relationships to form, even among occupational equals (Steinhorn and Diggs Brown 1999; Bell and Nkomo 2001; Reitman 2005). But the fact that mixed-race partnerships are rapidly increasing in frequency suggests that these contacts are of some consequence somewhere in urban space. The more we know about how mixed-race households form, and about where they live in relation to other households, same and mixed-race, the more complete our understanding of residential segregation dynamics will be. As such, mixed-race households render the

entreaties of feminist geographers to look within the home to understand residential segregation even more compelling.

NOTES

[1] The Russell Sage Foundation provided funding for the research in this paper. This paper reports the results of research and analysis undertaken while the authors were conducting research approved by the Center for Economic Studies at the U.S. Census Bureau. It has undergone a Census Bureau review more limited in scope than that given to official Census Bureau publications. Research results and conclusions expressed are those of the authors and do not necessarily indicate concurrence by the Census Bureau. It has been screened to insure that no confidential information is revealed. We wish to thank Rebecca Acosta at the California Census Research Data Center for her generous assistance with the data and disclosure requests. Early versions of this paper were presented at the annual meeting of the Southern Demographic Association in Washington DC, October 2003; at the Center for Statistics in the Social Sciences at the University of Washington, January 2004; and at the annual meeting of the Association of American Geographers in Philadelphia, March 2004. We thank participants at these meetings for their comments. We also thank Kim England and Serin Houston for their helpful comments on earlier drafts of this paper.

[2] The addition of a new race category and multiracial reporting on the 2000 Census makes comparison with earlier estimates of intermarriage rates problematic. For 2000, we aggregated Asians and Pacific Islanders together to conform to the 1990 joint Asian Pacific Islander category. We also adopted a procedure that treats most marriages as mixed if they involve couples who report a different single or multiple race grouping from their partner. This definition has little effect on estimates of the mixed race marriage rate. For example, when calculated only for those who report a single race in 2000 the rate drops just marginally.

[3] White-Native-American partnerships are the excluded combination because the numbers of Native Americans is very small in each of the 12 metros is very small, rendering their segregation measures of questionable value.

[4] The ubiquitous dissimilarity index (D) captures unevenness in residential distributions between two racial groups:

$$D = .5 * \sum_{j=1}^{J} \left| \left(\frac{w_j}{W} - \frac{x_j}{X} \right) \right|$$

where j indexes census tracts, and w and x indexes the two racial groups. W and X are the total populations of groups w and x, respectively, across all tracts, and w_j and x_j are tract counts of the respective groups.

[5] The decadal change in dissimilarity is calculated from indexes available on the census data page of the Lewis Mumford Center for Comparative Urban and Regional Research at the University at Albany: http://mumford.albany.edu/census/data.html

[6] The exposure (isolation)index, popularized by Lieberson (1981):

$$ {}_{w}P*_{x} = \sum_{j=1}^{J} \left(\frac{w_j}{W} * \frac{x_j}{t_j} \right) $$

calculates group x's population share in group w's typical tract, or commonly, the residential exposure of group w to group x; where j indexes census tracts, w and x index racial groups, and t is the total population of all racial groups. W is the total population of group w across all tracts, w_j, x_j, and t_j are tract counts of the respective groups. For example, a white-black index value of .23 indicates that whites live in neighborhoods where blacks constitute, on average, 23 percent of the tract's population. The index can be computed for each racial group in the population (including group w's residential exposure to itself – or group w's residential isolation), and the resultant values sum to 1.

[7] The decadal change in exposure is calculated from indexes available on the census data page of the Lewis Mumford Center for Comparative Urban and Regional Research at the University at Albany: http://mumford.albany.edu/census/data.html

REFERENCES

Abrams, R.H. 1943. "Residential Propinquity as a Factor in Marriage Selection: Fifty year Trends in Philadelphia." *American Sociological Review* 8: 288-94.

Bell, W. 1954. "A Probability Model for the Measurement of Ecological Segregation," *Social Forces,* 32: 357-364.

Bell, E. and Nkomo, S. M.. 2001. *Our separate ways: Black and white women and the struggle for professional identity.* Boston: Harvard Business School Press.

Blau, Peter M. 1977. *Inequality and Heterogeneity: A Primitive Theory of Social Structure*. New York: Free Press.

Bossard, J. 1932. "Residential propinquity as a factor in marriage selection." *American Journal of Sociology,* 38: 219-24.

Bowlby, S.R. and McDowell, L. 1987. "The Feminist Challenge to Social Geography." In *Social Geography: Progress and Prospect*, ed., Pacione, M. London: Croom Helm: 295-323.

Bozon M., and Heran F., 1989. "Finding a Spouse: A Survey of how French Couples Meet." *Population*, Vol. 44: 91-121.

Brenner, N. 2001. "The Limits to Scale? Methodological Reflections on Scalar Structuration." *Progress in Human Geography* 25: 591–614.

Burgess, E.W. 1925. “The Growth of the City: An Introduction to a Research Project.” In *The City*, ed., Park R.E., Burgess, E.W., and McKenzie, R.D. Chicago: Chicago University Press: 47-62.

Clark, A. 1952: An examination of the operation of residential propinquity as a factor in mate selection. *American Sociological Review,* 17(1), 17-22.

Clark, W.A.V. 1991. Residential preferences and neighborhood racial segregation: A test of the Schelling segregation model. *Demography* 28: 1-19.

Clark, W.A.V. 2002. “Ethnic Preferences and Ethnic Perceptions in Multi-Ethnic Settings.” *Urban Geography* 23: 237-56.

Coleman, D. and Haskey, J. 1986. “Marital distance and its geographical orientation in England and Wales, 1979.” *Transactions of the Institute of British Geographers,* 11: 337-355.

Cortese, C.F., Falk, R.F. and Cohen, J.K. 1976. “Further Considerations on the Methodological Analysis of Segregation Indices.” *American Sociological Review,* 41: 630-37.

Cowgill, D.O., and Cowgill M.S. 1951. "An Index of Segregation Based on Block Statistics." *American Sociological Review,* 16: 825-831.

Davie, M.R., and Reeves, R.J. 1939. “Propinquity of Residence Before Marriage.” *American Journal of Sociology* 44: 510-517.

Duncan, O. D., and Duncan B. 1955. "A Methodological Analysis of Segregation Indexes." *American Sociological Review* 20: 210-217.

Ellis, M., Wright, R., and Parks, V. (2004) "Work Together, Live Apart? Geographies of Residential and Workplace Segregation in Los Angeles." *Annals of the Association of American Geographers* 94: 620-637.

Estlund, C. 2003. *Working Together: How Workplace bonds Strengthen a Diverse Democracy.* New York: Oxford University Press.

England, K. 1991 "Gender Relations and the Spatial Structure of the City," *Geoforum* 22: 135-147.

Falk, R. F, Cortese, C.E. and Cohen, J. 1978. "Utilizing Standardized Indices of Residential Segregation: Comment on Winship" *Social Forces* 55:1058-66.

Fischer, C.S., Stockmayer, G., Stiles, J., Hout, M. 2004. "Distinguishing The Geographic Levels And Social Dimensions Of U.S. Metropolitan Segregation, 1960-2000." *Demography* 41(1), 37-59.

Hartigan, J. 1997. "Locating White Detroit." In *Displacing Whiteness: Essays in Social and Cultural Criticism,* Frankenberg R. ed., 180-213. Durham: Duke University Press.

Holloway, S.R., Ellis, M., Wright, R. and Hudson, M.A. 2005. Partnering 'out' and fitting in: residential segregation and the neighborhood contexts of mixed-race households. *Population, Space, and Place* 11, 299–324.

Houston, S., Wright, M., Ellis, M., Holloway, S., and Hudson, M. 2005. "Places of Possibility: Where Mixed-race Partners Meet." *Progress in Human Geography* 29 (6) 1-18.

Jahn J.A., Schmid, C.J., and Schrag C. 1947. "The Measurement of Ecological Segregation."*American Sociological Review,* 12, 293-303.

Jahn, J.A. 1950. "The Measurement of Ecological Segregation: Derivation of an Index Based on the Criterion of Reproducibility." *American Sociological Review.* 15, 100-104.

Jakubs, J.F. 1977. "Residential Segregation: The Taeuber Index Reconsidered." *Journal of Regional Science* 17:281-303.

Jakubs, J.F. 1981. "A Distance-based Segregation Index." *Journal of Socio-Economic Planning Sciences*. 15: 129-126.

Jones JP, Marston S, and K Woodward 2005 "Human Geography without Scale" *Transactions of the Institute of British Geographers*, 30: 416-432.

Kalmijn, M. 1993. "Trends in black/white intermarriage." *Social Forces,* 72*:* 119–146.

Kalmijn, M.1998. "Intermarriage and homogamy: causes, patterns, trends." *Annual Review of Sociology,* 24: 395-421.

Kalmijn, M. and Flap, H. 2001. "Assortative meeting and mating: unintended consequences of organized settings for partner choices." *Social Forces,* 79: 1289-1312.

Kennedy, R.J.R. 1943. “Premarital Residential Propinquity and Ethnic Endogamy.” *American Journal of Sociology,* 48: 580-584.

Kennedy, R. 2003. *Interracial Intimacies.* New York: Knopf.

Lieberson, S. 1981. “An Asymmetrical Approach to Segregation.” In *Ethnic Segregation in Cities*, ed., Peach C., Robinson V., and Smith S. London: Croom Helm: 61-82

Lieberson, S. and Waters, M. 1988: *From many strands: ethnic and racial groups in contemporary America.* New York, NY: Russell Sage.

Logan, J., Stults, B. and Farley, R. 2004: “Segregation of minorities in the metropolis: two decades of change”. *Demography,* 41: 1-22.

Marston, S.A. 2000. “The social construction of scale.’ *Progress in Human Geography* 24: 219–42.

Marston, S.A. and Smith, N. 2001. “States, scales and households: limits to scale thinking? A response to Brenner.” *Progress in Human Geography* 25: 615–19.

Massey, D.S. 1978. "On the Measurement of Segregation as a Random Variable." *American Sociological Review* 43:587-90.

Massey, D.S., and Denton, N.A. 1988. "The Dimensions of Residential Segregation." *Social Forces* 67: 281-351.

Massey, D.S., and Denton, N.A.1993. *American Apartheid.* Cambridge: Harvard.

McDowell, L. 1983. "Towards an Understanding of the Gender Division of Urban Space." Environment and Planning D: Society and Space 1: 59-72.

McDowell, L. 1989. "Women, Gender and the Organization of Space." In *Horizons in Human Geography*, ed., Walford, R. London: MacMillan: 136-151.

Moran, R.F. 2001. *Interracial Intimacy: The Regulation of Race & Romance.* Chicago: University of Chicago Press.

Morgan, B. 1981. "A contribution to the debate on homogamy, propinquity, and segregation." *Journal of Marriage and the Family,* 43: 909-921.

Morrill, R. (1991). "On the Measure of Geographical Segregation." *Geography Research Forum* 11: 25–36.

Park, R.E. 1925. "The City: Suggestions for the Investigation of Human Behavior in the Urban Environment." In *The City*, ed., Park R.E., Burgess, E.W., and McKenzie, R.D. Chicago: Chicago University Press: 1-46.

Peach, C. 1980. "Ethnic segregation and intermarriage." *Annals of the Association of American Geographers,* 70: 371-381.

Qian, Z. 1999. "Who intermarries? education, nativity, region, and interracial marriage, 1980-1990." *Journal of Comparative Family Studies* 30: 579-597.

Qian, Z. 2002. “Race and Social Distance: Intermarriage with Non-Latino Whites.” *Race and Society* 5: 33-47.

Qian, Z. and D.T Lichter. 2005. “Interpreting Recent Trends in Interracial Marriage: The Role of Racial Classification, Immigration, and Cohabitation.” Unpublished paper, Department of Sociology, Ohio State University.

Reitman, M. 2005. ‘Uncovering the white place: whiteness and whitewashing at work.” *Social and Cultural Geography*. Forthcoming.

Root, M. 2001. *Love’s revolution: interracial marriage*. Philadelphia, PA: Temple University Press.

Sakoda, J.M. 1981. "A Generalized Index of Dissimilarity!' *Demography* 18:245-50.

Schelling, T. 1971. "Dynamic models of segregation." *Journal of Mathematical Sociology* 1:143-186.

Shevky, E., and Williams, M. 1949. *The Social Areas of Los Angeles,* Berkeley: University of California Press.

Steinhorn, L. and Diggs-Brown, B. 1999. *By the color of our skin*. New York: Dutton.

U.S. Bureau of the Census. 1998. “Race of Wife by Race of Husband 1960, 1970, 1980, 1991, 1992.” http://www.census.gov/population/socdemo/race/interractab1.txt. Washington D.C.: U.S. Bureau of the Census.

U.S. Bureau of the Census. 2003. 2000 Census of Population and Housing. One Percent Public Use Microdata Sample, United States. Washington D.C.: U.S. Bureau of the Census.

Winship, C. 1977. "A Reevaluation of Indexes of Segregation." *Social Forces* 55: 1058-66.

Winship, C. 1978. "The Desirability of Using the Index of Dissimilarity or Any Adjustment of it for Measuring Segregation." *Social Forces* 57: 717-21.

Wong D.W.S. 1993. "Spatial Indices of Segregation." *Urban Studies* 30: 559-572.\

Wong D.W.S. 1997. Spatial Dependency of Segregation Indices. *The Canadian Geographer* 41: 128-136.

Wong D.W.S.1999. A Geographical Analysis of Multiethnic Households in the United States. *International Journal of Population Geography* 5: 31-48.

Wong D.W.S.2004. "Comparing Traditional and Spatial Segregation Measures: A Spatial Scale Perspective." *Urban Geography* 25: 66-82.

Wong, D.W.S., Lasus, H., and Falk R.F., 1999. "Exploring the Variability of Segregation Index D with Scale and Zonal Systems: An Analysis of Thirty U.S. Cities." *Environment and Planning A* 31: 507-522.

Wright, R., Houston, S., Ellis, M., Holloway, S. and Hudson, M. 2003. "Crossing Racial Lines: Geographies of Mixed-race Partnering and Multiraciality in the United States." *Progress in Human Geography* 27: 457–74.

Wu, X.B., and Sui, D.Z. 2001. "An Initial Exploration of a Lacunarity-Based Segregation Measure." *Environment and Planning B: Planning and Design* 28: 433-446.

Wu, X.B., and Sui, D.Z. 2001. 2002.. "GIS-Based Lacunarity Analysis for Assessing Urban Residential Segregation." ESRI International User Conference July 8-12, 2002. http://gis.esri.com/library/userconf/proc02/pap0667/p0667.htm (October 2005).

Yinger, J. 1995. Closed Doors, Opportunities Lost: The Continuing Costs of Housing Discrimination. New York: Russell Sage.

Groups	Mean Change in Dissimilarity 1990-2000	Mean Change in Dissimilarity Due to Elimination of Mixed-Race Households, 1990	Mixed-Race Household Effect as a Percentage of the Decadal Change
White-Black	-2.8	2.0	71.43%
White-Asian	1.5	5.0	333.33%
White-Latino	3.4	9.2	270.59%
Black-Latino	-3.8	1.2	31.58%
Asian-Latino	3.0	0.6	20.00%

Table 1. Mean Effect of the Elimination of Mixed-Race Households on Dissimilarity.
Note: Means are the averages of the values observed in the 12 metropolitan areas.
Source: Confidential Long Form Sample US Census, 1990.

Groups	Mean Change in Exposure 1990-2000	Mean Change in Exposure Due to Elimination of Mixed-Race Households, 1990	Mixed-Race Household Effect as a Percentage of the Decadal Change
White to Black	0.8	-0.4	50.00%
Black to White	-1.9	-1.1	57.89%
White to Asian	2.0	-0.6	30.00%
Asian to White	-9.1	-1.3	14.29%
White to Latino	3.3	-2.0	60.61%
Latino to White	-9.5	-4.7	49.47%
Black to Latino	4.3	-0.4	9.30%
Latino to Black	0.4	-0.8	200.00%
Asian to Latino	3.1	-0.2	6.45%
Latino to Asian	1.4	-0.1	7.14%

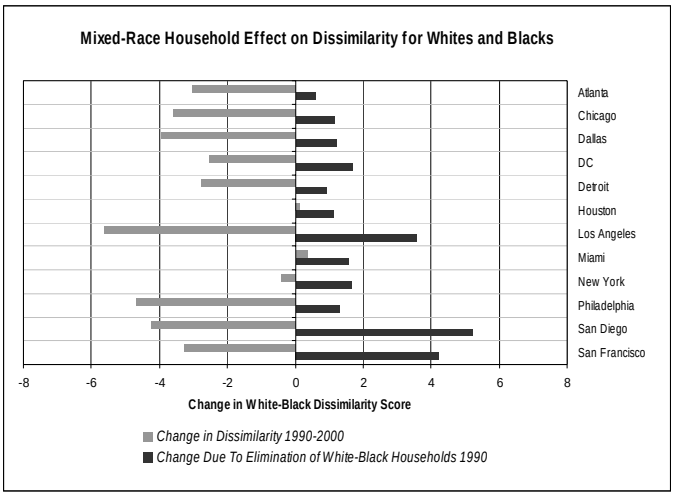
Table 2. Mean Effect of the Elimination of Mixed-Race Households on Exposure
Note: Means are the averages of the values observed in the 12 metropolitan areas.
Source: Confidential Long Form Sample US Census, 1990.

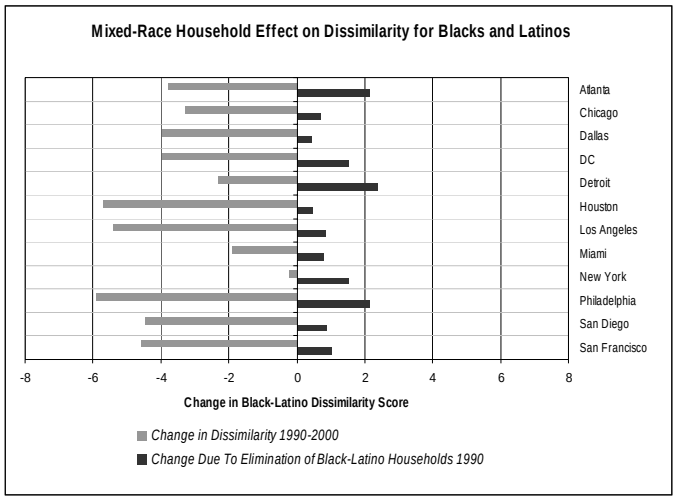
Sample	Diversity, D(k)				Diversity Due to Mixing in Households, D(h,k)-D(h)				Diversity Net of Mixing in Households, D(k)-[D(h,k)-D(h)]				%Diversity due to Mixing in Households			
	Mean	Std Dev	Min	Max	Mean	Std Dev	Min	Max	Mean	Std Dev	Min	Max	Mean	Std Dev	Min	Max
Atlanta	0.444	0.272	0.000	1.379	0.020	0.015	0.000	0.176	0.424	0.266	0.000	1.342	5.90%	5.10%	0.00%	41.00%
Chicago	0.454	0.328	0.000	1.412	0.030	0.022	0.000	0.211	0.424	0.315	0.000	1.367	9.00%	7.10%	0.00%	50.50%
Dallas	0.619	0.292	0.000	1.345	0.037	0.018	0.000	0.218	0.582	0.284	0.000	1.292	7.30%	5.20%	0.00%	57.10%
DC	0.635	0.311	0.000	1.401	0.042	0.024	0.000	0.176	0.593	0.300	0.000	1.374	7.60%	4.80%	0.00%	40.10%
Detroit	0.308	0.258	0.000	1.290	0.025	0.019	0.000	0.153	0.283	0.246	0.000	1.222	11.20%	7.20%	0.00%	49.50%
Houston	0.703	0.307	0.000	1.360	0.039	0.020	0.000	0.192	0.664	0.300	0.000	1.319	6.40%	4.20%	0.00%	32.30%
Los Angeles	0.803	0.269	0.043	1.452	0.069	0.030	0.000	0.283	0.734	0.260	0.033	1.374	9.20%	4.50%	0.00%	34.40%
Miami	0.626	0.302	0.046	1.316	0.059	0.034	0.000	0.308	0.567	0.287	0.035	1.234	10.70%	6.30%	0.00%	39.30%
New York	0.592	0.333	0.000	1.518	0.039	0.023	0.000	0.217	0.553	0.322	0.000	1.464	8.00%	5.30%	0.00%	57.10%
Philadelphia	0.384	0.281	0.000	1.351	0.023	0.020	0.000	0.317	0.360	0.270	0.000	1.320	7.90%	6.00%	0.00%	46.60%
San Diego	0.742	0.296	0.092	1.439	0.088	0.031	0.000	0.188	0.654	0.279	0.075	1.372	12.80%	4.40%	0.00%	31.40%
San Francisco	0.837	0.297	0.057	1.443	0.082	0.030	0.000	0.210	0.755	0.286	0.043	1.382	10.70%	4.40%	0.00%	33.80%
Mean	0.598	0.342	0.000	1.518	0.045	0.031	0.000	0.317	0.553	0.325	0.000	1.464	8.70%	5.70%	0.00%	57.10%

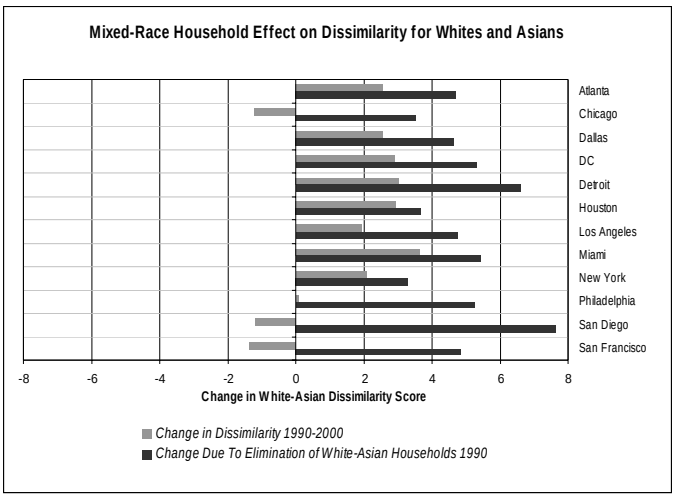
Table 3. Tract Entropy Decomposition Results
Note: Mean is the average of tracts in all 12 metropolitan areas, not average metro mean.
Source: Confidential long form data of the US Census, 1990

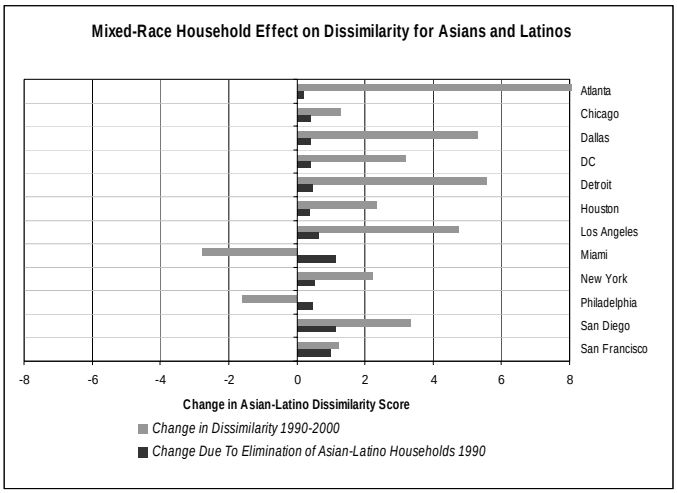
Sample	N (Tracts)	Intercept	*Intercept T-value*	D(k)	*D(k) T-value*	$D(k)^2$	*$D(k)^2$ T-value*	%MROS	*%MROS T-value*	$\%MROS^2$	*$\%MROS^2$ T-value*	Adj. R^2
Atlanta	470	**0.0601**	*13.54*	**-0.0756**	*-9.32*	**0.1787**	*8.04*	**1.2003**	*3.24*	**-11.1749**	*10.27*	**0.3648**
Chicago	1780	**0.0606**	*29.11*	**-0.1285**	*-27.19*	**0.2438**	*18.51*	**1.3634**	*15.90*	**-4.6495**	*2.04*	**0.4149**
Dallas	826	**0.0619**	*34.88*	**-0.1303**	*-26.03*	**0.1900**	*13.39*	**1.0941**	*13.87*	**-0.0191**	*0.98*	**0.4795**
DC	889	**0.0786**	*43.92*	**-0.1062**	*-20.93*	**0.0878**	*6.93*	**1.1586**	*14.51*	**-4.8703**	*0.96*	**0.3418**
Detroit	1243	**0.0692**	*22.81*	**-0.0988**	*-11.86*	**0.3535**	*16.12*	**1.8255**	*14.13*	**-17.9967**	*3.66*	**0.4722**
Houston	781	**0.0716**	*45.12*	**-0.1130**	*-26.27*	**0.0968**	*9.16*	**1.1525**	*20.35*	**-8.6114**	*1.67*	**0.5187**
Los Angeles	2523	**0.0903**	*104.54*	**-0.1383**	*-38.67*	**0.0710**	*10.02*	**1.1320**	*39.14*	**-3.2277**	*0.27*	**0.5539**
Miami	423	**0.1062**	*28.83*	**-0.1477**	*-13.60*	**0.0695**	*2.41*	**1.2216**	*8.40*	**-5.0509**	*2.17*	**0.3118**
New York	4550	**0.0771**	*82.50*	**-0.1150**	*-58.46*	**0.1318**	*23.95*	**1.2127**	*35.93*	**-3.8165**	*0.61*	**0.4581**
Philadelphia	1422	**0.0660**	*27.29*	**-0.0990**	*-18.26*	**0.2289**	*15.39*	**1.7194**	*19.04*	**-8.6174**	*1.00*	**0.4065**
San Diego	429	**0.1104**	*43.31*	**-0.1589**	*-18.42*	**0.0634**	*4.10*	**1.0025**	*12.21*	**-2.6272**	*0.53*	**0.5671**
San Francisco	1279	**0.1040**	*79.81*	**-0.1437**	*-30.66*	**0.0794**	*9.27*	**0.9515**	*20.46*	**-2.9783**	*0.43*	**0.6097**
All	16615	**0.0779**	*160.85*	**-0.1265**	*-107.14*	**0.1215**	*40.86*	**1.3508**	*78.74*	**-5.1423**	*0.20*	**0.4385**

Table 4. Tract Entropy Decomposition Regressions
Note: "All" combines tracts from all 12 metropolitan areas.
Source: Confidential long form data of the US Census, 1990









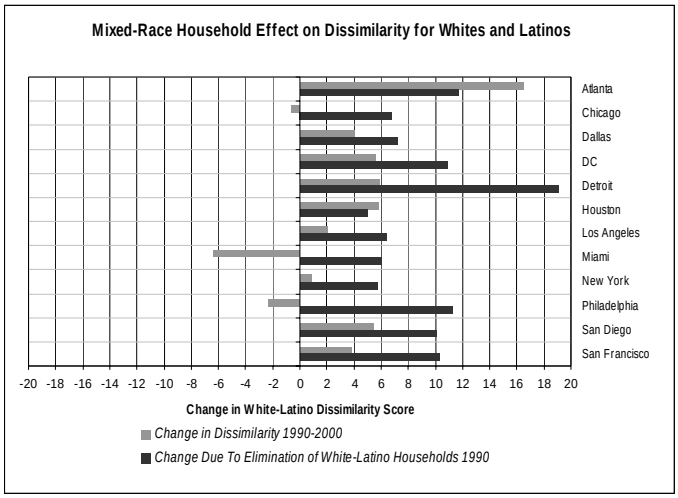
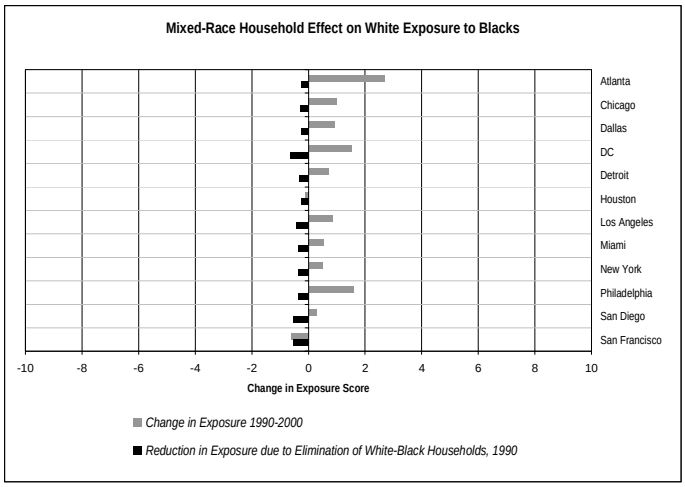
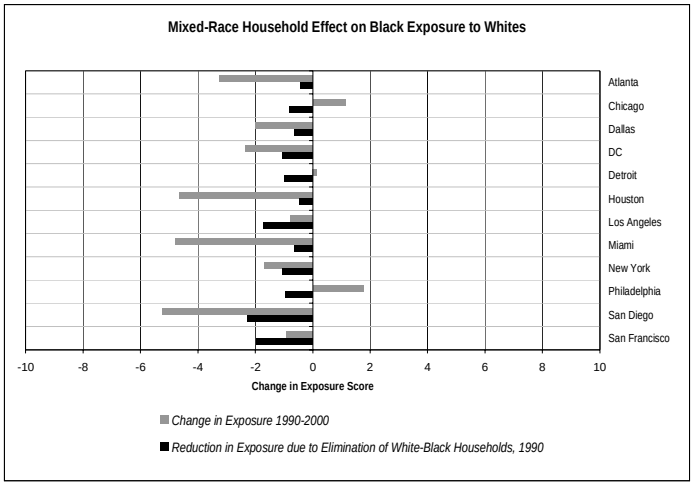
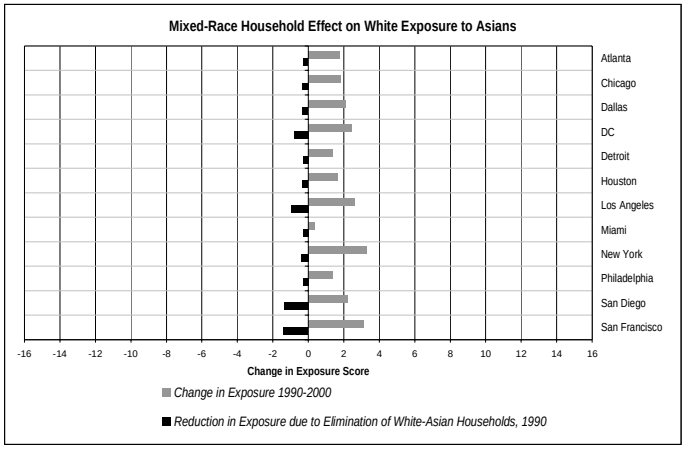


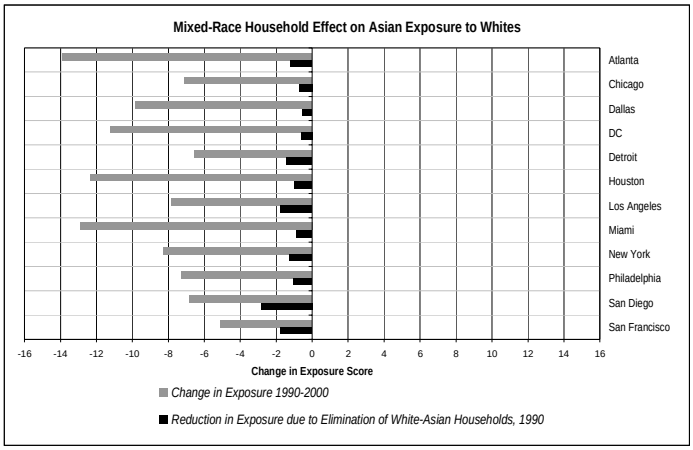
Figure 1: The Effect of Removing Mixed-Race Households on the Dissimilarity Index For Five Pairs of Groups, by Selected US Metropolitan Area, 1990.

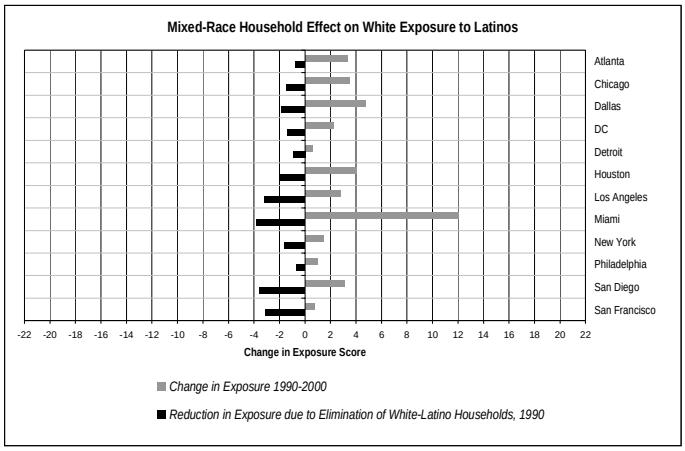
Source: Confidential Long Form Sample, US Census 1990











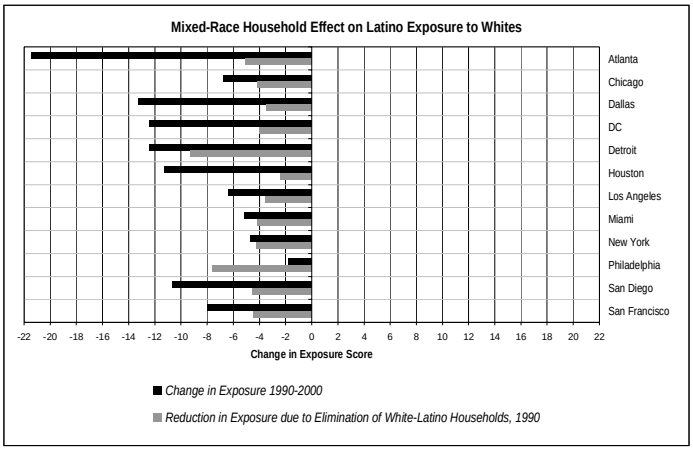
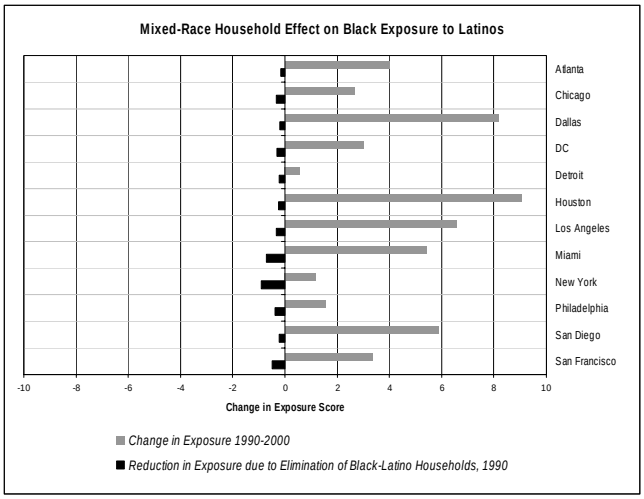
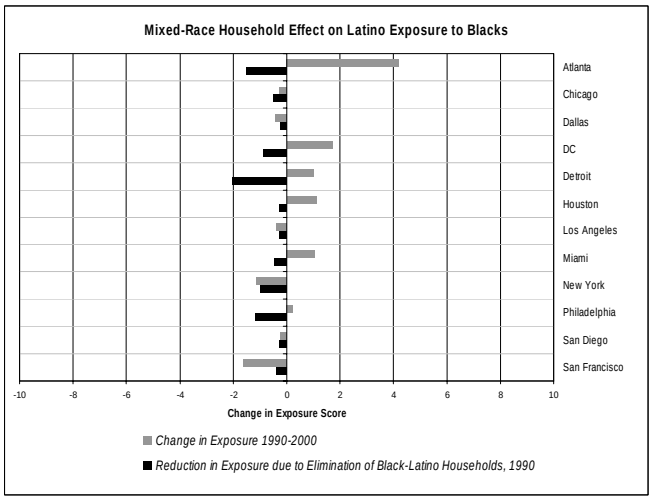
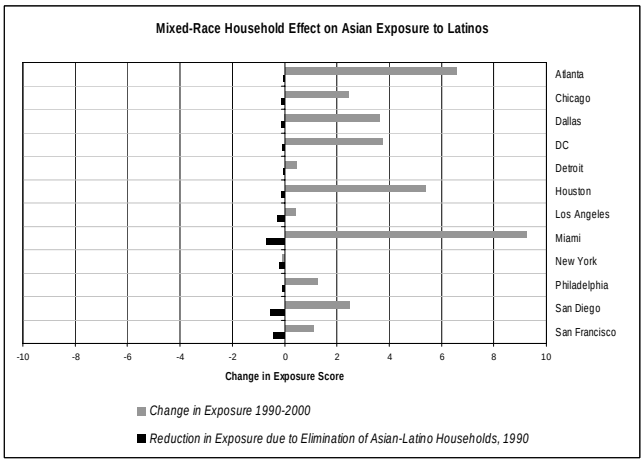


Figure 2: The Effect of Removing Mixed-Race Households on the Exposure Index For Five Pairs of Groups, by Selected US Metropolitan Area, 1990.

Source: Confidential Long Form Sample, US Census 1990







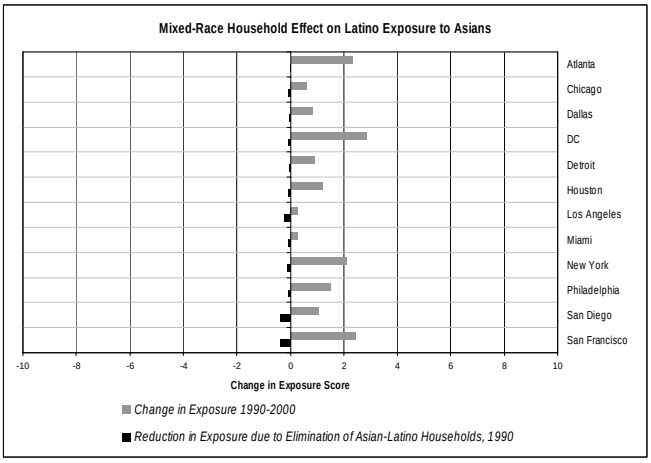


Figure 2 Continued.

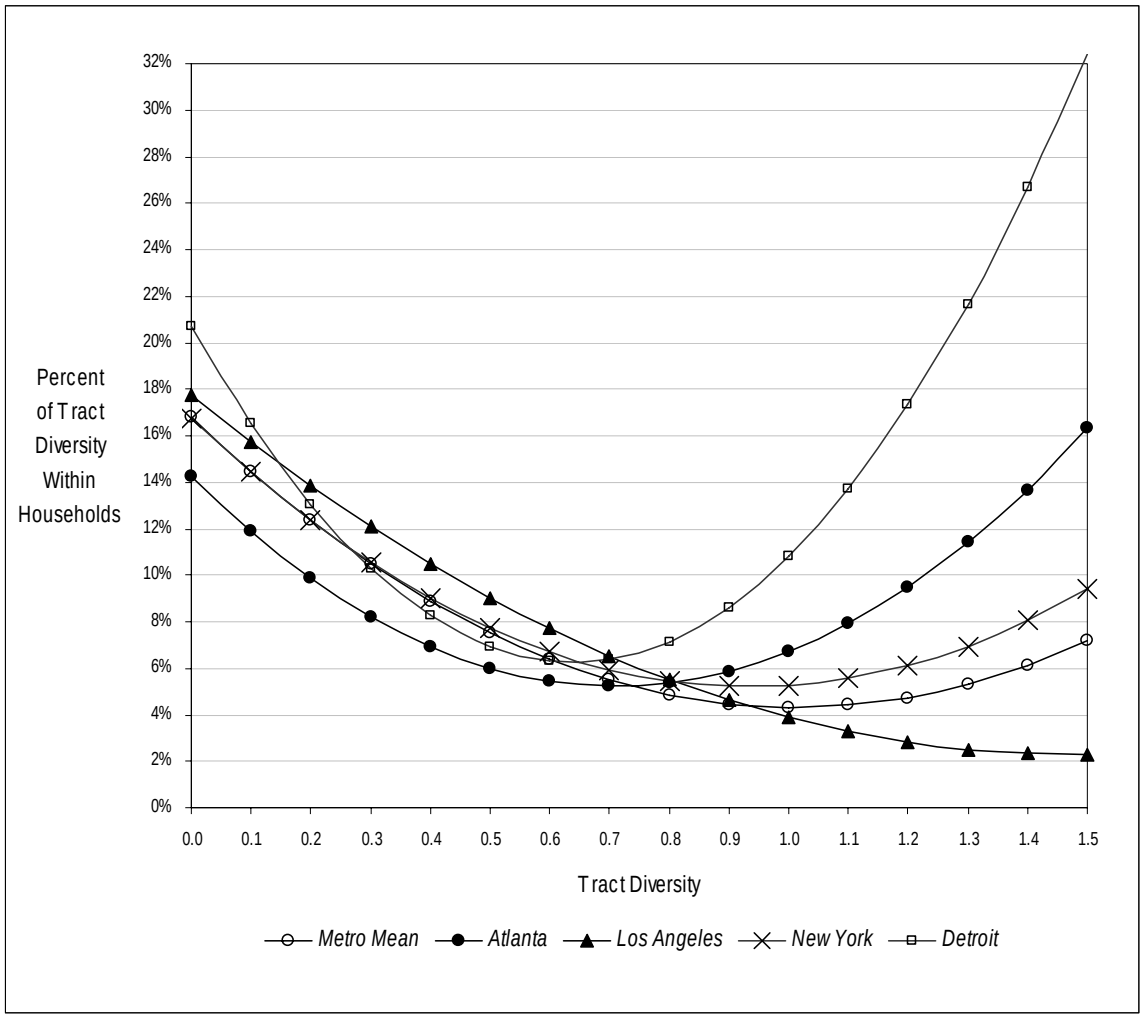


Figure 3. Percent of Tract Diversity Within Households by Total Tract Diversity.
Note: Evaluated at the area mean percent of mixed-race opposite sex couples in tracts.
Source: Confidential Long Form Sample, US Census 1990