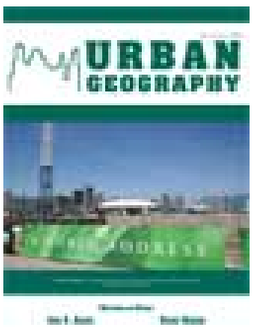

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What can we learn about changing ethnic diversity from the distributions of mixed-race individuals?

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ABSTRACT

It is hypothesized that self-defined mixed-race persons live in residentially mixed areas in the largest metropolitan areas in California. The hypothesis is tested by examining the distribution of mixed-race persons among ethnically and racially diverse and nondiverse neighborhoods in the San Francisco and Los Angeles Metropolitan Areas. The research confirmed that mixed-race individuals are more likely to live in areas with ethnic diversity and that the tendency is greater for the mixed-race population in the San Francisco–Oakland Metropolitan Areas than in the Los Angeles Metropolitan Area. Mixed-race individuals live in neighborhoods which are diverse with mixes of all four major ethnic and racial groups, and in "well-off" (but not the most affluent) neighborhoods. The study also shows that the mixed-race population is youthful. The association of mixed-race individuals and racially integrated neighborhoods will have important implications for the evolving nature of spatial integration in California specifically, and the United States more generally.

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Mixed race; residential segregation; diversity; California

Introduction

The mixed-race population in the United States is growing and their decisions about where to live, and the kinds of neighborhoods to select, have implication for changes in the levels of integration and segregation. The core of our interest is whether or not these individuals will in the long run be an important dimension in increasing diversity across neighborhoods in the US metropolitan areas. Although they are still a statistically small component of the changes in ethnicity, the fact that more than 40% are children and young adults, some of whom are about to form unions and enter the housing market, makes their impact likely to be considerable. As Etzioni (2001) has suggested, it is this group who may well create the blended society which will reduce the focus on race and ethnicity and will redirect attention to how diversity will change the neighborhoods of urban areas in Europe and the United States (Clark, Andersson, Östh, & Malmberg, 2015; Clark & Maas, 2009; Tasan-Kok, Van Kempen, Raco, & Bolt, 2013; Lawrence & Bentley, 2016; Vertovec, 2007). As an exemplar of this process we examine the geographical spread of self-defined mixed-race persons in the two large metropolitan areas in California – the San Francisco–Oakland Metropolitan Area and the Los Angeles Metropolitan Area. Because of their potential to change levels of

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segregation, the mixed-race population may well change the idea of a multicultural society. A significant proportion of mixed-race persons are children of mixed couples who by definition will in turn have mixed-race children. This observation is fundamental in understanding how diversity will change in the coming decades.

The paper contributes to the growing literature on racial mixing by focusing on how self-identified mixed-race individuals are distributed across neighborhood types. We will do this by taking advantage of a new multi-scalar approach to neighborhood classification. Thus, instead of using the racial composition of a fixed geographical area such as a census tract, individual blocks are classified by the composition of the population in spatial buffers of different size centered on the block that contain up to the 51,200 closest neighbors. The advantage of this method compared to a tract-based approach is that the neighborhood types will conform more closely to the multi-scalar social environments that individuals interact with in their daily life (see Clark et al., 2015) .[1] Using this refined approach to neighborhood classification will be helpful for identifying the interplay between the spatial mixing of racial groups and the phenomenon of self-identified mixed-race individuals.

A specific contribution of our research is to pair mixed-race persons and neighborhood types. Thus, the study focuses on the spatial patterns of neighborhoods and their proportions and combinations of mixed-race persons. The questions asked in this paper are; (a) In which types of neighborhoods do mixed-race persons live, (b) What are the combinations of ethnic groups in these neighborhoods, and (c) What are the socioeconomic characteristics of the neighborhood that mixed-race households are selecting?

The research is designed to extend a previous benchmark study of the effects of mixed-race households on trends in neighborhood-scale racial segregation (Ellis, Holloway, Wright, & Fowler, 2012). Although they are cautious in their interpretation, in general the study is innovative in their finding that mixed-race households can actually drive changes in neighborhoods and further modify segregation. They suggest that high rates of mixed-race household formation will reduce residential segregation considerably, even when preferences for own-group neighbors are high enough to maintain neighborhood racial separation. That study and the findings we report in this paper provide a new window on the thinking about the patterns of ethnicity and specifically the levels of mixing across different neighborhood types.

Previous research on the mixed-race population

The research literature which has examined mixed-race distribution patterns has pursued two different lines of investigation about this population. On the one hand research has examined the growth and spatial distribution of mixed-race individuals and mixed-race households themselves, while on the other hand, a second strand of research has focused on the extent to which non-related ethnic and racial individuals have intermarried and what those intermarried households portend for the future of residential integration and/or segregation.

The study of the distributions of mixed-race individuals has previously established that mixed-race individuals, on the whole, tend to live in neighborhoods with significant proportions of at least one other race (Frey & Myers, 2002). On average, the mixed white and black person lives in neighborhoods which is about 61% white and 19% black. In

contrast, the average neighborhood for a person identified as white alone is nearly 81% white and only 6% black, and for personal identified as black alone it is only 29% white and 54% black (Frey & Myers, 2002). Clearly, there is a striking difference in the residential composition for the mixed-race population versus the population that reports only one race. Similar findings by Fasenfest, Booza and Metzger (2006) also show evidence of more mixing for individuals who report mixed-race ethnicity. To some extent these observations reflect differences in income and resources. We know from previous research that mixed-race persons are likely to be younger and have somewhat greater incomes than their equivalent own race parallels (Clark & Maas, 2009).

At the same time, these generalizations must be considered with care because the outcomes are often locally complex. Just where a mixed-race person lives is a complex outcome of a set of choices and constraints and this is especially true for mixed-marriage households (Allen and Turner (1997) and Holloway, Ellis, Wright, and Hudson (2005)). Johnston, Poulsen, and Forrest in the UK context (2008) also documented that those who report dual ethnicity are more likely to live in areas where whites either dominate or predominate than is true for those who report single ethnicities. Again, this may reflect the desire "to buy" higher status neighborhoods.

With respect to composition (marriage) effects, more than a decade ago Farley (1999) posed the question – "are we now witnessing a process of assimilation as a result of increasing rates of racial exogamy in the marriage market?" The question can be elaborated to ask "Will the results of interethnic and inter-racial marriage – the increase in those who report themselves as multiethnic individuals – also change the process of incorporation and the patterns of residential separation?" The growing evidence seems to be that yes, separation is lower for couples who are interethnically married. Research in both the United Kingdom and the United States confirms that mixed-race couples tend to reside in racially diverse neighborhoods. Ethnographies of households headed by black and white partners attest that the attraction of such places is strong because many such households feel less comfortable in predominantly white neighborhoods and equally less comfortable in predominantly black communities (Dalmage, 2000). In the United States Holloway et al. (2005) showed that US mixed-race households tend to reside in less-segregated spaces than single-race households and that black–white households, in particular, live in neighborhoods characterized by their racial diversity, something which also occurs in the United Kingdom (Johston, et al 2008, Smith, Edwards, & Caballero, 2011).

Consistent with the arguments about increased socioeconomic status (SES) Wright., Holloway, and Ellis (2011) demonstrated that black–white-headed households are most often found in neighborhoods where whites constitute the majority group. Adding controls for SES and neighborhood racial structure reveals that black–white couples are drawn to diversity no matter which racial group forms the majority in the neighborhood. This result contrasts with the patterns that they reported for households headed by black couples (diversity acts as a draw only when they enter spaces comprising many whites or Asians) and white couples (neighborhood diversity is important when they reside in neighborhoods with many blacks or Latinos).

However, the new research by Ellis et al. (2012) has raised some caveats about the long-term integrative effects of mixed-race couples. Overall, their research confirms that high rates of mixed-race household formation will reduce residential segregation and that these results are sufficiently powerful to influence the overall magnitude of

decade long changes in the levels of residential segregation. At the same time, they suggest that even if the overall rate of residential segregation is declining, the fact that there are quite different outcomes for households headed by a white male and minority partner versus a minority male and a white female partner could generate different levels of integration across neighborhoods. In addition, even if the overall segregation is declining, as a result of a growing number of mixed-race households single-race segregation can remain high. This of course reemphasizes the increasing recognition that segregation is a dynamic process and while it is decreasing overall, in some cases for some groups it can be increasing. Their overall conclusion is that "researchers must be cautious about interpretations of declining segregation in the presence of growing fractions of the population living in mixed race households" (Ellis et al., 2012, p.566).

Synthesis and context

In the light of the findings of the previous literature, and the notes of caution above, our study takes up the issue of the specific links between the mixed-race population and the kinds of neighborhoods that they choose. The previous research clearly demonstrated that there is a tendency for the mixed-race population to choose areas between concentrated single-race/ethnic areas and also to choose areas that are less homogeneous on average. This paper extends these general findings by focusing on neighborhood units classified by their population racial and ethnic composition and examines how mixed-race households are distributed across these spatial units.

Our analysis focuses on the two largest metropolitan regions in California, the Los Angeles Metropolitan five county region and the seven counties of the San Francisco–Oakland Metropolitan Area. The selection is designed to examine the recent and ongoing changes in the ethnic make up of California which can be viewed as a harbinger of changes which will come, or in some cases have already come, to other metropolitan areas in the United States. In the last two decades California has continued to gain population and in the proportion foreign born. California now, in the second decade of the twenty-first century has a population of more than 38 million people, an increase of 8 million people in the last two and a half decades. Not only has the total population increased, the composition of the population also has changed significantly. In 1990, before the last large wave of foreign-born immigration, the state was approximately 57% white, non-Hispanic, but that has changed to a majority Hispanic state in 2015. Now, whites and Hispanics are approximately equal proportions of the total population with a significant population of Asians and a smaller population of African-Americans and native Americans. While there have always been diverse neighborhoods in California that tendency to an increasingly diverse mix has accelerated (Clark et al., 2015). These changes are reflections of general changes in diversity across neighborhoods in the United States (Lichter, 2013; Parisi, Lichter, & Taquino, 2011).

The change in composition at both regional and local levels has been driven by the increase in the foreign-born population. Now about 27% of California's population is foreign born and in the most populous counties in Southern California and the San Francisco Area more than 30% of the population in those counties is foreign born. It is true that immigration to California has slowed in the past decade, but even so

immigrants and their children make up a sizable proportion of the total California population – almost half of all children in California had at least one immigrant parent (Meija & Johnson, 2011). This is an appropriate context in which to investigate the nature of ethnic and racial intermixing and the patterns of the self-reported mixed-race population in the two major metropolitan concentrations in California.

The nature of the coming changes is captured in the age distribution of the mixed-race population. More than 40% of all mixed-race individuals are younger than 17 in California as a whole and in the two major areas studied in this paper, Southern California and the San Francisco Metropolitan Area (Table 1). The very fact that so many of the mixed-race individuals are not yet in unions or forming unions emphasizes how quickly the mixed-race population will grow as these individuals mature and enter into marriages and cohabitation. In total there are now approximately 1.8 million individuals who report mixed-race ancestry in California (Table 1).

Underlying our interest in the mixed-race population is the argument that if mixed-race households have attitudes of greater tolerance (Clark, 2017; Frey, 2015) we might expect social distance between groups to decline, and the decline in social distance to be followed by a decline in spatial separation (Clark & Maas, 2009; Wessel, 2009). It is in fact the link between racial and ethnic attitudes of the mixed-race population, and the residential locations, which stimulates our interest in the likelihood of changing spatial patterns of diversity in California neighborhoods. However, the available data cannot answer questions of attitude rather we can only examine the selections and patterns of the mixed-race population and make our inferences from those patterns.

Methods, data, and a multi-scalar classification of neighborhood types

The empirical analysis of this paper on the distribution of mixed-race individuals across neighborhood types in the Los Angeles Metropolitan Area and the San Francisco–Oakland Metropolitan Area has four dimensions. First, differences in the racial composition and the neighborhood composition of the Los Angeles Metropolitan Area and the San Francisco Metropolitan Area are analyzed. Second, we analyze variation in the proportion of mixed-race individuals across neighborhoods types in the Los Angeles and San Francisco Metropolitan Area, respectively. Third, the characteristics of neighborhoods with high versus low presence of mixed-race individuals are analyzed using a multinomial logit model with neighborhood type as the dependent variable. Finally, we

Table 1. The mixed-race population by age and in California, the San Francisco Metropolitan Area, and the Los Angeles Metropolitan Area in 2010.

Age	California (%)	San Francisco Metro Area	%	Los Angeles Metro Area	%
0–17	44.1	142,006	43.4	334,038	41.2
18–24	12.7	37,744	11.5	101,848	12.6
25–34	12.8	47,969	14.7	111,732	13.8
35–44	10.9	37,286	11.4	95,789	11.8
45–54	9.5	29,977	9.2	79,793	9.8
55+	10.7	32,050	9.8	87,281	10.8
Total	*1,815,384*	*327,032*	*100*	*810,481*	100

Source: US census and American Community Survey 2010.

analyze to what extent the concentration of mixed-race individuals is related to the SES of different neighborhoods.

Multi-scalar neighborhoods are egocentric neighborhoods, or "egohoods" (Hipp & Boessen, 2013), that are defined across a range of geographical scales. Thus, the neighborhood of a specific location is viewed as consisting of both the immediate surrounding area of perhaps the nearest 25 neighbors, and wider geographical contexts that include, for example, the 100, 400, 1,600, and 6,400 nearest neighbors. The adoption of a multi-scalar approach can be seen as a way to acknowledge that individuals evaluating the geographical context of a location do not only care about the immediate surrounding or a wider surrounding but in fact care about neighborhood qualities across different geographical scales.

In this paper we use block-level census data to construct such multi-scalar neighborhoods and to classify them based on the racial composition of the neighborhood population at different geographical scales. The construction and classification of multi-scalar neighborhoods was carried out in three steps. First, the Equipop software (Osth, Malmberg, & Andersson, 2014) and 2010 census data was used to compute the probability of meeting black, Hispanic, white, or Asian single-raced individuals among the 12, 25, 50, 100, 200, 400, 800, 1,600, 3,200, 6,400, 12,800, 25,600, and 51,200 nearest neighbors. This is done for census blocks in the entire state of California. With 4 different racial categories and 13 different scale levels this results in a data set where the geographical context of each block is described by 52 contextual variables. In the second step, these 52 contextual variables were used in a factor analysis in order to reduce the dimensionality of the data set and to extract summary measures of the ethno-racial residential context of each census block. It was found that six factors were sufficient to describe most of the variation in ethno-racial composition across the different geographical scales. The third step used cluster analysis on the resulting factor scores to group census blocks into 20 different neighborhood types. Full details on how this classification was carried out are given in Clark et al. (2015)

The resulting neighborhood types are presented in Figure 1. The graphs provide mean values for the population shares of the four races across different neighborhoods scales (local neighborhoods to communities), where neighborhood scale is determined by the number of nearest neighbors, *k*, included in the individualized neighborhood. This approach is similar to the one used on census tract data by Holloway et al (2012). They divide neighborhoods into high and low diversity and we disinguish (a) homogenous (b) semi-diverse neighborhoods, (c) diverse neighborhoods, and (d) highly diverse neighborhoods. Following Holloway et al however, we base this division on the entropy index but, given our multi-scalar approach, we use the median entropy index across different k-levels to rank the different neighborhood types. Moreover, in each group there are in fact four clusters where either Hispanics or white constitute the largest group. These clusters have been ordered based on the balance between Hispanics and whites and they are presented in column one to column four in Figure 1. In each diversity group there is also one cluster where either blacks or Asians constitute the largest group. These have been assigned to the fifth column of Figure 1.

The term enclave is used when a group is a majority for small neighborhood scales (low k) but another group becomes a majority for large neighborhood scales (large k). A mixed enclave occurs when there are many groups in the local area but one group

Figure 1. Graphs and the identification of clusters by racial and ethnic combination for 2010 (Clark et al., 2015). Each segment of the figure portrays the varying distribution of the four race/ethnic groups from small scale to large scale neighborhoods. These combinations vary from majority one race in the homogenous group to nearly equal groups in the very diverse combinations.

becomes dominant for large k. At local scales, when one group is dominant but mixing increases at large k values we call that small-scale homogeneous. (Clark et al., 2015)

The census and self-identified mixed-race persons

We use the neighborhood cluster types to locate mixed-race persons who are classified from the questions on ethnicity (Hispanic) and race (white, black, Asian) (Jones & Bullock, 2010) from the 2010 census. We define mixed-race individuals as an individual that self-identified as belonging to two or more racial groups. This was possible for the first time in the census 2000. Among those reporting more than one race 92% reported exactly two races (Jones & Bullock, 2010, p. 4).

In this study we included 15 counties out of the 58 in California, 5 counties in Los Angeles and 10 in the San Francisco–Oakland Metropolitan Area. In total more than 25 million people are included in the study. The age distribution is showed in Table 1 and the race distribution in Table 2.

Results

We position our results within an overview of the ethno-racial composition of the population in the studied areas and of the distribution of ethno-racial groups across neighborhood types as presented in Table 2 and Table 3. We continue the presentation of results with a focus on the mixed-race population and its distribution across neighborhood types in Los Angeles Metropolitan Area and the San Francisco Metropolitan Area (Table 4). Third, the question of where mixed-race individuals live is analyzed in a logit regression where the dependent variable is neighborhood type and the independent variable is the concentration of mixed-race persons among the 800 nearest neighbors (Figure 2). Finally, we analyze the neighborhood SES of where mixed-race individuals live in Southern California and the San Francisco Metropolitan Area (Table 5).

Racial composition and neighborhood composition in Los Angeles and the San Francisco Metropolitan Area

The racial composition of the San Francisco Metropolitan Area and Los Angeles Metropolitan Area differs fundamentally across the different racial and ethnic groups

Table 2. Ethnic and racial groups in the San Francisco and the Los Angeles Metropolitan Areas 2010.

	Los Angeles Metro Area		San Francisco Metro Area		Los Angeles and San Francisco Metro Areas	
One race						
Hispanics	7,595,453	42.5%	1,623,419	21.9%	9,218,872	36.5%
Non-Hispanic white	6,004,354	33.6%	3,189,300	43.0%	9,193,654	36.4%
Non-Hispanic Asians	2,162,146	12.1%	1,656,530	22.3%	3,818,676	15.1%
Non-Hispanic black	1,173,691	6.6%	462,482	6.2%	1,636,173	6.5%
Non-Hispanic other	130,881	0.7%	83,600	1.1%	214,481	0.8%
Two or more races	810,481	4.5%	397,790	5.4%	607,113	2.4%
Total population	17,877,006		7,413,121		25,290,127	

Source: US census 2010.

Table 3. Distributions of the mixed-race population across neighborhood types in the Los Angeles and San Francisco Metropolitan Areas.

	Population distribution		Proportion of mixed-race persons		Over representation and underrepresentation of mixed-race persons	
Neighborhood type	Los Angeles Metro Area	San Francisco Metro Area	Los Angeles Metro Area	San Francisco Metro Area	Los Angeles Metro Area	San Francisco Metro Area
Homogenous						
Homogenous Hispanic	16.7%	1.3%	4.0%	4.6%	−16.3%	−3.7%
Small-scale Hispanic/white	3.2%	3.0%	4.9%	5.7%	2.6%	19.3%
White small scale/Hispanic	3.5%	2.8%	3.8%	4.3%	−20.5%	−10.0%
Homogenous white	8.8%	12.1%	3.8%	4.0%	−20.5%	−16.3%
Homogenous black	0.9%	0.1%	3.7%	5.0%	−22.6%	4.7%
Semi diverse						
Hispanic, white	5.7%	1.2%	4.9%	5.9%	2.6%	23.5%
Mixed enclave, Hispanic/white	3.6%	3.1%	5.6%	6.3%	17.2%	31.9%
White enclave, Hispanic	1.5%	1.1%	3.7%	4.4%	−22.6%	−7.9%
White, Hispanic	6.7%	5.5%	4.7%	5.3%	−1.6%	10.9%
Asian, white/Hispanic	3.3%	10.4%	2.9%	4.0%	−39.3%	−16.3%
Diverse						
Hispanic dominated, white/Asian	5.2%	4.5%	4.8%	5.8%	0.5%	21.4%
Hispanic, white/black	9.3%	3.3%	5.3%	7.1%	10.9%	48.6%
White, Hispanic/Asian	8.1%	10.6%	5.3%	5.9%	10.9%	23.5%
White small scale, Hispanic/Asian	3.4%	7.7%	4.6%	5.3%	−3.7%	10.9%
Black/Hispanic mixed	1.7%	2.4%	4.1%	5.5%	−14.2%	15.1%
Highly diverse						
Mixed enclave Hispanic, Asian/white	4.8%	2.3%	4.5%	5.7%	−5.8%	19.3%
Hispanic, black/white	4.9%	3.9%	4.9%	6.8%	2.6%	42.3%
Mixed white/Hispanic/Asian/black	1.8%	7.4%	5.6%	7.1%	17.2%	48.6%
Mixed Asian/white/Hispanic	4.1%	11.1%	4.8%	5.6%	0.5%	17.2%
Asian small scale, white/Hispanic	2.8%	6.2%	4.1%	4.9%	−14.2%	2.6%

Table 4. Population distribution across neighborhood diversity groups in the Los Angeles Metropolitan Area and the San Francisco Metropolitan Area.

	Los Angeles Metro Area		San Francisco Metro Area	
Neighborhood diversity groups	Population	Share	Population	Share
1 Homogenous	5,905,442	33%	1,438,279	19%
2 Semi-diverse	3,732,131	21%	1,578,712	21%
3 Diverse	4,957,803	28%	2,110,183	28%
4 Highly diverse	3,281,630	18%	2,285,947	31%
	17,877,006		7,413,121	

Source: Neighborhoods based on analyses of US census 2010.

as Table 2 shows. Whites are the dominating group in the San Francisco Metropolitan Area (43%) and Hispanics is the dominating group in the Los Angeles Metropolitan Area (42.5%). The share of blacks is about the same in both areas but the share of Asians in the San Francisco Metropolitan Area (22.3%) is almost twice as high as the share of Asians in Los Angeles (12.1%). This implies that the second and third largest groups are about the same size in the San Francisco Metropolitan Area (Hispanics, 21.9%, Asians, 22.3%) whereas the second largest group in Los Angeles (whites, 33.6%) is much larger than the third largest group (Asians, 12.1%). This makes the San Francisco Metropolitan Area somewhat more diverse than Los Angeles.

The difference in the racial composition of the San Francisco Metropolitan Area and the Los Angeles Metropolitan Area is mirrored in the distribution of the population in these areas across neighborhood types, see Table 3 first two columns. Thus, in Los Angeles the neighborhood type with the largest share of the population is homogenous Hispanic. In Los Angeles 16.7% of the population live in this neighborhood type compared with only 1.3% in the San Francisco Metropolitan Area. In the San Francisco Metropolitan Area it is instead white homogenous that has the largest population share, 12.1% compared to 8.8% in Los Angeles. The larger presence of Asians in the San Francisco Metropolitan Area is also mirrored in the distribution of the population across neighborhood types, 10.4% live in Asian-dominated neighborhoods (Asian, white/Hispanic) in the San Francisco Metropolitan Area compared with only 3.3% in the Los Angeles Metropolitan Area. Other neighborhood types with high shares of Asians also have higher population shares in the San Francisco Metropolitan Area than in Los Angeles, for example, mixed Asian/white/Hispanic (11.1% in the San Francisco Metropolitan Area, 4.1% in Los Angeles), and Asian small scale, white/Hispanic (6.2% in the San Francisco Metropolitan Area, 2.8% in Los Angeles).

Overall, as shown in Table 4 the somewhat more diverse racial composition in the San Francisco Metropolitan Area is mirrored in a much larger population share living in highly diverse neighborhood types (31% in the San Francisco Metropolitan Area, 18% in Los Angeles) and a much lower share of the population living in homogenous neighborhoods (19% in the San Francisco Metropolitan Area, 33% in Los Angeles). In this way the Los Angeles Metropolitan Area can be seen as more racially segregated than the San Francisco Metropolitan Area (Table 4). For example, although the population share of blacks in Los Angeles and the San Francisco Metropolitan Area is about the same, only 0.1% of the San Francisco Metropolitan Area population live in

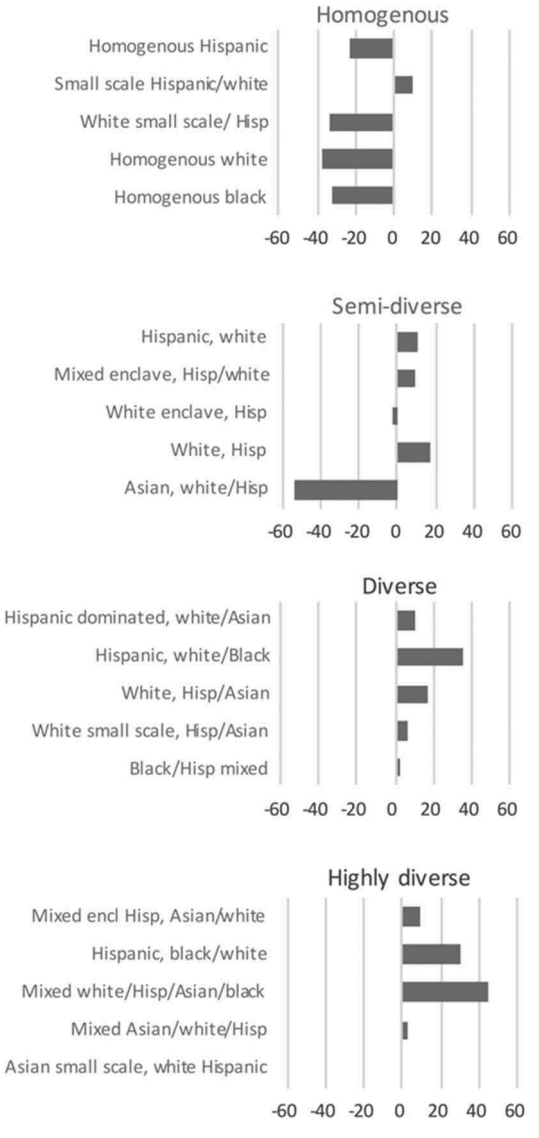

Figure 2. The effect of mixed-race proportion among the nearest 800 neighbors on the likelihood of neighborhood type membership. The figures presented are parameter estimates of a multinomial logit model. Asian small scale, white Hispanic is the reference category.

black homogenous neighborhoods compared with 0.9% in the Los Angeles Metropolitan Area. This indicates that there is a higher level of mixing between racial groups in the San Francisco–Oakland Metropolitan Area.

Mixed-race distributions in the San Francisco Metropolitan Area and Los Angeles

According to the 2010 census, the proportion of mixed-race individuals in the San Francisco Metropolitan Area is 5.4% compared with 4.5% in Los Angeles. In absolute figures the mixed-race population in the San Francisco Metropolitan Area numbers

Table 5. Effects of neighborhood type and socioeconomic composition on the proportion of mixed-race individuals among the nearest 800 neighbors in the Los Angeles Metropolitan Area and in the San Francisco Metropolitan Area.

	Los Angeles Metro Area sample		San Francisco Metro Area sample	
	Estimate	*t*-value	Estimate	*t*-value
Intercept	0.03972	(48.23)	0.05519	(39.39)
Socioeconomic variables				
Unemployment rate	0.00506	(1.5)	−0.01196	(−1.81)
Share rich	−0.04596	(−13.69)	−0.05682	(−11.73)
Median income, 100 000	0.00931	(9.48)	0.00792	(5.16)
Poverty share	0.00314	(1.49)	−0.01818	(−3.97)
Neighborhood types				
Homogenous Hispanic	−0.00505	(−12.6)	−0.00723	(−3.91)
Small-scale Hispanic/white	0.00155	(2.06)	0.00134	(1.03)
White small scale/Hispanic	−0.00644	(−13.2)	−0.01354	(−13.43)
Homogenous white	−0.00614	(−15.07)	−0.01275	(−19.9)
Homogenous black	−0.00915	(−8.09)	−0.00091	(−0.2)
Hispanic, white	0.00258	(4.88)	−0.00232	(−1.28)
Mixed enclave, Hispanic/white	0.00356	(6.52)	−0.00522	(−4.98)
White enclave, Hispanic	0.00013	(0.18)	−0.00590	(−3.59)
White, Hispanic	0.00414	(9.86)	−0.00067	(−0.81)
Asian, white/Hispanic	−0.01558	(−19.64)	−0.01386	(−16.42)
Hispanic dominated, white/Asian	0.00143	(2.12)	0.00140	(1.14)
Hispanic, white/black	0.00792	(17.15)	0.01397	(11.52)
White, Hispanic/Asian	0.00548	(10.72)	0.00299	(3.87)
White small scale, Hispanic/Asian	0.00245	(3.85)	0.00166	(2.11)
Black/Hispanic mixed	−0.00037	(−0.34)	0.00659	(4.75)
Mixed enclave Hispanic, Asian/white	0.00233	(3.58)	0.00432	(2.73)
Hispanic, black/white	0.00472	(6.82)	0.01645	(14.61)
Mixed white/Hispanic/Asian/black	0.00774	(7.3)	0.01585	(19.04)
Mixed Asian/white/Hispanic	−0.00026	(−0.38)	−0.00074	(−0.97)
Asian small scale, white/Hispanic	ref.		ref.	
Sample size	15,415		7,081	
R2	0.13037		0.25479	

Parameter estimates based on a 10% sample of the census blocks.

397,790 individuals compared with 810,481 mixed-race individuals in Los Angeles. Following Holloway et al. (2005) this higher proportion of mixed-race individuals is what is to be expected given that the San Francisco Metropolitan Area population lives in more diverse neighborhoods compared with the Los Angeles. However, as demonstrated in Table 3, the higher share of mixed-race individuals in the San Francisco Metropolitan Area cannot be fully explained by a difference in neighborhood composition.

The mean percent mixed race is 4.8 percent. It is the mean across all counties in our study. For both Los Angeles and the San Francisco Metropolitan Area the three most homogenous cluster types; Hispanic (cluster 1), white (cluster 2), and Asian (cluster 10) have underrepresentation of mixed-race individuals Table 3). For example, mixed-race individuals are underrepresented in homogenous Hispanic neighborhoods in Los Angeles (3.9% compared with an overall 4.4% overall presence of mixed race). The same can be seen for mixed-race individuals in the San Francisco Area's homogenous Hispanic neighborhood types where mixed race are 4.0% underrepresented compared with overall 5.3%. The same underrepresentation is seen for white small scale/Hispanic (cluster 4). This means that mixed-race persons do not live in homogenous

neighborhoods but to a large extent in areas which have mixes of the different ethnic and racial compositions. These are also areas which are interstitial areas, between higher concentrations of blacks, whites, Hispanics, and Asians. The maps are at too finer scale to easily present in the format for publication but they can be viewed in a separate file (Clark, Andersson, & Malmberg, 2017). As the lower part of the table shows, mixed-race persons are overrepresented in highly diverse neighborhoods (Table 3).

Clearly there is a difference between locations of mixed-race individuals in homogeneous versus varying levels of diversity. It is also true that all diverse neighborhood types in the San Francisco Metropolitan Area have greater proportions of mixed-race individuals – the San Francisco Metropolitan Area bars in the diagram extend further to the right than the Los Angeles bars. This finding points to the possibility that in addition to having a larger part of the population in mixed areas there are other factors in the San Francisco Metropolitan Area that promote an increase in self-identified mixed-race persons. It could be that lower population shares in homogenous neighborhood types can have the effect that racial characterizations become less important and that this is reflected in an increased propensity to identify as mixed race.

Correlations between neighborhoods and mixed-race neighbors

To evaluate the extent to which the share of mixed neighbors is correlated with neighborhood type, we estimate a multinomial logit model with neighborhood type as the dependent variable and share of mixed race among the 800 closest neighbors as the explanatory variable. The reason for using the proportion of mixed race among the 800 nearest neighbors is that this represents an intermediate scale level. This scale level has also in an earlier study (Strömblad & Malmberg, 2015) been shown to be important for neighborhood influences of ethnic composition on voting patterns. The level of observation is census block. In this model census blocks are assigned to neighborhood types based on the share of mixed race. The model also controls for location in the Los Angeles Metropolitan Area or in the San Francisco Metropolitan Area.

Estimating a multinomial model with neighborhood type as the dependent variable is a convenient way for analyzing how likely it is to find blocks with high shares of mixed-race individuals and low shares of mixed-race individuals among the 800 closest neighbors in different neighborhood types. A positive parameter estimate implies that blocks with high shares mixed-race individuals among the 800 closest neighbors are often found in the neighborhood type that the parameter points to relative to neighborhood types that are associated with lower parameter estimates. A negative parameter estimate implies that blocks with high shares mixed-race individuals among the 800 closest neighbors are unlikely to be found in the neighborhood type that the parameter points to relative to neighborhood types that are associated with higher parameter estimates.

The results are presented graphically in Figure 2 and clearly show that the higher the proportion of mixed race among any 800 closest neighbors the more probable the block is located in a diverse cluster. Exact values for the estimated parameters along with standard errors are presented in Table A1 (Appendix). As can be seen in Figure 2 the

higher the share of mixed race the more likely it is that the location is in neighborhood types in the groups of diverse and highly diverse clusters. And the opposite is true for homogenous neighborhood types. A high share of mixed-race persons among the closest 800, leads to lower odds for that location or block being a homogenous one. That is, there is an association between homogenous areas and lower shares of mixed-race persons (Figure 2).

We see different possible reasons to this result. First, the result might be understood as mixed-race persons choosing diverse neighborhoods. This argument would suggest that the processes of residential sorting and preferences among mixed-race individuals are behind the results. A second suggestion is that neighborhoods become diverse because of mixed marriages. Mixed marriages per definition result in mixed-race children in the area. Third, it could be that the presence of mixed-race persons signals that the neighborhood is open for different ethnoracial groups.

Neighborhood socioeconomic status and mixed-race persons

In Table 5 parameter estimates for the effect of neighborhood SES and neighborhood type on the concentration of mixed-race persons are presented. The models have been estimated separately for the Los Angeles Metropolitan Area and the San Francisco Metropolitan Area. It should be noted that data on SES is based on data at the level of census tract. Furthermore, since adjacent blocks have very similar values on both the dependent and independent variables a regression using all available blocks would lead to an underestimation of the standard errors. The estimations, therefore, have been based on a 10% sample of the census blocks which will give more correct standard errors.

Perhaps not surprisingly, mixed-race persons live in census tracts which by and large can be classified as middle-class neighborhoods (Table 5). They are neither poor nor wealthy. At the level of the 800 closest neighbors, mixed-race individuals live in areas with a relatively high median income, but a high share of top income households has a negative effect on the concentration of mixed-race persons. This is true both in the Los Angeles Metropolitan Area and the San Francisco Metropolitan Area. In the San Francisco Metropolitan Area, the poverty rate, and to some extent the unemployment rate, have a negative effect on the concentration of mixed-race persons but this is not the case in the Los Angeles Metropolitan Area.

Overall, it is worth reiterating that the mixed-race share is positively associated with high median income, suggesting that as many of them are children, that they are living with relatively "well-resourced" parents. In summary, the mixed-race population lives in neighborhoods that are fairly well off concerning SES but they do not live in affluent neighborhoods.

Concluding discussion

In this paper, we have analyzed the interplay between mixed-race individuals and neighborhood racial composition. We have done so in the context of California's two largest conurbations: The San Francisco–Oakland Metropolitan Area and the Los Angeles Metropolitan Area. Building on an approach to neighborhood classification

that looks at the population composition of areas surrounding individual census blocks our analysis provides supporting evidence for earlier findings on mixed-race individuals and neighborhood composition. Using this neighborhood classification together with an analysis of the racial composition in the two conurbations, and the distribution of mixed-race individuals across types of neighborhoods confirms some previous finding and provides new findings on ethnic residential patterns.

First, racial composition in the Los Angeles and the San Francisco Metropolitan Area diverge in that Los Angeles' largest group is Hispanics whereas whites is the largest group in the San Francisco Metropolitan Area. Further, Los Angeles' second largest group is whites whereas Hispanics and Asians form the two second largest groups in the San Francisco Metropolitan Area. Both areas have low proportions of blacks. Naturally, these different global proportions affect the neighborhood composition in the two conurbations. Los Angeles has much larger population proportion living in the homogenous Hispanic neighborhood type than the San Francisco Metropolitan Area. In contrast, the San Francisco Metropolitan Area has a much larger population share that lives in highly diverse neighborhood types.

Second, the distribution of mixed-race individuals is a function of the overall proportions of mixed-race individuals (5.4% in the San Francisco Metropolitan Area and 4.5% in the Los Angeles Metropolitan Area). However, the higher share of mixed-race individuals in the San Francisco Metropolitan Area does not simply generate the different composition of neighborhood types. At a very simplistic level the finding that the share of mixed-race individuals is higher in the San Francisco Metropolitan Area will generate more mixed neighborhoods. But it is also the case that for every neighborhood type, the share of mixed-race individuals is higher if the neighborhood is located in the San Francisco Metropolitan Area than in the Los Angeles Metropolitan Area. That is, mixed-race individuals are not only present in very diverse areas in the San Francisco Metropolitan Area, which would have been expected given the results by Frey and Myers (2002), rather mixed-race individuals live in all neighborhood types. This is a phenomenon that has no simple explanation though we can suggest that a possible reason is that the higher share of the San Francisco Metropolitan Area population that live in very diverse neighborhoods is linked to a diminished importance of racial categories and, thus, to an increase in self-identified racially mixed persons.

Thirdly, one of our most important findings is that a high share of mixed-race individuals among the closest 800 neighbors (which we suggest is close to what some would identify as a local neighborhood) is strongly correlated with racially diverse neighborhood types. This has at least two different interpretations. It could be that mixed-race individuals many of whom are children signal a presence of mixed-race couples, and as argued by Ellis et al. (2012) mixed-race households can be seen as drivers of neighborhood diversity. It could also be argued that a high presence of mixed-race individuals signals a neighborhood that is open to different racial groups and that this will be reflected in a racially diverse population. In contrast there is a negative association between high shares of mixed-race individuals and homogenous neighborhood types. That is, homogeneity in a neighborhood pushes mixed-race individuals away, which is a finding supported by earlier evidence, for example, Holloway et al. (2005).

Fourth, our analysis has also shown that a high share of mixed-race individuals is more typical of socioeconomically diverse neighborhoods than of high-poverty neighborhoods or high-income neighborhoods.

In summary, the results suggest several important potential outcomes. First, the increase in mixed marriages will likely translate into decreased residential segregation, though probably at a slow rate. Although Ellis et al. (2012) have provided some data on the patterns of mixed-race households, there is yet little data on the number and rate of mixed marriages. Second, *how* are mixed marriages being translated into decreased patterns of segregation, indeed are they a factor in decreased levels of segregation? Or as seen from the analysis of the San Francisco Metropolitan Area, what might other factors influencing a larger diversity in neighborhoods be? Alternatively, does the fact that there are increasingly neighborhoods with diverse populations increase the likelihood of mixed marriages as people are increasingly likely to come into contact with persons of a different race or ethnicity. Third, what is the driving force for mixed-race persons to live in mixed-race areas, do they want to live in areas where their children will "fit in" more easily than living in a homogeneous neighborhood? Fourth, will the perception of race change, as the mixed-race population increases?

Our paper has the implication that there will be a diminished importance of racial categories as mixing increases. These questions have important ramifications for the structure and future of race relations in metropolitan areas in the United States and beyond. It has already been pointed out that mixed couples can play an important role for reducing neighborhood level segregation. What our results suggest is that this effect is due not only to the fact that a mixed couple per definition brings people of different ethno-racial background to neighborhoods. It could also be that the presence of mixed household signals that a neighborhood is not racially closed but open to different racial groups.

Notes

1. The research on segregation and separation using multi-scalar neighborhoods is also taken up by Lee et al. (2008) and Parisi et al. (2011).

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Appendix

Table A1. Parameter estimates of multinomial logit model with neighborhood type as dependent variable. Standard errors in parenthesis.

Neighborhood type (dependent variable)	Intercept	Los Angeles Metro Area (San Francisco Metro Area is reference category)	Proportion of mixed-race individualsamong 800 nearest neighbors
Homogenous Hispanic	1.20567	1.51431	−22.76871
	(0.0480)	(0.0227)	(0.9100)
Small-scale Hispanic/white	−0.67237	0.53570	10.20421
	(0.0570)	(0.0197)	(1.0738)
White small scale/Hispanic	2.05083	0.51564	−33.57834
	(0.0466)	(0.0167)	(0.9618)
Homogenous white	3.26247	0.09271	−37.43618
	(0.0419)	(0.0142)	(0.8466)
Homogenous black	−0.63841	1.28245	−31.73391
	(0.0926)	(0.0531)	(1.8194)
Hispanic, white	−0.69223	1.22602	10.68378
	(0.0537)	(0.0226)	(0.9834)
Mixed enclave, Hispanic/white	0.00790	0.57797	8.68579
	(0.0494)	(0.0171)	(0.9417)
White enclave, Hispanic	−0.18067	0.63171	−2.48976
	(0.0576)	(0.0209)	(1.1207)
White, Hispanic	0.14445	0.58487	17.20123
	(0.0453)	(0.0154)	(0.8601)
Asian, white/Hispanic	2.55310	−0.30959	−53.67920
	(0.0486)	(0.0171)	(1.0754)
Hispanic dominated, white/Asian	−0.45310	0.49122	10.41976
	(0.0539)	(0.0185)	(1.0189)
Hispanic, white/black	−1.36136	1.04580	35.19872
	(0.0490)	(0.0176)	(0.8874)
White, Hispanic/Asian	0.11416	0.25516	17.37447
	(0.0456)	(0.0152)	(0.8667)
White small scale, Hispanic/Asian	0.37291	−0.02914	6.32394
	(0.0473)	(0.0159)	(0.9125)
Black/Hispanic mixed	−0.61738	0.09943	2.22765
	(0.0631)	(0.0212)	(1.2215)
Mixed enclave Hispanic, Asian/white	−0.71413	0.81620	9.98246
	(0.0566)	(0.0209)	(1.0565)
Hispanic, black/white	−1.39663	0.49397	29.77812
	(0.0538)	(0.0179)	(0.9719)
Mixed white/Hispanic/Asian/black	−2.51093	−0.18809	44.80602
	(0.0567)	(0.0190)	(0.9778)
Mixed Asian/white/Hispanic	0.44913	−0.12042	2.41479
	(0.0481)	(0.0162)	(0.9325)
Asian small scale, white/Hispanic	ref.	ref.	ref.
Number of observations	224,288		