Local, multiscale measures of segregation: Neighborhood change in Seattle 1990-2010

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The literature on segregation has benefited from an extensive series of developments in recent years adding significantly to our capacity to represent the complexity of residential patterns and neighborhood change (Wong, Reibel, and Dawkins 2007). Current best practice understands segregation as occurring simultaneously at multiple scales from the very local to the regional and as varying both within and among cities (O'Sullivan and Wong 2007; Reardon et al. 2008). This paper sets out to examine how the variations in the intensity of segregation at multiple scales can be related to changes in this intensity over time and across space. In short, what kinds of segregation lead to what kinds of neighborhood change and in what places?

Reardon and colleagues have made a substantial contribution to the literature by developing a measure that conveys the reality that segregation varies across scale and that different scales will be relevant to an individual when they are at home, walking to the park, or searching for a job. However, up to now, the measures they have developed have only been presented in aggregate form as a means of comparing the structure of multiscale segregation across cities (Lee et al. 2008; Reardon et al. 2008, 2009). This paper builds directly on their efforts by decomposing the multiscale segregation measure to reveal variation *within* a single metropolitan area. Several authors have acknowledged that segregation is best understood as a locally varying process (Chung and Brown 2007; Rey and Anselin 2011) with the variation across space and changes over time within cities being central to our understanding of the mechanisms that produce segregation and the impacts it might have on residents (Farrell 2008). This decomposition exercise represents a logical next step in the development of our understanding of the complex interactions between segregation and neighborhood change.

Methodologically, this paper leverages the decomposability of the spatial Entropy measure developed by Reardon and O'Sullivan (2004) and calculates a series of Entropy values at increasingly larger geographic scales for every cell of a raster surface. The result can be understood as a function relating Entropy to distance for each point in the study area. The challenge then becomes one of visualizing and interpreting this incredibly rich data structure as a means for understanding the residential patterns that are associated with stability or change.

This paper explores the relevance of two measures, the intercept and slope of the linear estimate at each point, for understanding the likelihood of change or stability. Specifically, for each cell of a raster surface we can estimate a best fit line from our multiscale segregation measure. The intercept of this line represents the intensity of segregation (Entropy) as the size of the local environment approaches zero. The slope conveys the rate at which segregation

decreases as the local environment increases in size to encompass the entire region. Descriptively we can explore the mean and variation of these variables in a given year and their change across years. We can also map these variables in each year and represent their change over time in particular places. By examining changes in the distribution of functional forms over time and space we can add to our understanding of the changing experiences of segregation for different populations within an urban area and perhaps glimpse more details about the mechanisms driving settlement patterns.

A significant motivation for capturing the local variation in multiscale segregation is to contribute to a related literature that has sought to understand neighborhood change in the U.S. as it relates to more diverse neighborhoods (Freeman 2009; Holloway, Wright, and Ellis 2012; Johnston, Poulsen, and Forrest 2007). A key contribution of this literature is to recognize that segregation (and diversity) means very different things depending on the racial or ethnic group that is locally dominant. Thus, a local area that has 50% Non-Hispanic white population and strong representation from several other racial/ethnic groups would be potentially quite different from a local area with 50% black population and an otherwise identical mix of other groups. Establishing the interactions among levels of segregation, dominant racial/ethnic group and the rate and nature of neighborhood change will be a key goal as this research moves forward. In the context of the present paper, this research agenda can be advanced by identifying functional forms in the relationship between segregation and distance that are more or less consistent with the stability of neighborhood population mix. Is neighborhood change more likely to occur in places that are diverse (assuming that diversity can act as an attractive force for potential gentrifiers) or in places that are adjacent to white-dominant segregated neighborhoods (assuming that gentrification is driven by housing price increases)? Careful study of the timing and location of changes in our multiscale measure can contribute to the literature on the mechanisms driving neighborhood change while also contributing to policy debates on how to limit the negative impacts of gentrification.

This paper examines local changes in neighborhood diversity across multiple scales for the City of Seattle between the years 1990 and 2010 with a particular emphasis on eight highly diverse neighborhoods in South Seattle (Figure 1). Seattle was chosen for this research because of its role in a larger project on the links between local economic development and neighborhood change. This project has generated detailed qualitative information on neighborhood change within the city over the same time period that will be essential to interpreting the changes under examination in this study. Seattle is also useful as a case study because it features neighborhoods that have unquestionably experienced gentrification during this time period (the "Central District" at the middle right of Figure 1) as well as a number of highly diverse neighborhoods that have shown remarkable stability in population mix through at least two periods of housing market boom ("South Beacon Hill" and "Rainier Beach" at bottom right in

Figure 1. See also Holloway et al. 2012 for a separate reference to the stable diversity present in parts of Seattle). To the extent that diverse neighborhoods are understood to be desirable, a better grasp of the characteristics of these neighborhoods will be beneficial.
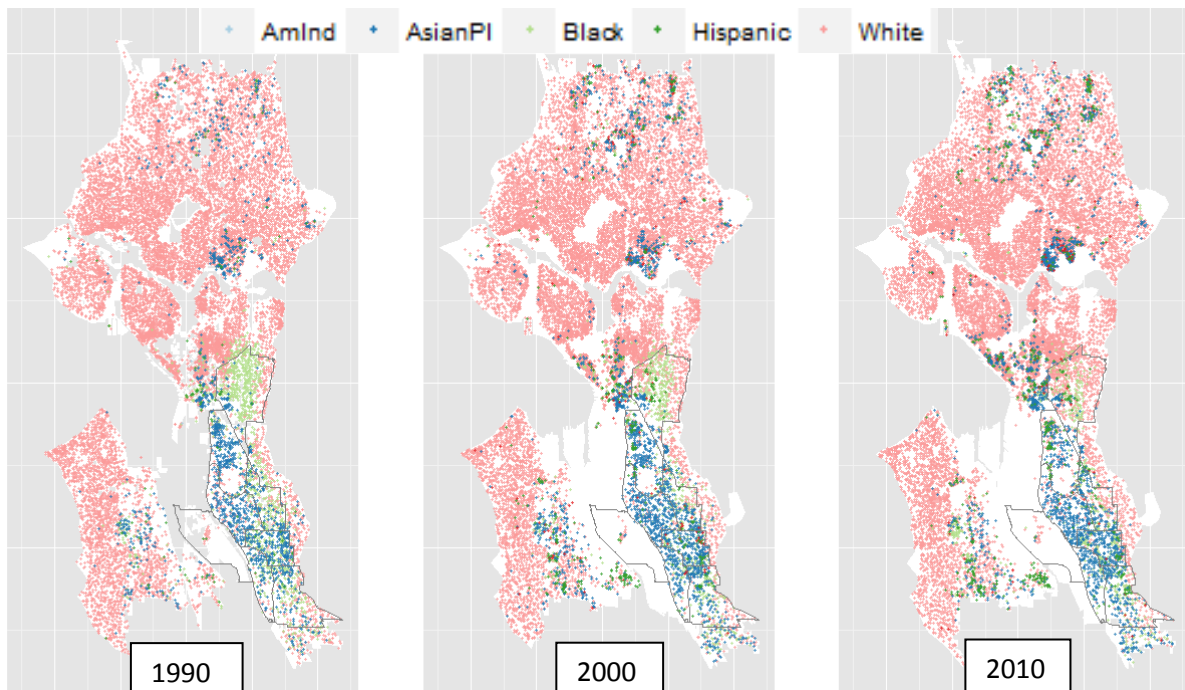

Figure 1: Dot density map of Seattle. 20 people per dot. Source: Census SF3 1990,2000,2010

Timeline

This abstract was culled from a working draft of the eventual paper that will be complete well before the March deadline. At present I have the literature review and methodology sections largely complete. All the relevant data is cleaned and ready to go. I have modified an existing set of functions in R (Hong and O'Sullivan 2013) to calculate the slope and intercept values that will be the focus of my work. I am currently working on the visualization of the results of these functions. This is my first submission to PAA and I was unaware until quite recently of the level of completeness expected in the submission process. Please forgive my failure to provide more complete results at this time.

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