Segregated by Age: Are we becoming more divided?*

by

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Abstract

This study documents residential segregation by age in the United States in 1990, 2000, and 2010 at multiple scales and investigates how levels of age segregation vary across geographic space. Multi-level analysis of segregation between older adults (age 60 and over) and younger adults (age 20-34) illustrates the extent to which segregation occurs between states, between counties, between county subdivisions, and at the micro-scale between blocks within counties and county subdivisions. Mapping and spatial analysis analyze geographic variation in age segregation, assessing regional patterns and demonstrating spatial clustering. Results show that at the micro scale older and younger adults are moderately segregated (at a similar extent as are Hispanics and non-Hispanic whites), and age segregation is stark in certain geographic areas that experience segregation at both macro and micro levels.

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Introduction

The population of the United States is aging with multifaceted demographic, social, and economic consequences. One potential consequence is increasing age segregation, but demographers have almost entirely ignored age as a factor in segregation (Cowgill 1978 is one exception), generally assuming that it is "natural" or benign (Uhlenberg 2000). However, there are potentially vital implications for understanding political ideologies, securing local service provision, ensuring support for institutions (like schools and senior centers), promoting the health and well-being of the older population who may benefit from interaction with young people, and for transferring intergenerational knowledge (Foner 2000, Binstock 2010, Attias-Donfut 2000). As households, institutions (like school, work, and service centers), and activities (recreation, hobbies, etc.) have become increasingly age-segregated over time; integrated residential communities could provide space where people of different age groups build relationships and share common goals (Riley and Riley 2000).

Without opportunities for interaction, age groups may compete with one another for limited public and private resources to support the interests, agendas, services, and institutions that best meet their age-specific needs (Foner 2000, Binstock 2010). Older adults may have social and political interests in promoting social security, senior care and services, leisure, and aging-related health services. Younger adults, on the other hand, are in their prime child-bearing years and may have interests in supporting education, family-oriented policies, and active recreation.

Cowgill (1978) found that residential segregation by age increased between 1940 and 1970 in US metropolitan areas. He attributed this increase to population growth and associated urban sprawl and to increasing diversity. As sprawl and diversity have continued to increase between 1970 and 2010, it may be

that Americans have continued to become increasingly segregated by age. In addition, the growth in popularity of retirement communities (age-restricted planned communities) may have further contributed to age segregation. However, no research has examined residential age segregation since 1970 or investigated patterns of age segregation outside metropolitan areas.

This study addresses residential segregation between older adults and younger adults across the United States. The objectives are: (1) to describe the extent to which older and younger adults are segregated; (2) to assess changes in age segregation between 1990 and 2010; and (3) to analyze patterns of age segregation across geographic space. The study is descriptive, but makes contributions to the segregation literature by focusing on age and by combining a multi-scale approach to measuring segregation with mapping and spatial statistics to investigate geographic variation in segregation patterns across the United States. The work is distinct in that the approach taken here celebrates the complexity of segregation by introducing measures at several scales and by emphasizing geographic variation, rather than reducing segregation to a single measure. This approach is important because it provides the opportunity to show where macro and micro segregation occur independently from one another and where they compound one another.

I refer to "macro" segregation and "micro" segregation to distinguish between the scale at which residential segregation occurs, following Parisi et al. (2011) and Lichter et al. (2007). Micro segregation refers to segregation at the very local neighborhood level, between blocks within county-subdivisions or within counties. Macro segregation refers to higher level segregation that occurs between states, counties, and/or county subdivisions (cities, villages, townships and other rural space). Micro segregation depicts the daily interactions that individuals have within their immediate neighborhood, while macro segregation is more important for political decision-making and interactions that individuals are likely to have with one another shopping, visiting key neighborhood institutions, or at work. As Parisi et al. note "segregation can

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occur at many different levels of geography" (2011, p. 833), and these levels of segregation, when they occur at the same time, may compound one another in their effects of limiting social interaction between population groups.

Research Design & Methods

Dealing with scale and space remain two important challenges in segregation research. Segregation indexes are sensitive to choice of geographic unit or scale of analysis (Lee et al. 2008), and the appropriate scale at which to measure segregation is well debated. "Neighborhood" definitions and the scale of the larger geography within which we compare neighborhood distributions both have important implications for measuring segregation (Lee et al. 2008). Parisi et al. (2011) address this issue by measuring segregation at multiple scales from what they call the "micro" level (between blocks within places) to the "macro" level between larger geographic units such as between regions and metropolitan areas.

Questions about scale are ultimately questions about space. Segregation is an inherently spatial process, yet the most common segregation measures do not include spatial reference (Grannis 2002, Lee et al. 2008). There are multiple ways in which spatial relationships might be taken into account. Researchers such as Dawkins (2006) and Lee et al. (2008) have proposed complex methods for incorporating space and scale in segregation indexes. Still, these approaches remain outside the methodological toolkit of most researchers, and they ultimately reduce a vast amount of complexity to a single, difficult to interpret segregation measure.

This paper addresses these challenges by observing the underlying complexity involved with segregation, rather than reducing segregation to a single measure. We take a relatively simple approach to dealing with space and scale by measuring and reporting on segregation at multiple scales using the familiar Dissimilarity Index (D), mapping ratios of older to younger adults, and employing basic spatial statistics to

investigate spatial clustering and illuminate regional patterns of age segregation. Taken together, these methods tell a rich story about the extent to which the American population is segregated by age and how age segregation varies across space. The approach emphasizes local levels of segregation analyzing the extent to which older adults and younger adults reside in the same immediate neighborhood (micro segregation), and it assesses more regional levels of segregation by evaluating segregation at the macro level (between states, between counties, and between county subdivisions) and investigating spatial clustering of county-level segregation.

We employ the dissimilarity index (Duncan and Duncan 1955, Massey and Denton 1988) to measure residential segregation and to analyze patterns of age segregation at multiple scales-- between states, between counties, between county subdivisions and at the micro-scale between blocks within counties and county subdivisions. County subdivisions include incorporated places, census designated places, and divisions of the more rural territory that makes up the remainder of counties. They are political units (minor civil divisions or MCDs) in several states in the Midwest and Northeast and carry associated political and community meaning in these states. Broadly, county subdivisions can essentially be thought of as cities, villages, and divisions of the more rural space. The dissimilarity index (*D*) is the most commonly used measure of segregation. It measures the evenness of distribution of the population across space, ranging from 0 to 100 where 0= no segregation and 100= total segregation. It can be interpreted as the percent of the population who would have to move to equally distribute older adults and younger adults.

Using D, we compare the distribution of two population groups: older adults (age 60 and over) vs. younger adults (age 20-34). Adults age 60 and over have reached or are nearing retirement age. They are not likely to live with their own children under age 18. The focus is on ending career and preparing for or living in retirement. People at ages 20-34, on the hand, have very different needs and interests. Younger adults are in their prime child-bearing years and focused on building a career and family.[1]

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Notably, *D* is not affected by the composition of the population at the larger geography. For instance, when examining age segregation by block within counties, a county with a high proportion of older population (and a small young population) can have the same *D* as a county with a low proportion of older population (and large young population). Instead, *D* is a measure of how evenly dispersed across blocks the population that does reside within the county is.

Data are total population counts by five-year age group from US Census 1990, 2000, and 2010, Summary File 1. Like Lichter et al. (2007), we analyze micro segregation by examining census blocks within county subdivisions. Census blocks provide the basic component building block for our analysis. These units are similar to a city block (in more urban areas and considerably larger in more rural areas). They approximate the immediate neighborhood within which people live and interact with neighbors on a regular basis. While most segregation studies use the census tract as unit of analysis, use of this unit has been called into question (Lee et al. 2008), and tracts do not work well for more rural areas of the country outside metropolitan areas (Lichter et al. 2007). Census blocks are the most appropriate unit for the building blocks of this study because they nest perfectly within county subdivisions and because they are workable for more rural areas (Lichter et al. 2007, Parisi et al. 2011).

In order to measure segregation at multiple scales, we associated multiple geographic identities (county subdivision, county, and state) with each individual block using ArcGIS and TIGER/Line shapefiles to create a dataset in which blocks are clearly nested within county subdivisions which are located within counties, within states. In order to maintain geographic consistency over time, block data from each decade were associated with larger geographic boundaries (states, counties, and county subdivisions) as they were at Census 2000. We then calculated the dissimilarity index (*D*) at the various scales in Stata using Reardon's "seg" command. The resulting *D* values depict average macro segregation (between states,

between counties within states, and between county-subdivisions within counties) and micro segregation (between blocks within county subdivisions) across the entire United States.

We continue to explore the extent of age segregation at the macro level at Census 2010 in more detail by summarizing age structure at the state and county levels. Mapping the ratio of older adults to younger adults at the county level shows which counties are disproportionately old and those that are especially young and how they are distributed across space. Finally, exploratory spatial analysis melds micro and macro segregation measures. We analyze spatial patterning of micro segregation examining how spatially clustered counties across the United States are based on their level of micro segregation (*D* of blocks within counties). A significant Moran's *I* (global measure of spatial autocorrelation) would indicate that counties with similar levels of micro age segregation tend to cluster together in space. This finding would suggest that micro segregation is related to a somewhat different dimension of macro segregation. If larger geographic regions (clusters of counties) tend to all experience elevated micro segregation, there could be broader implications for macro processes, such as political decision making. Local indicators of spatial autocorrelation (LISA statistics) show *where* counties with similar (and dissimilar) levels of micro segregation cluster together in space, noting where pockets of highly segregated counties lie.[2]

Results

Table 1 shows the average dissimilarity index at multiple scales in 1990, 2000, and 2010. This summary provides a sense of the extent of age segregation, how it has changed over time, and at what scales segregation tends to occur. Results show that on average in the United States, age segregation increased somewhat between 1990 and 2000 (at all scales except between states), but remained essentially stable between 2000 and 2010. In the most recent decade, age segregation between states declined somewhat, but segregation between county subdivisions increased.

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Most of the age segregation occurs at the micro level. In 2010, micro D was 42.6, meaning that in the average county subdivision 42% of the population would have to move to a new block in order to evenly distribute older and younger adults within the locality. This level of micro segregation is similar to what Lichter et al. (2007) found for segregation between Hispanics and Non-Hispanic Whites at the micro level (between blocks within census places)[3], and falls within what they refer to as a "moderate" degree of segregation. Furthermore, it is important to point out that because each of the geographies shown in Table 1 nest within one another, each D value (at each scale) essentially represents a compounding of segregation. In other words, there is a certain (though small) degree of segregation between states, there is additional segregation between counties within states, still more segregation between county subdivisions within counties, and then the most segregation at the micro scale between blocks within county subdivisions.

Insert Table 1 about here.

These national level statistics offer an indication of the average level of segregation across the United States, but they mask variation. For instance, in 2010 state level D for counties within states ranged from 3.3 in Connecticut to over 21 in Florida and 23 in North Dakota. Looking at micro segregation for blocks within county subdivisions in 2010, 42.4% of all county subdivisions experienced low age segregation (D<40, following Lichter et al.'s 2007 classification of micro segregation by race/ethnicity), 47.4% experienced moderate age segregation (D= 40-60) and 10.2% experienced high age segregation (D> 60).

Figure 1 shows variation in the age structure of the population by state (macro segregation), noting the percent of the population over age 60. While segregation between states is quite low as a whole, there remains considerable variation between states. The proportion of older adults ranges from a low of about 13% in Alaska and Utah to a high of over 23% in Florida.

Insert Figure 1 about here.

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Figure 2 illustrates macro segregation between counties. It shows the ratio of older adults to younger adults by county at Census 2010. The ratio for the United States as a whole is 0.91, meaning that counties with a ratio near 0.91 have an expected distribution of older to younger adults with no age segregation (shown in white). Green counties are disproportionately young, while brown counties are disproportionately old. Dark brown counties have more than twice as many older adults as younger adults. Dark green counties have more than twice as many young as old. Young adults tend to be clustered in a relatively few counties (colleges, cities, military). Many counties have a disproportionately older population, especially in the West and in known retirement destinations (i.e. Florida, Arizona, New Mexico, and the Upper Midwest lakes areas).

Insert Figure 2 about here.

Figure 3 visualizes geographic variation in micro segregation between blocks within counties. Darker blue counties indicate high levels of micro segregation, while lighter counties experience relatively low levels of segregation. Counties in the Great Plains, in other areas of the rural West and Upper Midwest, and in Florida tend to be the most segregated by age. Appalachia and other areas of the rural South tend to be more integrated.

Insert Figure 3 about here.

As mentioned previously, spatial statistics investigate the degree to which counties with similar levels of micro segregation cluster together in space. Moran's i is a global measure of spatial autocorrelation noting the average degree to which like counties cluster together (Anselin 1988). Overall, in 2010 counties tend to have similar levels of micro age segregation as their neighbors, exhibiting a high degree of spatial autocorrelation (Moran's i= 0.59, p-value <0.001, Queen contiguity spatial weights matrix).

Figure 4 shows where pockets of high and low segregation counties cluster across space using local indicators of spatial autocorrelation (LISA statistics). LISA statistics examine relationships between specific

counties and their neighbors. For instance, if a county scores high on the segregation index and so do its neighbors, the county is shown in dark red. If both a county and its neighbors score low, the county is shown in dark blue. Paler shades represent counties that are different from their neighbors, with pink counties exhibiting higher segregation than their neighbors and light blue counties experiencing less segregation than their neighbors. Only counties with statistically significant spatial relationships ($p<0.05$) with their neighbors are colored in this map. Non-significant counties are shown in white.

<center>Insert Figure 4 about here.</center>

Conclusions

We find evidence that older adults and younger adults are moderately segregated across the United States at the micro level, and somewhat less segregated at macro levels. While age segregation increased somewhat in the 1990s, it did not change between 2000 and 2010. The degree of age segregation at both the macro and micro levels varies considerably across local space. Older states (e.g. Florida and Maine) have a noticeably different age structure than younger states (e.g. Alaska and Utah). At the county level, the ratio of older to younger adults is at least 22% higher than the national ratio of 0.91 in 65% of all counties. In 13% of counties (n= 403) mostly in the Great Plains and in retirement destination counties, the number of older adults is twice the number of younger adults.

Micro segregation also varies significantly across space. While some areas experience significant age segregation, others are quite integrated. Furthermore, counties with similar levels of micro segregation tend to cluster together in space creating whole regions of the country with relatively little age integration, especially across the Great Plains and in retirement destination pockets in Florida and Arizona.

Particularly interesting is the fact that the same regions with clustered micro segregation tend to be those with a relatively old population (macro segregation). Many of these areas are places where older

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people have moved into the region and/or younger adults moved out. Because the dissimilarity index controls for the age composition of the population at the county level, the finding that certain areas of the country that have an older population composition overall are *also* highly segregated at the micro level suggests that young adults and older adults may have very little interaction in these areas. These are places where macro and micro segregation compound one another. For example, while West Virginia, Florida, and Montana are each among the oldest states in the country, the relatively few young adults who do live in West Virginia reside in neighborhoods together with the older population to a much greater extent than in Montana or Florida.

In sum, our substantive results imply that further analysis of age segregation across the US is warranted and raise questions about the differences in the extent of age segregation between similarly aging areas of the country like the Great Plains and Appalachia. These results are purely descriptive and additional research should be undertaken to analyze correlates to age segregation and to investigates its social and economic causes and effects. Particularly interesting would be to analyze the degree to which racial, ethnic, and age segregation are related.

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Table 1:   Average Age Segregation at Multiple Scales, 1990-2010

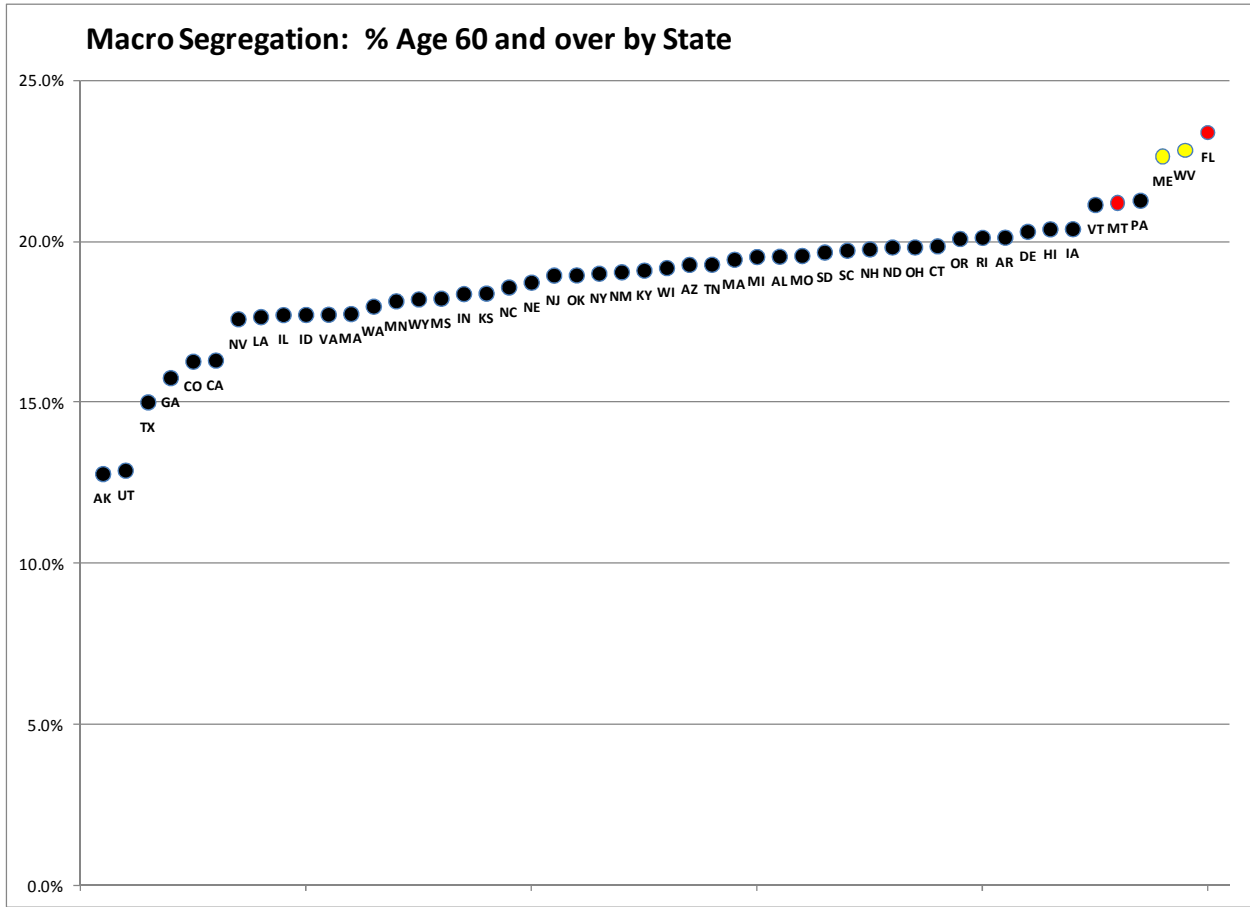|	1990	2000	2010
Between States/Within US	7.7	7.5	6.7
Between Counties/Within State	12.6	13.0	13.0
Between County Subs/Within County	10.1	10.7	11.6
Between Blocks/Within County Subs (micro)	39.9	42.5	42.6

Figure 1

Macro Segregation: % Age 60 and over by State

Figure 2

Macro Age Segregation: County-level Concentrations of Old and Young

Ratio of Older Adults to Younger Adults
Census 2010

- 0.14 to 0.49 (Young)
- 0.5 to 0.69
- 0.7 to 1.09
- 1.10 to 1.99
- 2.0 to 5.9 (Old)

Figure 3

Residential Segregation between Older and Younger Adults within Counties

Dissimilarity Index (2010)

13.5 to 36.6
36.7 to 44.3
44.3 to 51.5
51.5 to 61.3
61.3 to 87.2

Data Sources: US Census 2010, Summary File 1 and TIGER/line shapefile for counties.

Figure 4

Clusters of Age Segregation:
Dissimilarity Index of Blocks within Counties

Local Indicators of Spatial Autocorrelation (LISA)

- High - High
- High - Low
- Low - High
- Low - Low

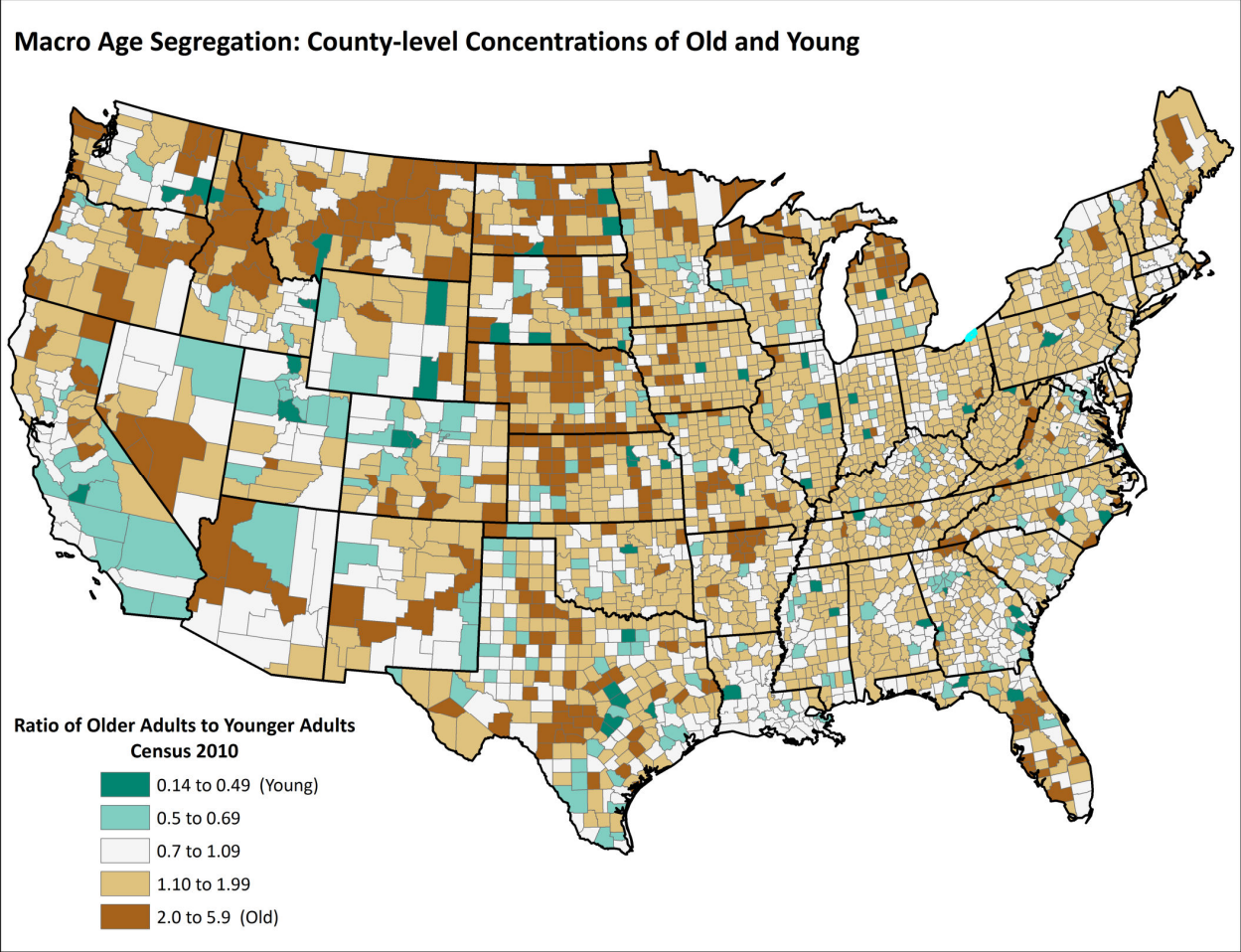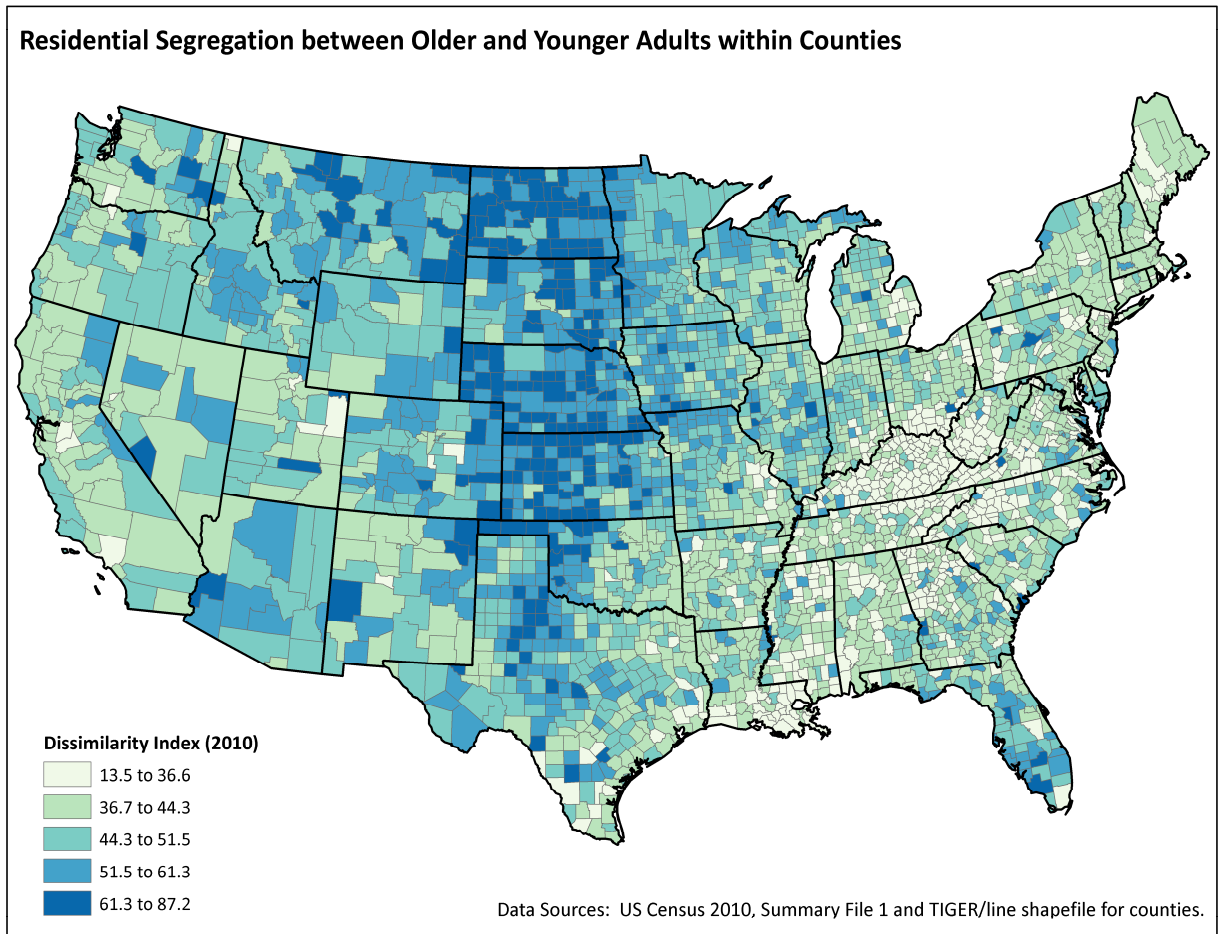Notes: Only relationships with p< 0.05 are shown. Global moran's i= 0.59, p<0.001.

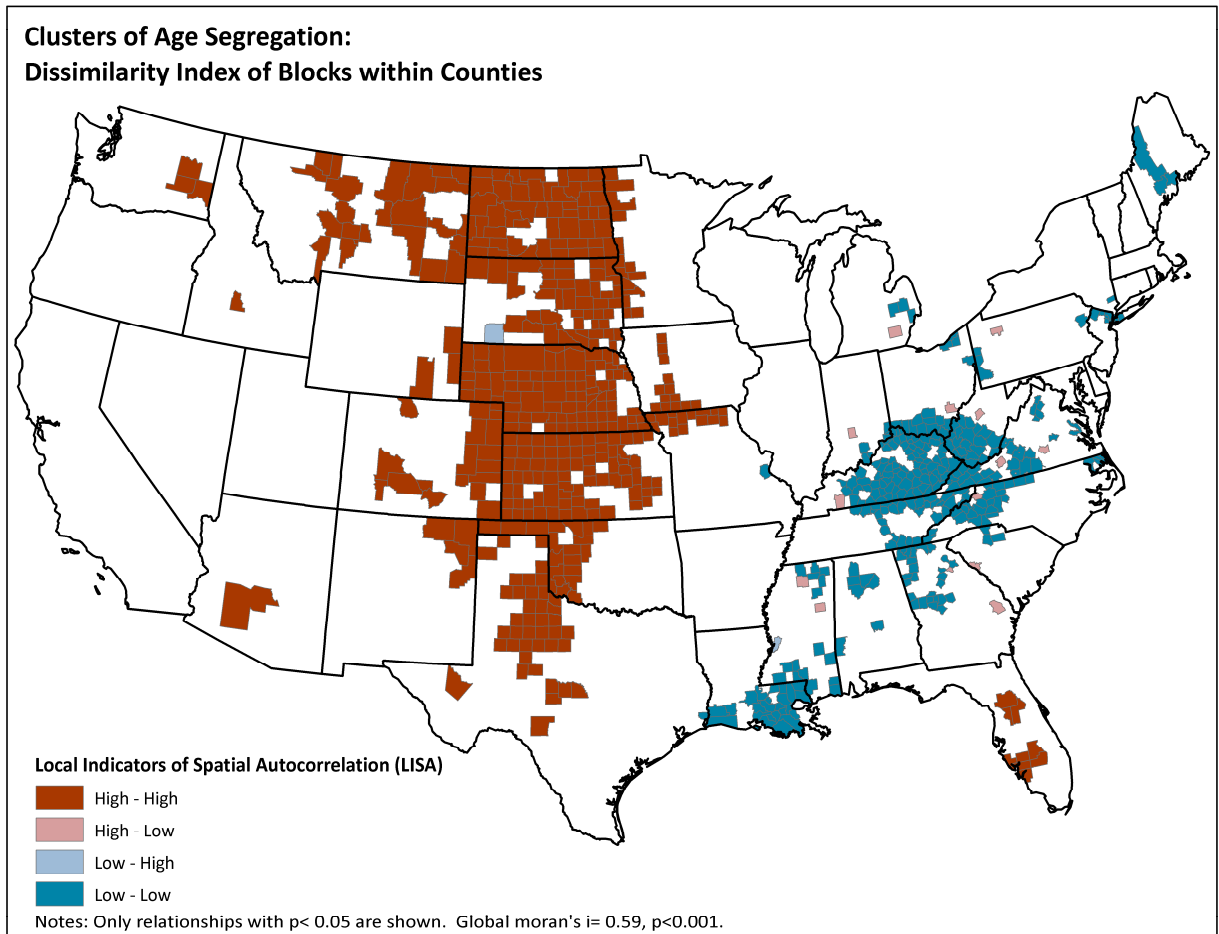[1] Note: We include the total population from census counts, rather than the household population. The total population will include those living in group quarter such as nursing homes or college dormitories. For the specific age groups under analysis, these group quarters are likely to contribute strongly to age segregation—they will cluster the population into these institutions in a particular block. Still, we have made this choice quite deliberately because even when the age segregation is based on institutions, it is still real and may have important social effects.

[2] See Anselin (1998) for details of spatial statistical measures.

[3] Lichter et al. 2007 found micro segregation between Hispanics and Non-Hispanic Whites D= 44.05.