# Chapter 8
# Further Comments on Differences Between Displacement and Separation

In Chap. 6 I documented that displacement (D) and separation (S) routinely diverge by large amounts in some empirical analyses. Then in Chap. 7 I provided technical discussions to clarify how D and S can vary independently. I also stressed that the combination of high-D, low-S – which occurs when displacement from uneven distribution is dispersed rather than concentrated – has important sociological implications and I advised researchers to check for this pattern and guard against incorrectly assuming that high levels of displacement (D) are accompanied by high levels of group separation (S). In this chapter I try to encourage researchers to follow this advice by discussing three topics relevant to measuring separation and understanding how it may diverge from displacement.

I begin by revisiting the empirical relationship of D and S originally discussed in Chap. 6 and reviewing it in more detail in light of the material presented in Chap. 7. I then review plausible scenarios for how displacement can come to be dispersed in a way that creates large D-S differences. Discussions of this topic are not common in the literature. I address this gap to help researchers become more comfortable with giving attention to the contrast between dispersed and concentrated displacement from uneven distribution. I next focus on a practical issue researchers should bear in mind when seeking to measure and compare displacement and separation. I then conclude the chapter by noting an alternative option for measuring group separation and area racial polarization some researchers may find useful because it is easy to compute and explain and also tends to correlate closely with the separation index.

## 8.1   Revisiting the Empirical Relationships of Displacement (D) and Separation (S)

I now examine empirical differences between D and S in more detail by revisiting the data on White-Minority residential segregation in core based statistical areas (CBSAs) for 1990, 2000, and 2010 originally discussed in Chap. 6. My goal in this discussion is to discuss D-S differences in light of perspective gained from the material presented in Chap. 7. Figure 8.1 plots scores for the separation index (S) by scores of the dissimilarity index (D) for CBSAs in 1990, 2000, and 2010. The plot includes 4,319 White-Minority segregation comparisons screened on having at least 1,500 persons in both groups in the comparison. The diagonal reference line plots D against itself. The figure shows that in empirical application values of S are consistently lower than values of D. Logically, it is possible for the values of D and S to be equal in any comparison. But this occurs only when all group displacement from even distribution is concentrated in all-White or all-minority areas. It is readily apparent from the figure that even an approximation of this outcome is an uncommon occurrence for the cases in this data set. Figure 8.2 reverses the point of view for the relationship and plots scores for the dissimilarity index (D) by scores of the
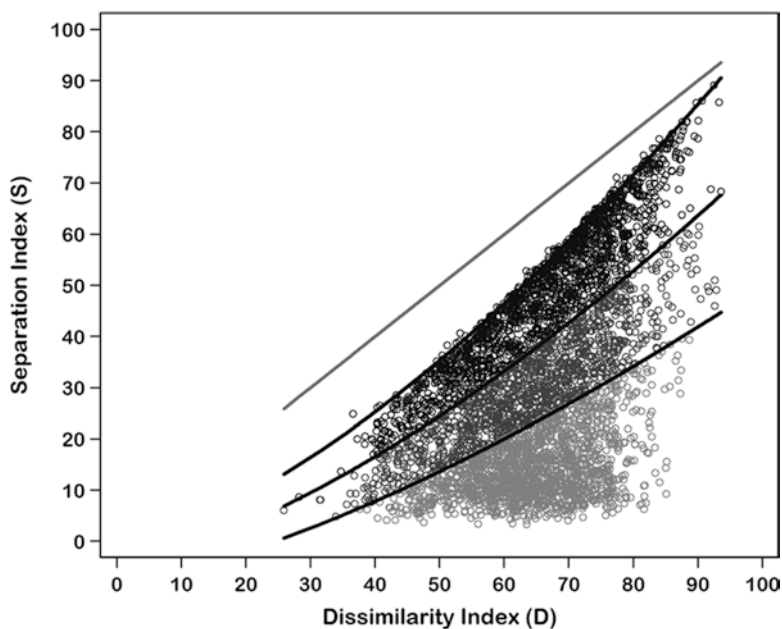


**Fig. 8.1**  Separation index (S) by dissimilarity index (D) for White-Minority segregation comparisons computed using block-level data for CBSAs in 1990, 2000, and 2010 (Reference lines: Diagonal for D by D and reference curves for 100 %, 75 %, and 50 % of $D^{3/2}$. 4,319 cases for White-Black, White-Latino, and White-Asian segregation comparisons with at least 1,500 persons in both groups)
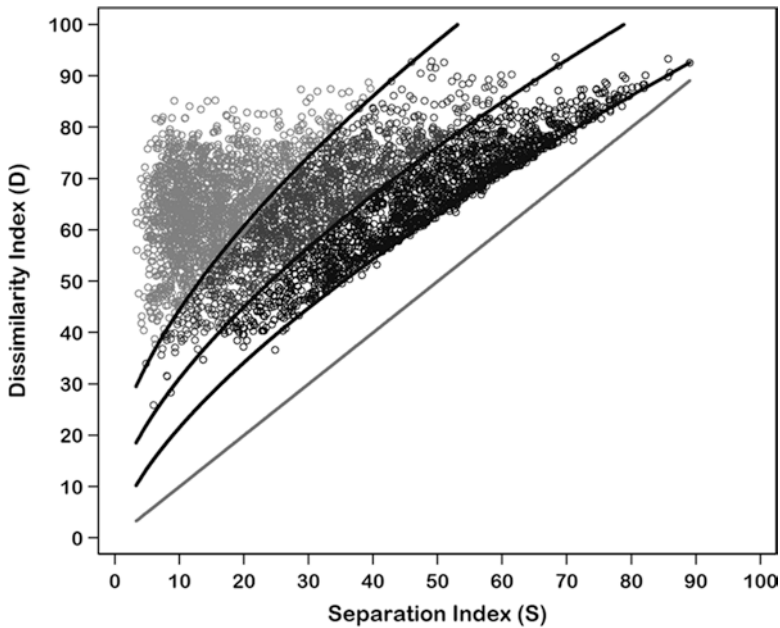
**Fig. 8.2** Dissimilarity Index (D) by separation Index (S) for White-Minority segregation comparisons computed using block-Level data for CBSAs in 1990, 2000, and 2010 (Reference lines: Diagonal for S by S and reference curves for 100 %, 75 %, and 50 % of $S^{2/3}$. 4,319 cases for White-Black, White-Latino, and White-Asian segregation comparisons with at least 1,500 persons in both groups)

separation index (S). Here the diagonal reference line plots S against itself. Unsurprisingly, the figure shows that values of D in this data set are consistently higher than values of S. The main benefit of this figure is to highlight how values of D can be misleading if one's goal in measuring segregation is to identify prototypical segregation involving group residential separation.

The curved reference lines near the diagonal in each figure serve to highlight a "stylized fact" for D-S correspondence. It is the empirical regularity that, while it is logically possible for S to take a value equal to D in any comparison, values of S rarely exceed $D^{3/2}$ in empirical analyses. Similarly, values of D rarely fall below $S^{2/3}$. In view of this empirical relationship, I characterize cities that fall along the interior boundary of the empirical D-S relationship depicted in Figs. 8.1 and 8.2 as cities where segregation follows a "prototypical" pattern. By this I mean that group displacement from even distribution registered by D is substantially concentrated and produces group residential separation registered by S.

More specifically, I characterize segregation as clearly "prototypical" when scores for D and S track each other in parallel based on the mild nonlinear relationships of $D \approx S^{2/3}$ and $S \approx D^{3/2}$. Thus, for example, to characterize a city as having

| General Categories | D Range | S Range |
| --- | --- | --- |
| Very High / Pronounced | 75-100 | 65-100 |
| High / Substantial | 60-74 | 45-64 |
| Medium / Moderate | 45-59 | 30-44 |
| Low / Limited | 20-44 | 10-29 |
| Very Low / Minimal | 0-19 | 0-9 |

**Fig. 8.3** Guidelines for identifying prototypical segregation based on concordant scores for dissimilarity (D) and separation (S) when displacement from even distribution is substantially concentrated

a prototypical pattern of segregation I would expect S to be near or above 65 when D is 75; or, conversely, I would expect D to be near or below 75 when S is about 65. The reference lines in the two figures reflect how values of D and S will correspond when "prototypical" segregation varies from low to medium to and high. For convenience and consistent use of terms for describing the levels of segregation when displacement and separation are concordant, I offer guidelines in Fig. 8.3 for broad categories of prototypical segregation where dissimilarity (D) and separation (S) are concordant. When D and S align as they do in these broad categories, it is reasonable to describe displacement from even distribution as being substantially concentrated such that groups are living apart, rather than together, roughly in keeping with the degree possible at the observed level of displacement from even distribution.

In Fig. 8.4 I offer a more detailed set of guidelines for judging when D and S do not correspond as one would expect when displacement from even distribution is concentrated in the manner that produces a pattern of "prototypical segregation." The first two columns list values of D and S that are "clearly concordant" meaning that the D-S combinations listed involve values of the separation index (S) that are in the higher range of what is possible given the level of displacement from even distribution indicated by the dissimilarity index (D). The quantitative guideline I apply for "clear concordance" of D and S is for the value of S to be equal to or higher than 95 % of $D^{3/2}$. The third column lists values of S that lead me to characterize the D-S comparison as "Discordant" meaning that, instead of being substantially concentrated, displacement from even distribution is substantially dispersed and consequently produces a level of group separation that is well below that expected under prototypical segregation. The quantitative guideline I apply is that S is at or below 75 % of $D^{3/2}$. The fourth column lists values of S that lead me to characterize the D-S comparison as "Very Discordant" meaning that displacement from even distribution is highly dispersed and produces a level of group separation that is very low in comparison to that expected under prototypical segregation. The quantitative guideline I apply is that S is at or below 50 % of $D^{3/2}$.

| D Value | S Value is Concordant (Displacement is Substantially Concentrated) | S Value is Discordant (Displacement is Dispersed) | S Value is Highly Discordant (Displacement is Highly Dispersed) |
|---------|---------|---------|---------|
| D = 90 | S ≥ 81 | S ≤ 60 | S ≤ 35 |
| D = 80 | S ≥ 68 | S ≤ 50 | S ≤ 28 |
| D = 70 | S ≥ 56 | S ≤ 40 | S ≤ 21 |
| D = 60 | S ≥ 44 | S ≤ 31 | S ≤ 15 |
| D = 50 | S ≥ 34 | S ≤ 23 | S ≤ 10 |
| D = 40 | S ≥ 24 | S ≤ 15 | S ≤ 5 |
| D = 30 | S ≥ 16 | S ≤ 8 | --- |
| D = 20 | S ≥ 9 | S ≤ 3 | --- |

**Fig. 8.4** Guidelines for assessing concordance-discordance of dissimilarity (D) and separation (S)[a] ([a]Concordant (displacement is substantially concentrated) with $S \geq 95\%$ of $D^{3/2}$; Discordant (displacement is dispersed) with $S \leq 75\%$ of $D^{3/2}$; and highly discordant (displacement is highly dispersed) with $S \leq 50\%$ of $D^{3/2}$)

Figures 8.1 and 8.2 include reference lines that correspond to the quantitative guidelines just outlined. The figures thus document that many White-Minority comparisons in these cities do have scores on D and S that place the cities in question comfortably within the category of having "prototypical segregation" wherein displacement from even distribution is accompanied by a correspondingly level of group separation and area racial polarization. At the same time, however, the figures also make it clear that a great many White-Minority comparisons in these cities have D-S combinations that are either discordant or very discordant indicating that segregation does not follow the "prototypical" pattern that researchers and broad audiences assume is typical.

In individual cases of a particular White-Minority comparison in a given city, D−S discrepancies can be discussed and evaluated in several ways including the following.

- Comparing the simple D−S difference
- Expressing S as a percentage of D (i.e., $100 \cdot S / D$)
- Expressing S as a percentage of $D^{3/2}$ (i.e., $100 \cdot S / D^{3/2}$)

If the simple D−S difference is small, the situation involves concentrated displacement from even distribution that produces group separation at near the maximum level possible given the extent of group displacement. When the D-S difference is large, it is clear that the situation involves "dispersed displacement" that wherein group separation and neighborhood racial polarization are well below what is

possible given the level of displacement. That is, while the groups are differ substantially in proportions residing in below-parity areas, they nevertheless tend to live together in neighborhoods that vary in a relatively narrow range on racial mix (p) and are not residentially separated into racially homogeneous neighborhoods.

The relative comparison of D and S should be considered when the simple D-S difference is non-negligible, but not extreme. Expressing S as a percentage of D indicates the relative extent to which displacement from even distribution is concentrated. If the value reaches 100, it indicates that group displacement is maximally concentrated in a way that produces non-parity neighborhoods that are racially homogeneous (all same-group) or nearly so.

The relative comparison of S and $D^{3/2}$ provides another reference point for assessing whether D and S are discordant. Values at 80 % and above indicate that the values of D and S align in reasonable correspondence to what is expected when segregation follows a prototypical pattern at a levels characterized as low, medium, high, etc. as suggested above. This means that, at a given level of group displacement from even distribution (D), the degree of group residential separation (S) is in line with standard expectations. If the value drops below 75 %, it signals a D-S discrepancy wherein at least one group's displacement from even distribution is dispersed rather than concentrated. Values that fall below 50 % indicate that at least one group's displacement from even distribution is highly dispersed and thus it not appropriate, and may even be substantially misleading, to characterize the two groups as living apart from each other.

When focusing on individual cases in detail, these guidelines for "quick comparisons" can be supplemented with detailed comparisons of group distributions on area racial composition. Elsewhere I provide a more extended review of graphical and quantitative analyses highlighting selected cases of White-Minority segregation that illustrate a variety of outcomes for D-S comparisons ranging from concordance (prototypical segregation) to very discordant (displacement without separation) in Fossett (2015).

## 8.2    Scenarios for How D and S Discrepancies Can Arise

Segregation researchers rarely comment on whether displacement measured by D involves group separation and neighborhood polarization measured by S. This is understandable because the issue is rarely discussed in either empirical studies or in the literature on segregation measurement. Accordingly, some might wonder if it is easy for D and S to differ in dramatic ways. In Chap. 6, I reviewed data showing that this is indeed the case empirically when the scope of segregation analysis is broad (i.e., expands beyond large metropolitan areas) and when samples include cities where minority populations are small in relative size.

Given the lack of discussion of dispersed displacement and D-S divergence, it is understandable that consumers of segregation research and researchers themselves

may wonder "How can such patterns come about?" In this section I review some scenarios for how high-D, low-S situations can arise. My goal is to help readers gain a more intuitive understanding of how displacement can come to be extensive without also producing the high levels of group separation needed to create the pattern of prototypical segregation.

To begin, imagine a city with 100 neighborhoods each of which has 1000 residents. Additionally assume the city population is 98 % White and 2 % Black with 98,000 White residents and 2000 Black residents. Under exact even distribution all 100 neighborhoods will have 980 White residents and 20 Black residents. This, of course, would be a pattern of "no segregation" and the values of D and S will both be zero (0.0).

Now consider two alternative scenarios for how the same population could be rearranged to create a high level of uneven distribution. The first scenario produces a pattern of "prototypical segregation" – displacement from even distribution with substantial group separation and area racial polarization. It involves taking 49 of the 100 neighborhoods and exchanging the Black residents in these neighborhoods with White residents in one of the remaining 51 neighborhoods. This will leave 49 "above-parity" neighborhoods with 1000 Whites and no Blacks, 50 "parity" neighborhoods with 980 Whites and 20 Blacks, and 1 "below-parity" neighborhood with no Whites and 1000 Blacks. The resulting value of D will be 50 and the value of S also will be 50. The combination of $S = D$ signals a residential pattern of uneven distribution with the maximum polarization possible at this level of displacement.

Note that the pattern is logically easy to create even though the Black population is small.[1] I will review empirical examples along these lines in a couple of case studies considered below. The key feature of the situation is that the Black residents displaced into "below-parity" areas are concentrated in a small number of homogeneous areas – a single area in this hypothetical case – creating the pattern associated with prototypical segregation.

The second scenario I consider produces uneven distribution in the form "displacement without separation" or "dispersed displacement". In this situation a larger fraction of the Black population lives in "below-parity" areas where Whites are under-represented (and Blacks are over-represented) but at the same time there is minimal group separation and no neighborhood polarization. This scenario involves taking 50 of the 100 initial neighborhoods and exchanging the Black residents in these neighborhoods with White residents in the other 50 neighborhoods. In this case, however, the exchanges are implemented so no single neighborhood gains more than two new Black residents or loses more than two White residents. Implementing these exchanges will leave 50 "above-parity" neighborhoods with

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[1] All that is required is that the size of the minority population exceeds the size of the typical neighborhood. In this example, the size of the Black population (2000) is twice the size of the typical neighborhood (1000).

1000 Whites and no Blacks, and 50 "below-parity" neighborhoods with 960 Whites and 40 Blacks.

In contrast to the first scenario, Black households displaced into "below-parity" areas are dispersed "thinly" across areas that are overwhelmingly White in terms of racial composition. As a result, displacement is extensive and affects half of the Black population but it does not produce group separation because it does not concentrate displaced Black households in areas that are predominantly Black. The resulting value of D for this scenario will be 51 and the value of S will be 2. Note that D is high under this scenario and in fact is slightly higher than in the first scenario that produced prototypical segregation. In contrast, S is much lower and indicates extremely low group separation. The resulting combination of high-D, low-S indicates uneven distribution with extensive displacement but minimal group separation and residential polarization.

Both scenarios of population residential distribution are simple and feasible demographically. However, if one assumes that Blacks are a minority population with little influence in the city's political system, the sociological implications may vary markedly across the two scenarios. In the first scenario, half of Blacks reside in an all-Black ghetto or enclave. One can imagine that this makes them vulnerable to disadvantages in neighborhood conditions as neglect of the "Black" neighborhood by city administrators would have no adverse impacts on Whites. In the second scenario, all Blacks reside in neighborhoods that are 96 % White. While these areas are overwhelmingly White, they are technically "below parity" and contain a large share of the Black population. Accordingly, the residential patterns involved are fundamentally different from that produced in the first scenario. Black separation from Whites and area racial polarization are essentially absent. As a result, one can imagine that Blacks are less vulnerable to disadvantages in neighborhood conditions because city administrators are unlikely to neglect "below-parity" neighborhoods where Blacks are "over-represented" because this would have adverse impacts on many more Whites than Blacks. Additionally, for neighborhood outcomes that are truly shared, Whites and Blacks would share a common fate and even if Black interests were not served well, they would be "protected" from harm when Whites interests are satisfied.

"Fair enough" someone might say. But can one imagine "real world" sociological processes that would produce the two very different patterns of segregation associated with these two scenarios? Again the answer is yes. One example of a potentially plausible historical scenario is the case of White-Black segregation in northern cities before and after the Great Migration. Lieberson's (1980, 1981) analyses of Black residential patterns 1890–1930 suggests that the relative numbers for Blacks in northern cities at the beginning of the time period were low and he speculates that due to the modest levels of Black presence Whites may not have perceived Blacks as a major threat to White residential areas. Accounts of the time suggest that, while Whites were hardly welcoming to Blacks, they did not yet engage widely in virulent anti-Black violence and other severe forms of discrimination that later

would become widespread. The pre-Great Migration setting thus afforded opportunity for wider dispersal of the Black population which Lieberson reports is indicated by low average scores for Black isolation in a set of 17 "leading non-southern cities" for which data are available. Lieberson's analysis indicates that Blacks initially resided disproportionately in "below parity areas" with moderate to high displacement but they did not at this time experience the high levels of concentration and isolation in ghettos that would later come to characterize Northern and Midwestern urban areas.[2]

Lieberson then notes that the Black population grew rapidly in relative size in these cities as the Great Migration progressed in subsequent decades. White concerns about residential encroachment by Blacks increased and acts of anti-Black violence and both legal and informal housing discrimination against Blacks become more dramatic and more frequent. Increasingly, Blacks were driven from White residential areas and concentrated in predominantly Black areas that over time became large ghettos. With this, displacement as measured by D increased over this period. That is not surprising. What Lieberson points out as more intriguing is that Black isolation also increased at an even faster pace. More specifically and importantly for this discussion, Black isolation in these cities increased at a pace well beyond that which would result from Black population growth alone. This is consistent with Blacks being increasingly disproportionately concentrated in predominantly Black areas. By 1930 large ghettos were emerging across northern cities generally and familiar patterns of "prototypical segregation" came into being where previously they were not the norm.

The account Lieberson builds by combing quantitative analysis of data on residential distributions with historical information from the time period lays out a process of Black displacement from even distribution changing over time from being moderate and somewhat dispersed to being both more substantial and much more concentrated. This account is plausible and intriguing. But it also is quantitatively less than definitive because the analysis of residential patterns of the era is hampered by absence of data for small areas. Lieberson necessarily made use of data for larger areas such as "wards" in combination with historical accounts of relative dispersal of the Black population transitioning to concentration in ghettos.

In light of this I give attention to some other examples that are quantitatively more definitive but less well known. The examples involve Latino migration to "new destination" communities in recent decades. Detailed analysis of block-level data over the period 1990–2010 shows that high-D, low-S patterns of dispersed displacement for White-Latino segregation are common in new destination communities and in many cases transition over time into high-D, high-S patterns of prototypical segregation (Fossett, Crowell, Saenz, and Zhang 2015).

Several qualitative studies of Latino settlement in new destination communities including as examples a study of Garden City, Kansas (Broadway 1990), a study of

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[2] Lieberson does not report values of the separation index. However, in the context of a near-binary White-Black city composition, overall isolation is a close proxy for pair-wise isolation. When it is low in comparison to its logical maximum of 1.0, as Lieberson reports, it implies that S also is low.

Marshalltown, Iowa (Grey and Woodrick 2006), and a study of Durham, North Carolina (Flippen and Parrado 2012) provide a basis for suggesting a plausible "composite" scenario of possible social dynamics underlying the quantitative patterns.[3] In this composite scenario Latino individuals and families initially migrate in small numbers drawn by economic opportunities. Since it is a new Latino destination with minimal prior Latino presence, White-Latino ethnic relations are inchoate and not yet well-formed. Demographically, there are no pre-exiting barrios or Latino residential areas for Latino immigrants and migrants to settle in. The qualitative accounts noted above suggest that early arriving Latino families do not initially encounter strong, widespread discrimination in housing, possibly due to their small numbers and their novelty in the absence of established White-Latino relations. As a result, early-arriving Latino settlers tended to locate idiosyncratically following available affordable housing vacancies distributed across many neighborhoods. These early arriving Latino families and households did tend to live in "below-parity" areas. But, as confirmed by quantitative analysis of block-level data, they typically lived in areas that were predominantly White, often overwhelmingly White. Few Latinos at this time lived in predominantly Latino neighborhoods.

This pattern produces a "classic" high-D, low-S index score combination associated with the segregation pattern of high displacement without group separation and area racial polarization. Quantitatively, it is a fundamentally at odds with an alternative and sociologically plausible scenario in which early arriving Latinos are concentrated in rapidly forming barrio and enclave neighborhoods due to multiple causes including as two examples housing discrimination based on linguistic and cultural differences and dynamics ethnic congregation based on mutual-support and ethnically structured flows of information regarding housing opportunities.

The key point to bear in mind that empirical studies that rely solely on D cannot differentiate between the two alternative scenarios. But the D-S comparison makes it possible to use data to sort the story out more carefully and the observed high-D, low-S outcomes are more consistent with the "dispersed displacement" scenario.

Many new destinations continue to attract Latino migrants and experience steady, sometimes rapid, Latino population growth. As the Latino population grows, the White population often begins to take greater notice and becomes less tolerant of the presence of Latinos. Anti-immigrant and nativist sentiment increases and discrimination against Latinos in housing increases and constrains residential opportunities for Latino families and households. As Latino neighborhoods emerge, they may be attractive locations for settlement for later arriving Latino migrants, especially those with limited English language skills. Such options were not available initially, of course, because the Latino presence was too limited.

These complementary dynamics of increasing discrimination and immigrant congregation dynamics can serve to concentrate larger shares of the Latino population in predominantly Latino areas forming enclaves or barrios. As this transition

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[3] Special thanks to Cassidy Castiglione, an undergraduate research assistant who helped identify these case-studies during her participation in an National Science Foundation Research Experiences for Undergraduates Summer Institute at Texas A&M University in summer 2015.

occurs, the pattern of segregation also undergoes a transition wherein S rises faster than D. Indeed, the value of D itself may remain relatively stable or may even fall. The reason for this is that displacement – that is, White-Latino differences in proportion residing in "above-parity" areas was already high. But the pattern of displacement is changing from being dispersed to being concentrated. Over the span of a few decades, the high-D, low-S pattern of dispersed displacement for Latinos may then shift to a high-D, high-S combination of "prototypical segregation." The data reviewed in Fossett, Crowell, Saenz, and Zhang (2015) indicate that the quantitative trend just described can be seen across many Latino new destinations over the period 1990–2010.

These are just two examples of how possible, and I argue plausible, scenarios for social dynamics and trends could potentially produce White-Minority uneven distribution in the form of both "dispersed displacement without separation" and "concentrated displacement" resulting in "prototypical segregation". Accordingly, sociologists should be mindful of the possibilities and should consider systematically examining segregation indices that can reveal the presence of these distinctive residential patterns. The easiest option for doing so is to examine both D and S and note when instances of D-S concordance and discordance are found.

## 8.3   A Practical Issue When Comparing D and S – Size of Spatial Units

Values of S and D can and sometimes do disagree. When the differences are large, the discrepancy will always be in a particular direction; D will be high and S will be low. This outcome is rich with sociological implications but its occurrence is rarely discussed. The example introduced earlier in which I contrasted median scores for White-Black segregation with White-Asian segregation illustrated this point. D was high for both group comparisons with scores of 72.1 and 64.6, respectively. In contrast, S for White-Black segregation (46.4) was more than three times higher than S for White-Asian segregation (13.2). This result suggests something potentially important about the difference between White-Black segregation and White-Asian segregation. It is that consistently high levels of displacement from even distribution are evident in both comparisons, but group separation and residential polarization are present only in White-Black segregation. Uneven distribution for White-Asian segregation does not involve group separation and residential polarization. Instead, Asian displacement from parity on area proportion White (p) involves dispersed displacement with quantitatively small departures from parity. Consequently, Asians live alongside Whites and experience similar residential outcomes. Blacks experience similar extensiveness of displacement from parity on area proportion White (p), but the departures from parity are much larger quantitatively and as a result Blacks do not live alongside Whites and do not experience similar residential outcomes with regard to area proportion White (and presumably also with area

characteristics that are correlated with area proportion White). Based on this, it is reasonable to conclude that the potential for differences in life chances and other consequences to arise from segregation are much greater for Blacks than from Asians even though typical values on D are relatively close.

This example along with the examples discussed in the preceding section of this chapter make a compelling case for the value of comparing S with D. However, I now caution that, before researchers finalize conclusions based on comparing D and S, they should take to review certain aspects of study design to make sure that the conclusions offered will be sound. The aspect of research design to review is the comparison of group size and the population size of the spatial units used to assess segregation. This aspect of research design is potentially important for both S and for D. But its consequences can be different for D and S and in some conditions can exaggerate D-S differences.

It is of course well known that using larger spatial units will result in lower segregation scores for any index of uneven distribution. Conventional wisdom is that this is not generally a major concern so long as it is reasonable to assume that the effect is approximately constant across cases. In that situation, researchers will know that overall levels of segregation will be lower, but at the same time they can expect that comparisons across cities or for a given city over time will still reveal fundamental variations in patterns and trends over time.

Unfortunately, it is not always reasonable to assume that the impact of areal unit choice is approximately constant across measures or across individual cases. One potentially serious problem can arise when spatial units used to measure segregation are large in relation to overall group size.[4] It is that segregation index scores will be misleadingly biased down when smaller homogeneous regions are "hidden" within larger heterogeneous areas. The problem affects both D and S but not to the same degree. The previous chapter noted that S is sensitive to large differences in area racial composition that reflect area racial polarization and group residential separation. But measurement of polarized differences is susceptible to being diminished when smaller homogeneous areas occur within larger units. This leads to lower values on D as well as S. But in this case, D is protected by its crudity as, whether due to true social dynamics or due to limitations of research design, reductions in area polarization only impact D when the associated changes cause one area to cross from one side of overall city racial composition (P) to the other. In essence, using areal units that are "too large" imposes an artifactual "ceiling" on scores for group separation and neighborhood polarization by pulling area-specific values on racial composition (p) toward the grand mean (P).

The problem of underestimating segregation will be worse under at least two conditions. The first is when segregation is manifest at a relatively low spatial scale – for example, at the block level – *and* segregation also follows a pattern of small-scale "checkering" instead of large-scale clustering. In this situation the aggregation of smaller homogeneous units within larger heterogeneous units can

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[4] The key issue is absolute group size, not relative size. However, the two often go hand in hand and so the issue often will be salient when relative group size is small.

reduce values of both D and S dramatically. Fortunately, the practical consequence is usually modest because segregation patterns in US cities are characterized more by large-scale clustering than by small-scale checkering.

The second condition is when segregation patterns include homogeneous regions that are smaller than the areal units used in the study design. The practical consequence of this problem is greater when groups are small in size. Even when area polarization is substantial and homogeneous areas for a group are clustered, the value of S cannot reach its maximum value if the overall size of the smaller group does not comfortably exceed the population size of the areal units used to assess segregation. As noted above, the impact will be potentially important for both D and S, but more so for S. As a result, using large spatial units when investigating segregation involving small groups can distort comparisons of D and S making D-S differences appear larger than would be the case if a better research design was used.

In light of this, researchers should give the issue careful thought when making decisions about research design. Happily, the problem is easy to understand and, once appreciated, major problems are easy to avoid. The solution is to confirm that the spatial units used to assess segregation have the logical capacity to capture group separation and residential polarization for the groups in the comparison.

Brief discussion of a hypothetical example can illustrate the key issues. Assume a hypothetical city with 4 equal size census tracts each containing 4000 people. Also assume that each tract is subdivided into 4 equal size block groups (for a total of 16 block groups) each containing 1000 people. Next assume that the city has two groups, one with 15,000 people and one with 1000 people, and then assume that everyone in the smaller group resides in a single block group. Finally, assume that each block group is divided into 10 equal size blocks each containing 100 people.

In this example, S and D will both register perfect segregation ($D = S = 100.0$) if their values are computed using block data or block group data. However, if they are computed using tract data their values will be 80.0 for D and 20.0 for S. This contrast illustrates two points. The first is that both displacement (D) and separation (S) can be measured without error if the spatial unit used in the research is "right sized" as it is in this example when using blocks and block groups.

The second point is that when the spatial unit used is too large – meaning specifically that the population of the smaller group is too small to fill multiple areas, as is the case when using tracts in this example – the value of all indices of uneven distribution will be underestimated. Furthermore, while both D and S will be underestimated based on this problem with research design, the impact will tend to be more dramatic for S for reasons give above. This in turn can distort the comparison of D and S. In the worst case scenario, it would produce an incorrect impression that a high D, low S situation of "dispersed displacement" or "displacement without separation" prevails when a better research design would reveal a high-D, high-S combination indicating a pattern of "prototypical segregation".

A simple practice can guard against the problem; avoid using spatial units that are too large to reveal group separation and neighborhood polarization involving small groups. A practical rule of thumb is that typical population size for spatial

units should be one-third to one-fifth the total size of the smaller group. Alternatively, group size should be 3–5 times larger than typical area population size. When this condition is met, it will be possible to detect group separation and neighborhood polarization when it is present. However, if the spatial units are too large – that is, if their typical population size approaches or is larger than the size of the smaller group, it will be impossible to fully "see" group separation and residential polarization when it is present.

### 8.3.1 A Case Study of White-Black Segregation Cullman County Alabama

I now review a real world example that illustrates both the problem and the solution. The case is White-Black segregation in Cullman county Alabama, which constitutes the Cullman, Alabama core-based statistical area (CBSA). In 2000 the county population included 73,940 Whites and 726 Blacks with Blacks comprising less than 1 % of the population. A *New York Times* article (Dawidoff 2010) reports that Black residents of the area describe the county as having a racist history including vigorous KKK activities and a hostile attitude toward Blacks in the Jim Crow era and beyond as exemplified by the fact of "sundown town" signs being posted in Cullman, the largest urban center of the county, well into the 1970s.[5] Historically, this caused Blacks to be excluded from the city of Cullman and the demographic legacy remains evident in contemporary residential distributions for the county. As of 2000, a majority of the Black population residing in the county lived in or near the small city of Colony, an outlying hamlet traditionally known as a "safe haven" for Blacks located in the hilly countryside to the south of Cullman, which was originally settled by former slaves who received land during Reconstruction following the Civil War (Kaetz 2013; Dawidoff 2010).

The social history of the county explains why Blacks are few in number in the local population and it provides a basis for expecting that the small Black population present would be residentially separated from Whites. This is in fact the case. But it is crucial to use "right sized" spatial units to "see" this pattern in a quantitative analysis of White-Black segregation. Group separation and residential polarization is readily evident in analysis using data for census blocks ( $S = 62.6$ ). But it is less evident in analysis using data for census block groups ( $S = 21.0$ ) and it is not evident at all using data for census tracts ( $S = 5.8$ ). In comparison, values of D do not differ so dramatically by type of spatial unit. The progression for D is 94.2 for blocks, 82.6 for block groups, and 73.8 for tracts. Values for both S and D are lower when using tracts instead of blocks. But the difference between block- and tract-based scores for D is modest in comparison to the same difference observed for

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[5] Loewen (2005) study of "Sundown" towns discusses Cullman and many other cases and notes that sundown signs proclaimed messages such as "Nigger Don't Let the Sun Go Down on You in This Town" and were common place in Alabama and many other states of the South and Midwest.

S. The progression in D-S difference is from 31.6 for blocks, 61.6 for block groups, and 68.0 for tracts. Recalling guidelines for D-S comparison offered in earlier chapters, the comparison based on block data indicates high-D, high-S and "prototypical segregation" based on a pattern for concentrated displacement from even distribution. In contrast, the comparison based on tract data suggests high-D, low-S consistent with a pattern of "dispersed displacement" or "displacement without separation".

The explanation for these results is simple; the typical population sizes of census tracts and even census block groups are too large to detect White-Black residential separation in a situation where the Black population is small. The typical tract in Cullman County has a population of approximately 4,000 so, even if all Blacks in the county lived in a single tract, they would live in a predominantly White tract. In contrast, the typical block in Cullman County has approximately 24–28 people (similar to block data for other communities around the country) and thus block-level analysis has the logical capacity to easily detect White-Black separation and residential polarization if it is present. And it definitely is. Out of 2,449 populated blocks in Cullman County in 2000, a subset of twelve (12) blocks that were at least 75 % Black (and with at least 10 residents) contained over 370 Blacks, over half of the Black population in the county. GIS-based mapping of population distribution for the Cullman CBSA (not reviewed here) reveals that these 12 blocks are located in a cluster of contiguous blocks in and around the hamlet of Colony. The high value of the separation index ( $S = 62.6$ ) computed from block data registers this pattern of group separation and residential polarization clearly and unambiguously. Its interpretation is simple, straightforward, and sociologically meaningful. Whites and Blacks in Cullman County are residentially separated from each other and members of both groups primarily live in racially polarized neighborhoods where their own group predominates.

The lesson from this case is that tracts can be too large to detect White-Black residential separation even when the size of the Black population exceeds the size of the typical tract. This problem can occur under at least two conditions. One is when segregation involves "checkering" occurring at a spatial scale smaller than the tract. Checkering could occur for example when multiple small predominantly Black neighborhoods arise in different parts of the city. Extreme clustering would occur when predominantly black neighborhoods are contiguous and form a single Black ghetto. Analysis using block level data will detect segregation in both cases. Analysis using tract data will detect segregation only in the second case.

A second condition can further complicate the situation. It is when tract boundaries do not coincide with the perimeters of clusters of homogenous subareas (e.g., blocks). Census guidelines call for tract boundaries to follow social homogeneity in population distribution when feasible. But even at time of original "founding" boundary alignment may not be perfect because other competing concerns (e.g., tract population size, features of the natural and built environment, political boundaries, etc.) also must be taken into account. Even when boundaries initially delimit homogeneous populations, this can change over decades based on dynamics of neighborhood change and population redistribution. Analysis using block level data

will be minimally affected by this problem because of their small spatial and population size. Analysis using tract level data can be affected in non-negligible degree, especially when minority population size is small.

### 8.3.2   A Case Study of White-Minority Segregation in Palacios TX

Palacios Texas is a small city found in the southwest corner of Matagorda County which constitutes the Bay City Texas CBSA. The case of Palacios is interesting because it is characterized by a segregation pattern not seen frequently in empirical studies – a high-D, high-S combination for White-Asian segregation in a community with a relatively small Asian population. Before proceeding, I first pause to make the case that it is reasonable to examine the city of Palacios separately from the rest of the Bay City CBSA. Palacios is a small spatially isolated coastal community located on Matagorda Bay some 28 miles away from the larger, inland community of Bay City. Significantly, Palacios and the nearby region is home to approximately 16% of the total population in the CBSA but about 79% of the CBSA's Asian population.[6] The counts by group for Palacios are 2,895 Latinos, 2,236 Whites, 706 Asians, and 239 Blacks.

The D-S combinations for all White-Minority segregation comparisons in Palacios follow patterns of "prototypical segregation." The White-Black segregation comparison involves a high-D, high-S combination (D = 79.6, S = 50.1) and White-Latino comparison involves a medium-D, medium-S combination (D = 54.9, S = 39.9). These are not particularly unusual for the region. What is unusual is that in Palacios White-Asian segregation also is characterized by a high-D, high-S combination (D = 75.3, S = 64.2) that is rarely seen for White-Asian comparisons.

Close review of the residential pattern by GIS analysis and also with an in-person, on-site visit confirms what the quantitative analysis suggests; namely, White-Asian segregation in Palacios follows a prototypical pattern of extensive displacement from even distribution that is highly concentrated resulting in a high level of group separation and neighborhood racial polarization. GIS analysis confirmed by on-site review of contemporary residential patterns combined with review of historical materials reveals that the Asian population in Palacios has for at least three decades been concentrated in a small set of six adjoining blocks that are home to a thriving Vietnamese community that came into existence in 1976–1983 as a result of a refugee settlement program.[7]

This example provides further evidence that segregation patterns can span a wide range of logically possible outcomes in terms of D-S combinations and that valu-

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[6] Population counts and other analyses reported below are based on the census tract in Matagorda County Texas that contains all block groups overlapping with or adjoining Palacios.

[7] This discussion draws on an article "A Shrimp Tale" by Robert Draper in the October 1996 issue of *Texas Monthly* magazine which recounts the history of Vietnamese settlement in Palacios and its reception by and impact on the local community.

able insights can be gained by examining both displacement (D) and separation (S). In the case of Palacios TX, the unusual high-D, high-S combination for White-Asian segregation prompted a closer inspection. This in turn revealed an interesting community history with social dynamics that serve to produce and perpetuate a pattern of White-Asian segregation that is quite different from that seen in most communities. In particular, White-Asian is highest of all White-Minority comparisons and much higher than the White-Latino comparison and closer qualitative review confirms that the quantitative finding of high-D, high-S identifies a city with a unique history of ethnic relations and residential segregation.

This example also provides further evidence that the concern that values of the separation index (S) will necessarily be low when groups are small is clearly unfounded. The comparisons of D and S for Palacios, Texas show that these indices can reveal much about segregation of small groups in small communities so long as the research design uses spatial units that are appropriate for the research setting. In this case that requires using block data. When using block data interesting and varied patterns of segregation are revealed by contrasting values of D and S across White-Minority comparisons. GIS analysis of group residential distributions and in-person, on-site inspection of the residential patterns confirms the patterns suggested by the D-S contrasts.

Indeed, the unusually high level of group separation in the White-Asian comparison is both obvious and quite striking when one is "on the ground" in Palacios. But due to the small size of the group populations involved, all of these patterns would be missed if segregation were assessed using tract-level data or even block group-level data. A single tract includes all of Palacios and also the surrounding area so tract-level analysis is infeasible. The tract containing Palacios is comprised of six block groups so block-group analysis is technically possible. But it would be highly misleading. In 2000 the tract containing Palacios had 237 populated blocks. A small cluster of six (6) contiguous blocks located on the northern side of the city forms a Vietnamese enclave easily identified by GIS analysis and on-site inspection. The six blocks contained over half (50.7 %) of the Asian population in the Palacios area and had a population of 41 (10.3 %) non-Asians and 358 (89.7 %) Asians. The enclave cannot be identified using block group data because it is located in a block group where the other blocks (not in the enclave) have a population of 888 (98.1 %) non-Asians and 17 (1.9 %) Asians. Accordingly, computing D and S using block group data yields values of 26.7 for D and 6.3 for S and equally low values for the other White-Black and White-Latino comparisons as well.

### 8.3.3   Reiterating the Importance of Using "Right-Sized" Spatial Units

The takeaway point from these two quantitative case studies is that it is important to use "right-sized" spatial units when assessing residential segregation and particularly when using S to assess group separation and residential polarization for groups

that are small in size. The good news is that S will reliably detect residential separation between two groups so long as the spatial units used in the research design are appropriate for the analysis. In the cases just examined, block data readily revealed patterns of segregation even when some of the groups in the segregation comparisons were very small in overall population size.

Block data were once widely used in segregation analysis including most notably the landmark study by Taeuber and Taeuber (1965) and dozens of studies that used and supplemented these measures (e.g., Schnore and Evenson 1966; Roof 1972; Roof and Van Valey 1972; Sorenson et al. 1975). But in recent decades, with only occasional exceptions such as Lichter and colleagues (2010) and Allen and Turner (2012), segregation studies have relied primarily on tract-level data. The examples reviewed above highlight how the practice of using larger spatial units such as tracts and even block groups can limit the potential scope of segregation studies by creating problems for assessing residential separation between groups when one group is small. This sometimes is mistakenly viewed as a problem inherent in the indices themselves. Indeed, some have raised concerns that the separation index will "necessarily" yield low values when segregation involves small groups. The examples just reviewed show this view is mistaken on two counts. First, to the extent that there is a problem, it is not limited to the separation index; it applies to all popular indices of uneven distribution. Second, the problem is not inherent in the indices; the problem is with basic features of research design in failing to use spatial units appropriate for obtaining valid assessments of segregation.

The analyses just reviewed demonstrate that both D and S can yield misleading low values when computed using tract-level and block group-level data but will correctly signal the presence of substantial segregation when computed using block-level data. This suggests that studies should use block-level data to guard against the problem. But as noted above this practice has become uncommon. The prevailing use of tract-level data is partly due to the fact that census tabulations for tracts provide more detailed breakdowns of population groups. But another important factor is that methodological studies have noted problems that can arise when measuring segregation using small spatial units. Taeuber and Taeuber's thorough discussion of issues in segregation measurement (1965: Appendix 1) noted one reason. It is that it can be difficult or even impossible to achieve even distribution with small areas and small groups because populations are distributed in indivisible, whole number "clumps" associated with individuals, families, and households, not fractional parts, and this makes it difficult to exactly reproduce city-wide racial proportions in small areas. Winship (1977) pointed out a second reason that has been seen as more important. It is that indices measuring uneven distribution are inherently susceptible to undesirable, non-negligible upward bias when segregation is assessed using small spatial units.

The potential undesirable impact of both factors is more consequential for D than for S. But it is an important concern and, accordingly, I review it at length in analyses I present in Chaps. 14, 15 and 16. I save the details of that discussion for later. For now, I note that the new methods introduced in this monograph make it possible to identify the underlying basis for the problem of index bias and introduce new versions of popular indices that eliminate undesirable impact of bias while retaining

| Type of Area | Factor for Ratio of Group Population Count to Area Population Size | | |
|---|---|---|---|
| | 3 | 5 | 10 |
| Blocks @ 30 persons | 90 | 150 | 300 |
| Block Groups @ 1,250 persons | 4,750 | 6,250 | 12,500 |
| Tracts @ 4,000 persons | 12,000 | 20,000 | 40,000 |

**Fig. 8.5**  General guidelines for group population thresholds needed to assess displacement and group separation and area racial polarization

other desirable index properties such as familiar substantive interpretations. Based on this, I have no reservations in advising researchers to use data for smaller spatial units when investigating segregation involving small groups. Concerns about index bias when using block-level data can be readily addressed using methods outlined in this monograph.[8]

### 8.3.4   More Practical Guidance for Using S

The discussion to this point raises the concern that all aspects of segregation in general and group separation and residential polarization in particular may not always be assessed accurately in studies that investigate segregation involving small groups using tract data. Earlier I suggested a "rule of thumb" that the size of the smaller group in the analysis should be 3–5 times the size of the areal units used to assess segregation. This informal guideline provides a basis for diagnosing the situation and considering alternative options for research design. I summarize the implications of this guideline for studies using blocks, block groups, and tracts in Fig. 8.5. Note that the guidelines do not focus on relative size per se. That is appropriate because for this issue relative size is not the true source of the problem. The guidelines instead focus instead on group population counts and indicate that to be "safe" the population size of both groups in the comparison should be at least 3–5 times the typical population size for the areal unit used. In addition, I have added an even more conservative factor of 10 to 1 and then have listed the associated group size "thresholds" for being able to "safely" analysis of displacement from even distribution and group separation and residential polarization when using data for blocks, block groups, and tracts:

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[8] The results for the examples of block-level analysis discussed in this chapter are for "standard" versions of D and S, not the "unbiased" versions I introduce in Chap. 15. In these particular cases, the issue of bias does not distort the findings presented. So I use standard versions of D and S to avoid introducing unnecessary complication to the discussion here.

These calculations make it clear that fairly large city group counts are needed to reliably assess displacement from uneven distribution and group separation and area racial polarization with tract-level data. The "safe" threshold ranges from 12,000 to 40,000 depending on whether one chooses a liberal (3:1) or conservative (10:1) ratio of group population size to typical area population size. Studies using census tract data often include cases where the size of the smaller group in the comparison falls below these thresholds, especially the conservative threshold. This raises questions as to whether assessments of displacement from even distribution and group separation and area racial polarization have been equally reliable across all cases in past studies using tract-level data. The basis for concern is not as great when segregation is measured using data for block groups because the thresholds for group size requirements are lower. The basis for concern is smaller still when segregation is assessed using block data because the thresholds for group size requirements are very small. This indicates that using block data is the safe way to go on this aspect of research design.

## 8.4   A Simple Index of Polarization

I conclude this chapter with a brief discussion of an alternative option for measuring group separation and area racial polarization. I offer the alternative because I recognize that D is popular in part because it is easy to compute and explain. In my opinion, S also is attractive on these counts and compares favorably with D, especially when both indices are presented in the difference of means formulation. But I also recognize that it others may it useful to have an alternative measure of separation when even greater simplicity is a priority. I suggest such a measure here terming it the "Polarization" index.

The index is constructed as follows. First, for both groups, calculate the percentage in each group that resides in areas where their group predominates based on a user-chosen "threshold" or "cut-point" such as 65 % same-group presence ($POL_{65}$). To illustrate using Cullman County, I first calculate the percentage of Whites that reside in areas that are 65 % White and I then calculate the percentage Blacks that reside in areas that are 65 % Black. The results show that 99.9 % of Whites lived in predominantly White areas and 61.8 % of Blacks lived in predominantly Black areas. The value of the polarization index is set to the lower of these two values and so $POL_{65}$ is 61.8.

The logic for this measure is as follows. If the residential distributions of the two groups are polarized, the percentage residing in predominantly same-group neighborhoods must be high for *both* groups. If the distributions are not polarized, the number will be low for at least one of the two groups. So taking the minimum of the two values can serve as a simple "polarization" index. In addition to being easy to compute, the score of 61.8 for White-Black polarization (at 65 %) in Cullman County is easy to interpret; it indicates that at least 61.8 % of both groups reside in neighborhoods where their group predominates (at a level of 65 % or higher).

   The main benefit of this measure is that it may be useful for helping broad audiences gain an immediate intuitive grasp of group separation and neighborhood polarization. I have conducted detailed analyses (not reported here) of the behavior of this simple index of separation and polarization and I find that the measure can be highly serviceable. It ranks cases in a consistent way over different user-choices for the threshold for same-group presence and its values typically track the separation index (S) fairly closely. For example, when using threshold levels for group predominance over the range of 55–75 %, the index values for Cullman fall between 53.3 and 62.5 and thus are roughly comparable to the value of S at 61.8.[9]

   Consistency between S and POL also is seen when considering a broader range of cases. For the large, multi-year CBSA data set introduced earlier in Chap. 6, the correlations among "cut point" polarization indices using thresholds set at 5 point increments over the range 55–80 % ranged from 0.93 and 0.94. Of course, while these correlations are very high, they are not perfect. That is to be expected because S registers separation and polarization across the full spectrum of area racial composition, not just in relation to a single threshold value. The trade-off then is between precision of measurement (S) and easy of discussion and presentation ("cut point" polarization indices).

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[9] Setting the threshold at 5 point increments ranging from 55 to 80 % yields polarization scores of 62.5, 62.5, 61.8, 54.7, 53.3, and 53.3.

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