Neighborhood Isolation and Mortgage Redlining in Milwaukee County

Woojin Chang

Michael Smith

Geography 578

William Gartner

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Table of Contents

Objectives

Housing policy can entrench the disadvantages of segregation in communities. We seek to identify and quantify economic disparities and neighborhood isolation associated with mortgage redlining. Mortgage redlining is a historical practice by which home loans were selectively denied to certain neighborhoods based on demographics using a system of residential security grades. We will quantify neighborhood isolation by applying a segregation index to three socioeconomic variables: home ownership rate, median household income, and median home value. We will repeat these steps for four time points to construct an analysis of neighborhood isolation over time. We will also conduct a series of ANOVA tests to determine if a neighborhood's residential security grade has a significant impact on the variation of the socioeconomic variables.

Introduction

A history of discriminatory housing policy in the United States was institutionalized during the first half of the 20th century. These practices intensified racial and socioeconomic segregation, especially in large urban centers like Milwaukee County, Wisconsin (Squires and O'Connor, 64). Milwaukee County lies on the western shore of Lake Michigan, north of Chicago. It is primarily an urban county, containing the city of Milwaukee and surrounding suburbs. It exhibits many features common to large American cities. It has a diverse population and a history of discriminatory housing practices, including restrictive covenants and mortgage redlining (Squires and O'Connor, 63). Redlining is defined as, "the practice of denying or restricting financial services to certain neighborhoods based on the racial makeup of that neighborhood" (Reece 2009, 5). An additional definition is suggested by Hillier, "Redlining is place-based discrimination, and it must be identified through spatial analyses" (2003, 164). We will conduct a spatial analysis to determine if there are significant socioeconomic differences among residential security grades (A, B, C, and D) as defined by the Residential Security Map of Milwaukee County, created by the United States Federal Home Loan Bank Board (FHLBB) in 1938. In addition, we will quantify and visualize neighborhood isolation by aggregating the segregation indices of three socioeconomic variables (home ownership rate, median household income, and median home value).

This research design is intended to address the following questions:

- Where are the isolated neighborhoods in Milwaukee County, and to what degree they isolated?
- Are there significant differences in the socioeconomic variables among the residential security grades?

This research project will leverage spatial analyses to document the historical effects of discriminatory housing policy while providing insight into the current state of neighborhood isolation in Milwaukee County. The data produced by these analyses can inform future research and policy decisions.

Background

In the early 20th century, racial ideologies began to influence housing policy as the National Association of Real Estate Boards (NAREB), founded in 1908, "adopted an agenda that advocated for strict residential segregation" (Hernandez 2009, 7). Mortgages were mainly a local industry until the 1934 creation of the Federal Housing Administration (FHA), which centralized existing discriminatory lending practices (Hernandez 2009, 8). In 1935, the Home Owners' Loan Corporation (HOLC) took it a step further and created residential security grade maps that divided residential areas into four residential security grades, indicating the perceived lending risk for insurance companies (Gregory and Ell 2007, 191).

The special explanation page of the Residential Security Map of Milwaukee County explains discriminatory lending practices in the different housing grades. "The first grade or A areas are 'hot spots' where good mortgage lenders with available funds make their maximum loans... perhaps up to 75-80% of appraisal... The second grade or B areas are completely developed.., but not what the people are buying today who can afford a new one (so) hold loan commitments 10-15% under the limit... The third grade or C areas are characterized by infiltration of a lower grade population (and thus) hold loan commitments under the lending ratio for the A and B areas. The fourth grade or D areas... are characterized by detrimental influences in a pronounced degree, undesirable population or an infiltration of it. Low percentage of home ownership, very poor maintenance and often vandalism prevail... Some mortgage lenders may refuse to make loans in these neighborhoods" (1938).

As time passed, discrimination policy became more extreme. In 1938, Homer Hoyt, a federal housing policy advisor, wrote a report that ranks fifteen ethnic groups in terms of their

impact on housing values. Following Hoyt's advice, the FHA stated that same racial classes should occupy housing properties in a neighborhood to retain stability of housing values (Squires and O'Connor, 3). Following the government policy, insurance companies began to assess applicants by their names and racial/ethnic backgrounds (Heimer 1982, 48).

The 1944 G.I. Bill, intended to benefit the WWII veterans, further solidified discriminatory loan practices. Both the FHA and the U.S. Department of Veteran's Affairs granted the overwhelming majority of loans to white veterans and excluded African American applicants (Simmons and Harding 2013, 19-20). Following the Civil Rights Movement in the 1960s, Congress passed the Federal Fair Housing Act in 1968 and the Equal Credit Opportunity Act in 1974 to end housing discrimination (Squires and O'Connor 2001, 5). Although these laws provided a legal framework to counter discrimination, most banks were still unwilling to grant mortgages to applicants living in non-white neighborhoods, and thus, the impact of mortgage exclusion persists (Simmons and Harding 2013, 20).

Methodology

Our research project consists of two key concepts: residential security grade and neighborhood isolation. The residential security grades are defined directly from the Residential Security Grade Map (Figure 1). The concept of residential security grade is composed of four variables: grades A, B, C, and D. Grade A is defined as, "homogenous; in demand as residential locations in good times or bad" (FHLBB, 1938). Grade B neighborhoods are succinctly summarized in the 1938 report, "They are like a 1937 automobile -- still good, but not what people are buying today who can afford a new one" (FHLBB). The discriminatory practices of the time become clear with the definitions of grades C and D, "C areas are characterized by age, obsolescence, and change of style; expiring restrictions or lack of them; infiltration of a lower grade population…" (FHLBB, 1938) Grade C neighborhoods are regarded as transitional. The redlined neighborhoods are defined as Grade D. According to the FHLBB, they are "characterized by detrimental influences in a pronounced degree, undesirable population or an infiltration of it" (1938).
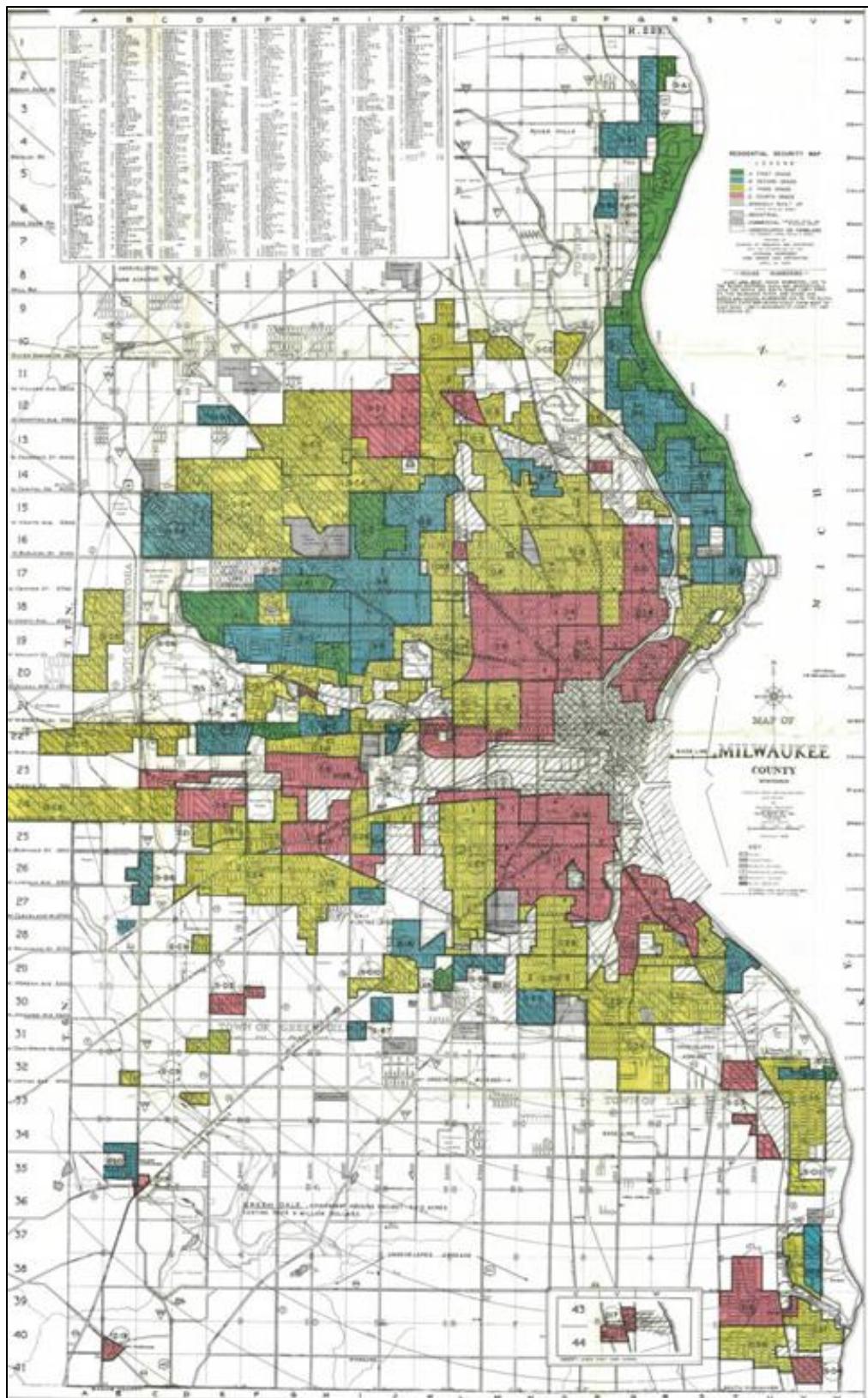
Figure 1. Residential Security Grade Map of Milwaukee County, Wisconsin, 1938.

The residential security grades are operationalized by merging the variables into two groups: Areas with favorable lending terms and redlined areas. Grades A, B, and C are combined to represent areas with favorable lending terms. Grade D represents the redlined areas. Grades A, B, and C are merged to a single operationalized variable because they represent areas where banks were willing to lend. Lenders are more conservative with mortgages in grade C, but are nonetheless still willing to extend credit (FHLBB, 1938). Grade D, on the contrary, represents redlined areas. Here banks often refused to make home loans, as evidenced in the FHLBB report, "The areas are broader than so-called slum districts. Some mortgage lenders may refuse to make home loans in these neighborhoods…"(1938). Representing the residential security grades in this way is supported by their historic definitions and allows us to separate the redlined neighborhoods in our analysis of neighborhood isolation. The concept of neighborhood isolation is measured by three socioeconomic variables. Home value and home ownership are measures of housing, while income is a measure of economic status. These variables are operationalized by using the median value or rate for each census tract: median home value, median household income, and home ownership rate. The concepts of residential security grade and neighborhood isolation and their variables are merged with the census tracts feature class data layer to create an original data layer (Figure 2).
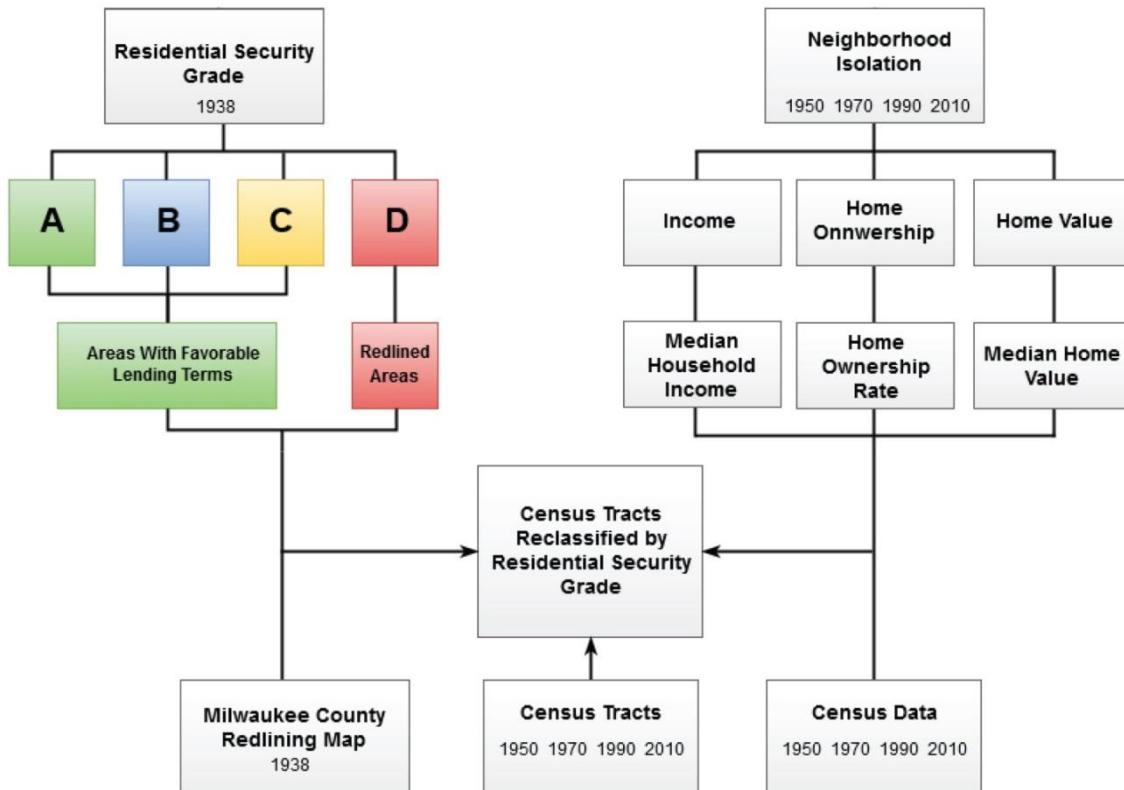

Figure 2. Conceptualization Diagram.

To implement our analysis, we overlay the census tracts for each time point (1950, 1970, 1990, and 2010) with the Residential Security Grade Map (Figure 3). We use georeferencing techniques to ensure the Residential Security Grade Map aligns with Milwaukee County census tracts for each time point. We reclassify the census tracts feature class by adding a new field in the attribute table to represent residential security grade (Figure 4). We reclassify each census tract according to which residential security grade composes the majority of the census tract. We create an additional field, "redlined", defined as a binary with zero being the areas with favorable lending terms (grades A, B, and C) and one being the redlined areas (Grade D).

Next we download the census data for the socioeconomic variables from the US Census Bureau and the National Historic GIS database. The data includes median household income, home ownership rate, and median home value for years 1950, 1970, 1990, and 2010. We standardize the monetary variables (median home value and median household income) to 2010 dollars using official inflation rate data (Bureau of Labor Statistics, 2016). We join the data for each time point with the corresponding census tract feature class using a common field, GIS Join Match Code, provided in the census data.

To determine how the census tracts are reclassified, we consistently apply a rule of majority: the residential security grade that composes the majority of a census tract classifies the census tract. In most cases the classification is clear, so we use visual inspection to reclassify the census tract. However, there are cases of uncertainty for certain census tracts. To address this issue we utilize the cut polygons tool in ArcMap to outline each residential security grade within the census tract (Esri, 2014). We then use the calculate geometry option in the attribute table and examine the area of each residential security grade to determine what residential security grade composes the majority of the census tract. The residential security grade with the most area in census tract is the final classification. Many studies utilize visual inspection and GIS analysis. In one study, Cohen et al. (1998, 294) use visual inspection of images to "characterize errors in a clear cut harvest map derived from Landsat data." Although this study has a different objective than ours, its use of visual inspection supports this process as an appropriate scientific method.
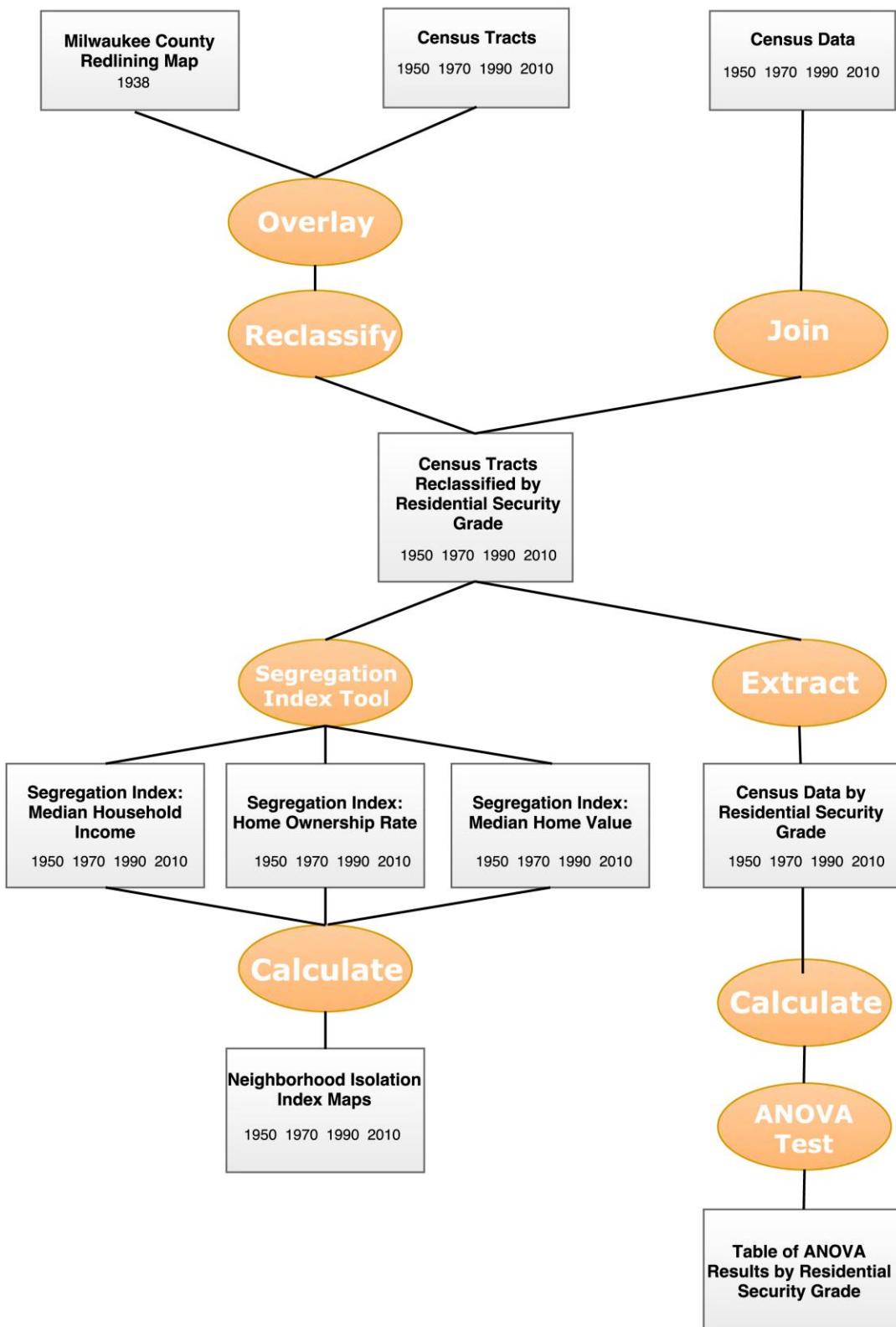
Figure 3. Implementation Diagram.
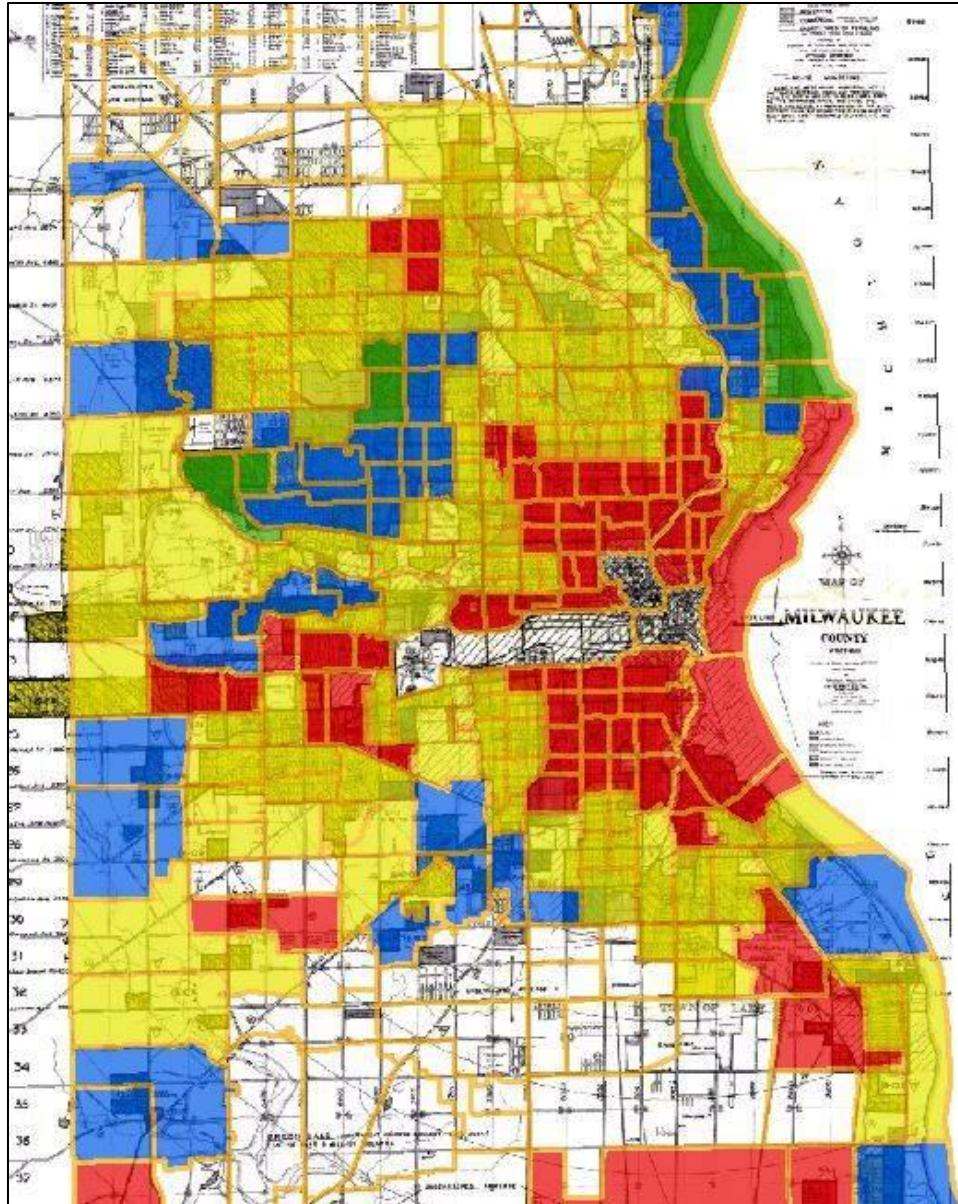
Figure 4. Reclassified Census Tracts.

To evaluate neighborhood isolation, we first must quantify it. We apply a segregation index analysis to each socioeconomic variable using the segregation index tool (Esri, 2013). We input the values of the variables for each census tract. The analysis calculates how the local values, or the data enumerated by census tract, differed from the global values, which are the aggregate census tract values for Milwaukee County. We visualize the segregation index by standardized local dissimilarity (Z_Sdm), as suggested in by Esri (2013).

The low Z_Sdm values (light green, Maps 13-24) represent socioeconomic variable values more similar to Milwaukee County as a whole, while the high Z_Sdm values (dark green, Maps 13-24) represent socioeconomic variable values more dissimilar to Milwaukee County. We run the segregation index analysis of the socioeconomic variables for each time point and visualize the output based on the census tract geography of Milwaukee County. The resulting maps illustrate the segregation index for each variable over time. Since we are evaluating the segregation index across multiple years, we use a quantile classification scheme to facilitate the comparison of the data at different time points.

To quantify neighborhood isolation, we followed the methods used by Reece et al. to calculate an opportunity index (2009). We averaged the Z_Sdm values for each socioeconomic variable, enumerated by census tract, to create a composite index of segregation based on these variables, termed the neighborhood isolation index. We conduct this process for each time point, resulting in a series of four maps that illustrate the neighborhood isolation index over time. Similar to the segregation index maps, these are symbolized where low neighborhood isolation is light green, and high neighborhood isolation is dark green (Maps 25-28). We are evaluating the neighborhood isolation index across multiple years, so we use a quantile classification scheme to facilitate the comparison of the data at different time points.

Next we conduct a series of ANOVA tests to determine if a neighborhood's 1938 residential security grade has a significant impact on the variation of the socioeconomic variables over time. First we calculated the mean value of the socioeconomic variables for each residential security grade and time point (Table 1). We ran ANOVA tests for each socioeconomic variable using NCSS Statistical Software (2016). The results from the ANOVA test allow us to see there are significant differences among the residential security grades over time for each socioeconomic variable.

Year	Residential Security Grade	Mean Median Household Income	Mean Home Ownership Rate	Mean Median Home Value
1950	A	$35,757.70	65.90%	$1,066,134.89
1950	B	$33,930.00	62.12%	$1,065,736.78
1950	C	$31,767.53	57.21%	$929,320.08
1950	D	$27,650.69	38.69%	$721,532.76
1970	A	$119,930.80	76.91%	$1,058,032.44
1970	B	$77,353.68	62.16%	$733,617.94
1970	C	$62,027.94	55.09%	$553,013.62
1970	D	$53,760.92	39.50%	$410,709.60
1990	A	$92,167.01	74.45%	$400,328.34
1990	B	$57,279.12	58.12%	$221,528.75
1990	C	$40,423.98	49.56%	$150,115.00
1990	D	$31,421.78	33.71%	$123,273.54
2010	A	$90,815.00	76.82%	$387,178.00
2010	B	$53,412.00	58.13%	$214,205.00
2010	C	$38,796.00	51.24%	$151,575.00
2010	D	$34,110.00	38.90%	$150,043.00

Table 1. ANOVA Test Input.

Results and Discussion

Our results show that the median home values, the home ownership rates and median family incomes in non-redlined areas, especially the neighborhoods in Grade A, were continuously higher than the ones of redlined areas (Grade D) (Figures 5- 10). In case of the home ownership rate, the value for Grade A increased more than ten percent over the last three decades while the values for the other three zones did not change much.
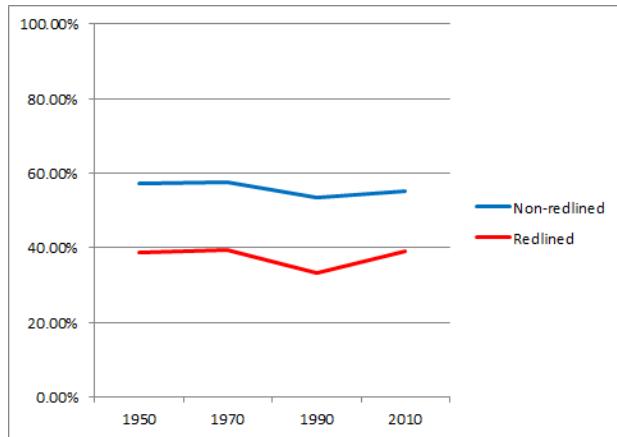
Figure 5. Home Ownership Rates of Non-Redlined and Redlined Areas in 1950, 1970, 1990 and 2010.
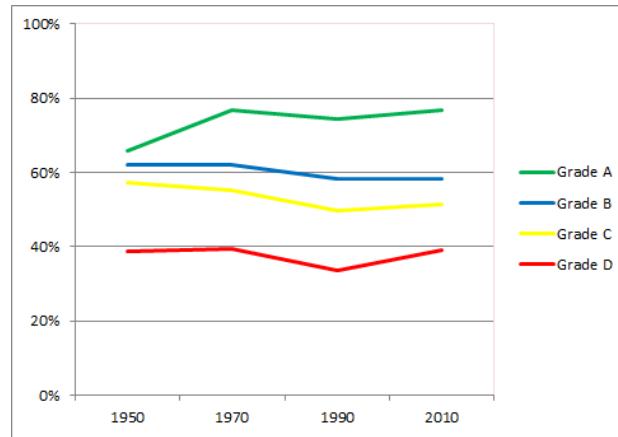
Figure 6. Home Ownership Rates of Grades A, B, C and D in 1950, 1970, 1990 and 2010.
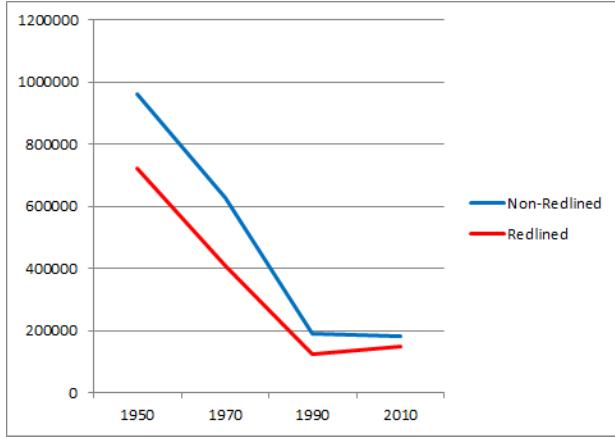
Figure 7. Median Home Values of Non-Redlined and Redlined Areas in 1950, 1970, 1990 and 2010.
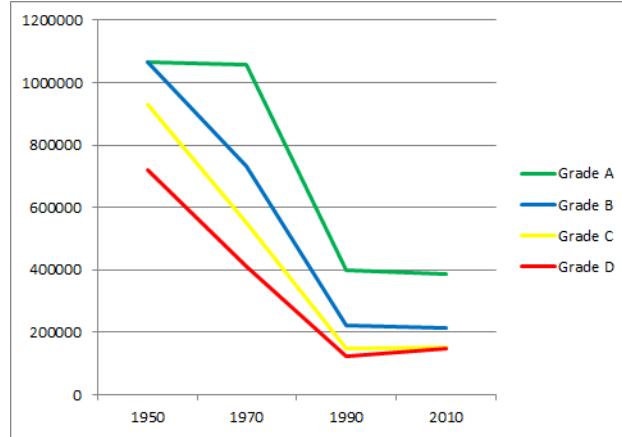
Figure 8. Median home Values of Grades A, B, C and D in 1950, 1970, 1990 and 2010.
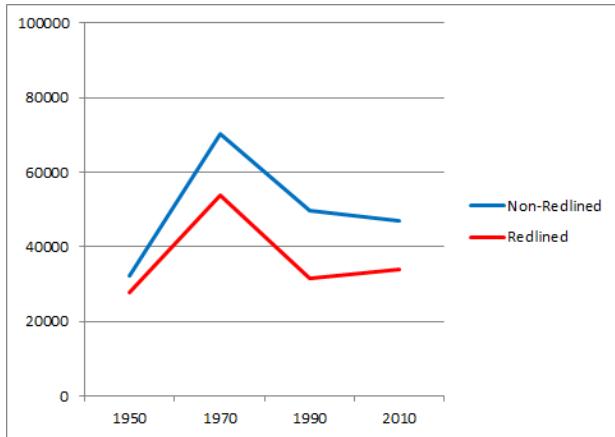
Figure 9. Median Family Incomes of Non-Redlined and Redlined Areas in 1950, 1970, 1990 and 2010.
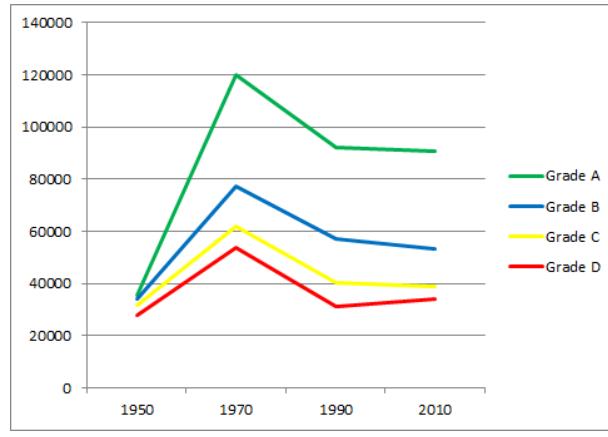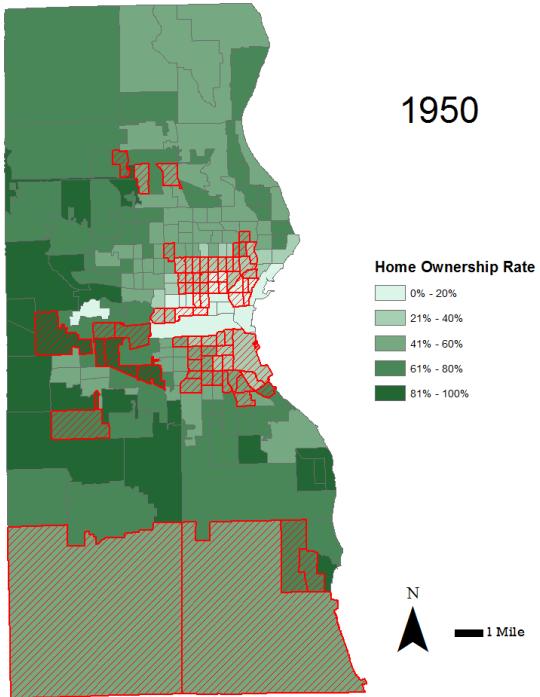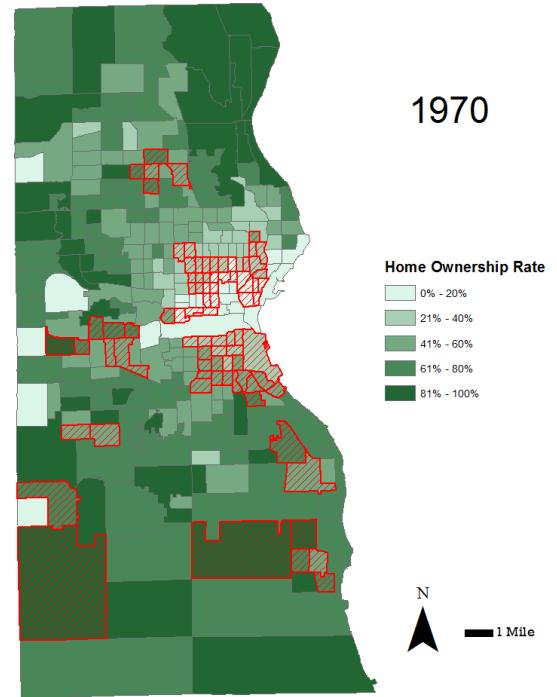

Figure 10. Median Family Incomes of Grades A, B, C and D in 1950, 1970, 1990 and 2010.

The increasing socioeconomic gaps between redlined neighborhoods and non-neighborhoods in Milwaukee County are shown more clearly in our raw data maps. In fact, the home ownership rates of the wealthy neighborhoods in Milwaukee County grew continuously over time while the rates stayed low in the redlined areas (shaded in red) (Maps 1- 4). In case of median home value, the differences between the wealthy and the poor areas are more clearly visible (Maps 5- 8). In general, home values in the redlined areas have been consistently low, but there are some signs of increasing home values near downtown at the east-central part of the
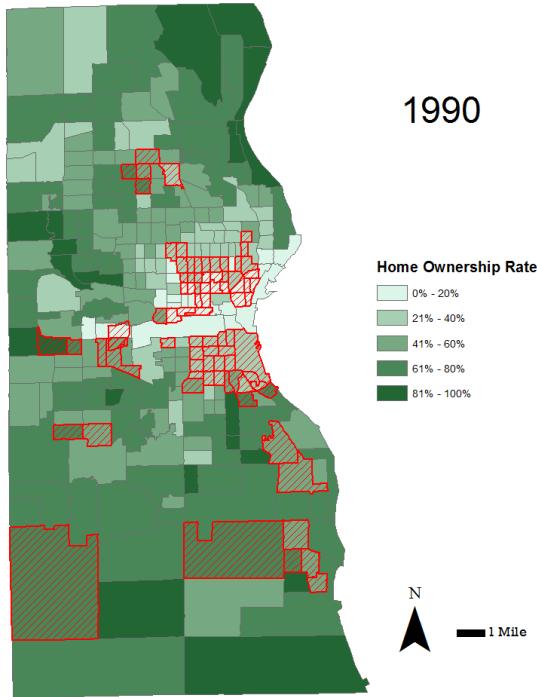
city from 1990 on. The median income maps also show similar pattern (Maps 9- 12). On one hand, the gap between the rich and the poor neighborhoods increases, but in the other hand, some of the originally poor redlined districts near downtown began to show higher income in later years.
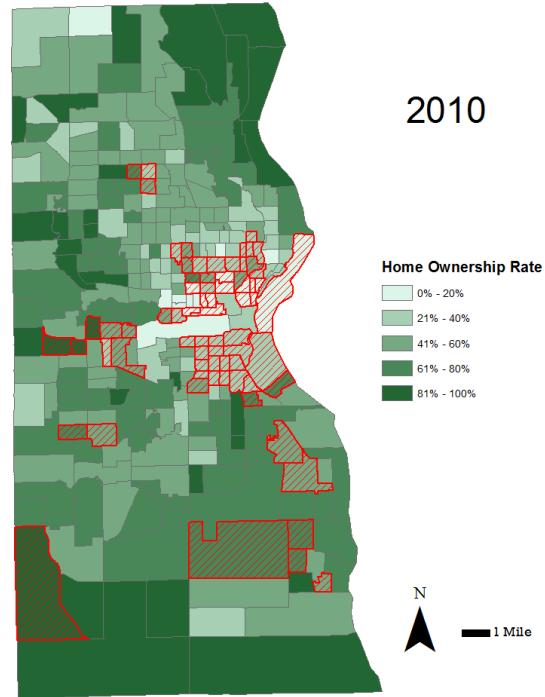

Map 1. Home Ownership Rate, 1950.
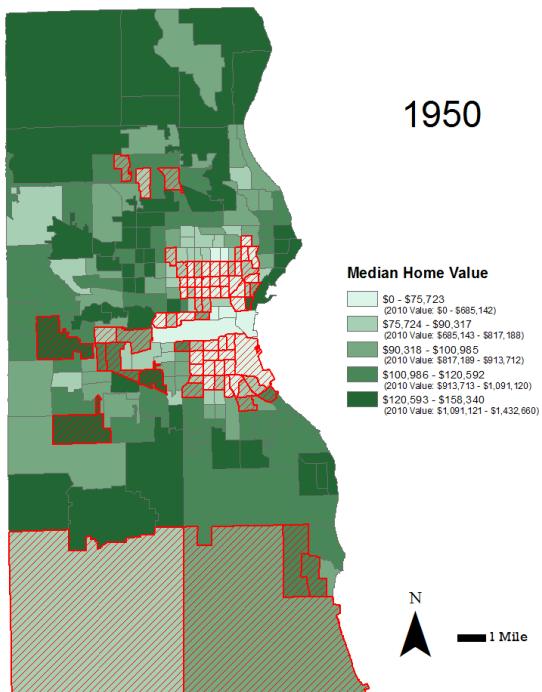
Map 2. Home Ownership Rate, 1970.
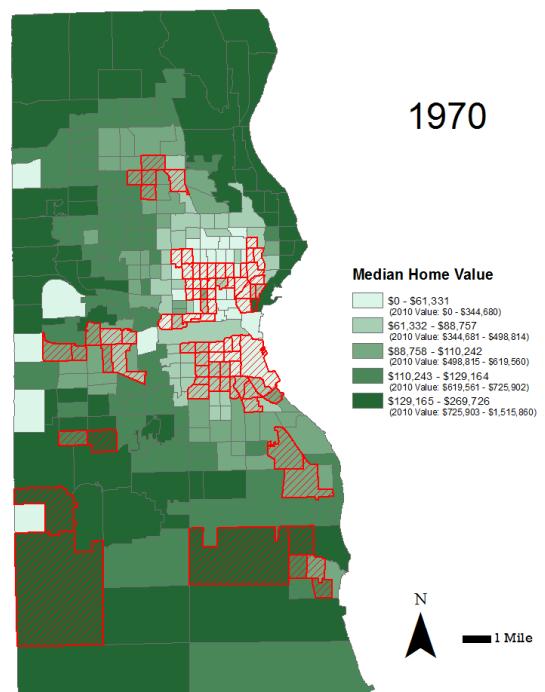
Map 3. Home Ownership Rate, 1990.
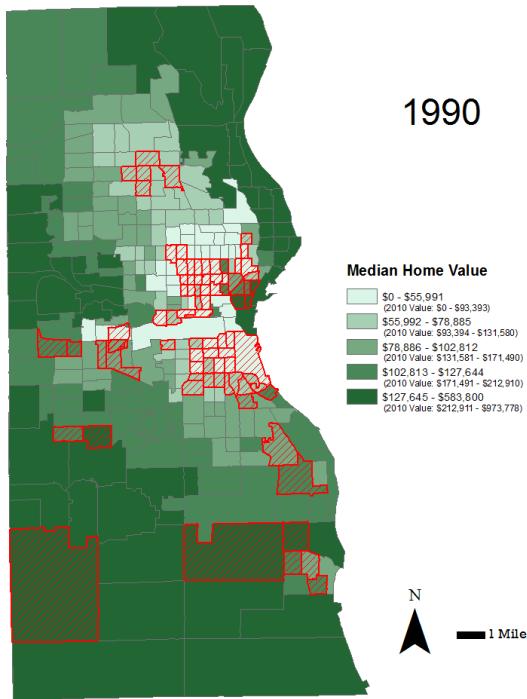
Map 4. Home Ownership Rate, 2010.
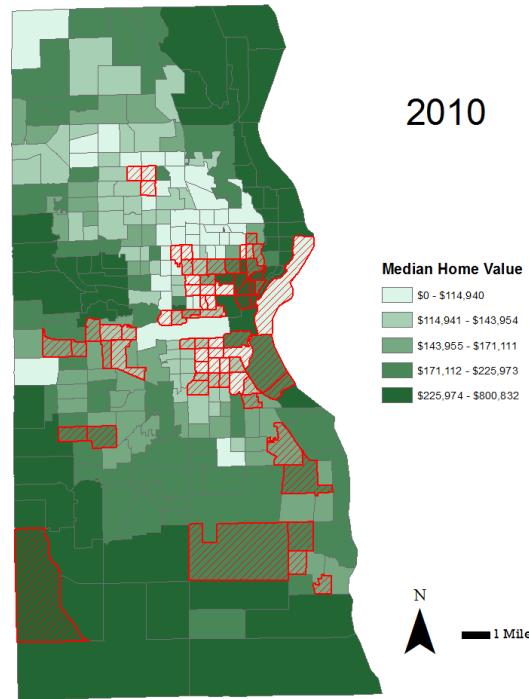
Map 5. Median Home Value, 1950.
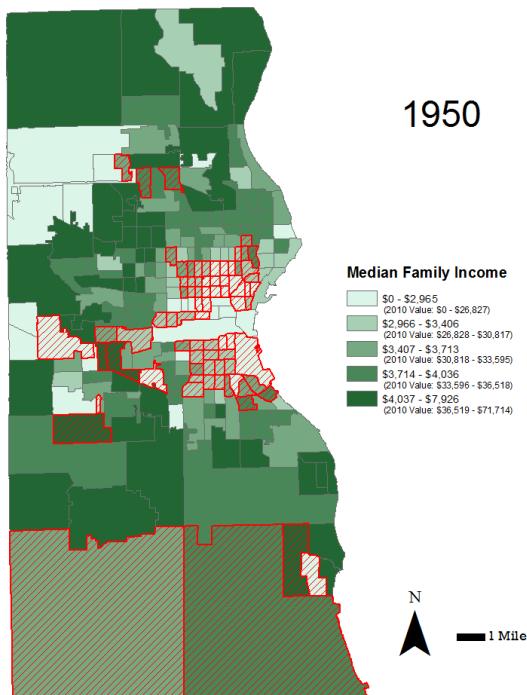
Map 6. Median Home Value, 1970.
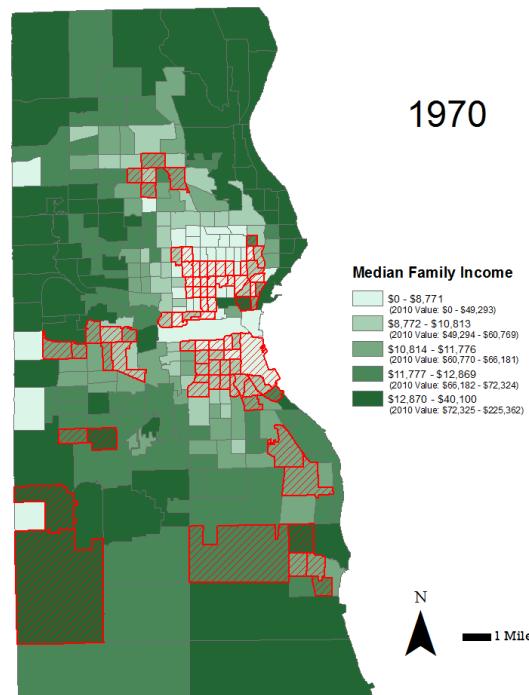
Map 7. Median Home Value, 1990.
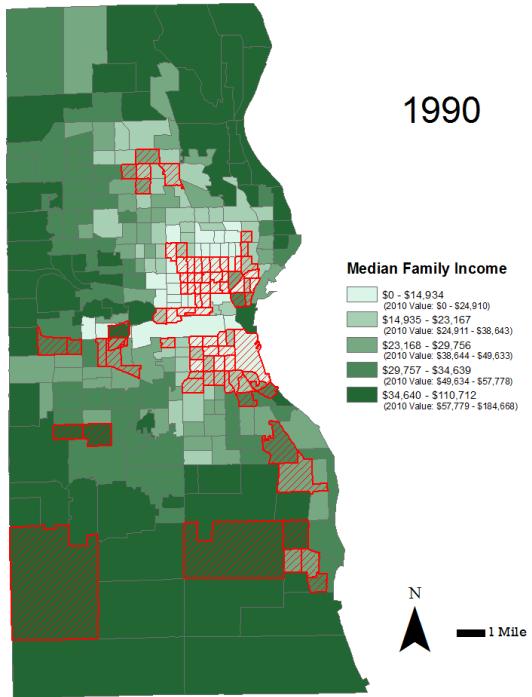
Map 8. Median Home Value, 2010.
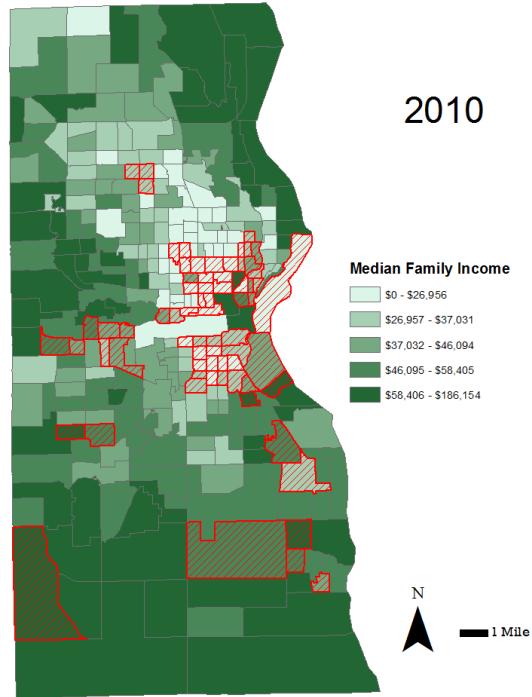
Map 9. Median Family Income, 1950.


Map 10. Median Family Income, 1970.
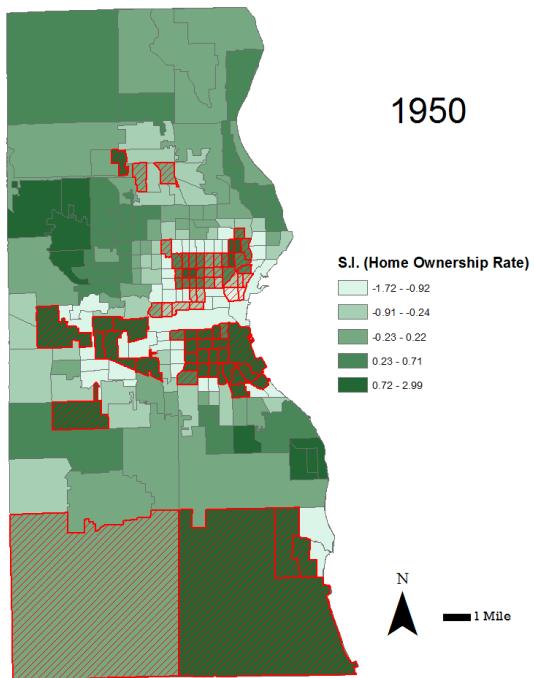
Map 11. Median Family Income, 1990.   Map 12. Median Family Income, 2010.
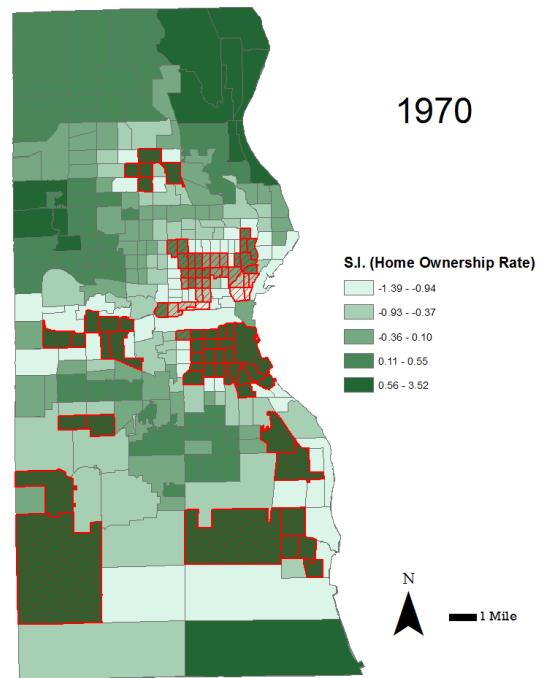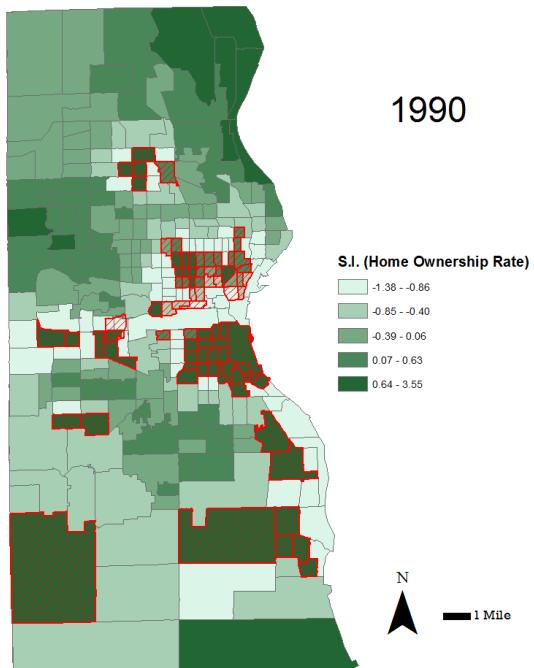
While the raw data maps only show us the general socioeconomic gaps between redlined neighborhoods and the others neighborhoods in Milwaukee County the, segregation index maps show the extreme isolation of the poor areas from the rest of the city. The segregation index maps of the home ownership rate show that the redlined neighborhoods have been clearly isolated from the others (Map 13-16). The areas with low home ownership rates surrounding the redlined areas make the poor neighborhoods look like social islands. The wealthier area in the northeast also shows a pattern of isolation, but as clearly as the redlined areas. The patterns in the segregation index maps of the median home value and the median household/family income are similar with the ones of the home ownership rate (Maps 17- 24). The socioeconomic patterns of redlined neighborhoods were clearly different from adjacent areas, and the dissimilarity increased in the wealthy areas in the later years. Furthermore, the neighborhood isolation index maps that combine the three socioeconomic variables repeat the dissimilarity patterns in 1950, 1970, 1990 and 2010 (Maps 25- 28).
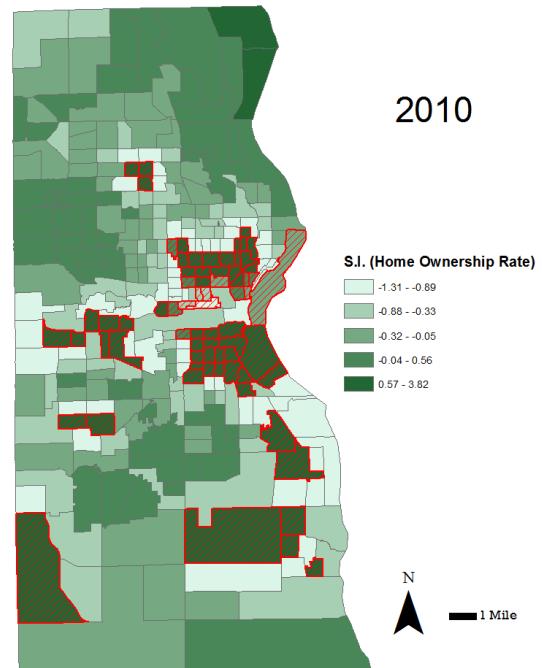
Map 13. Segregation Index of Home Ownership Rate, 1950.
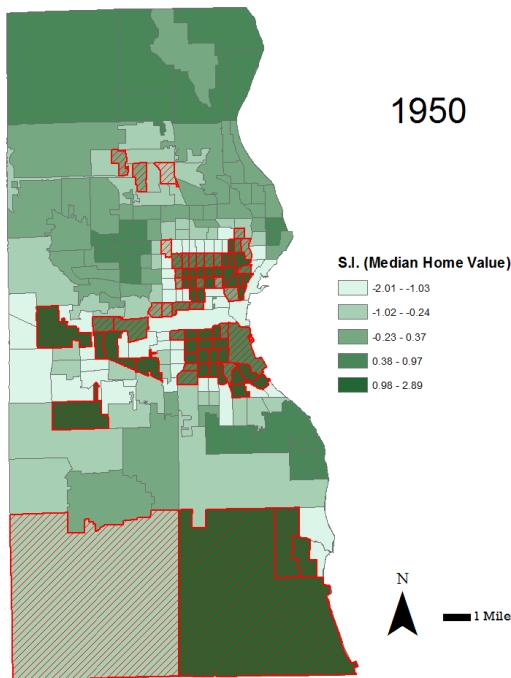
Map 14. Segregation Index of Home Ownership Rate, 1970.
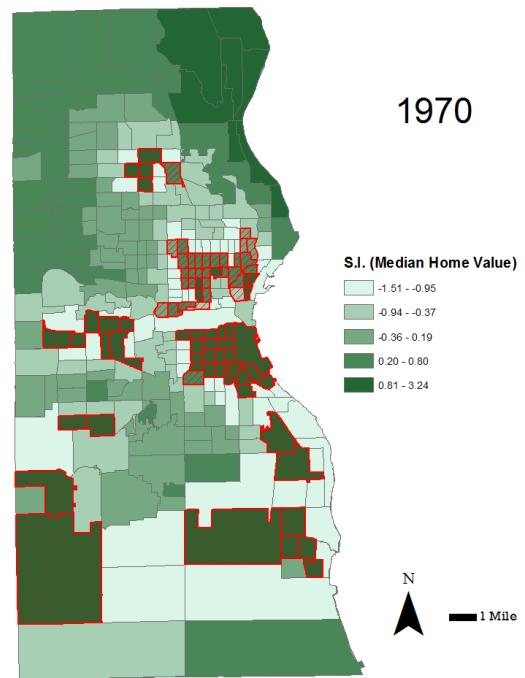
Map 15. Segregation Index of Home Ownership Rate, 1990.
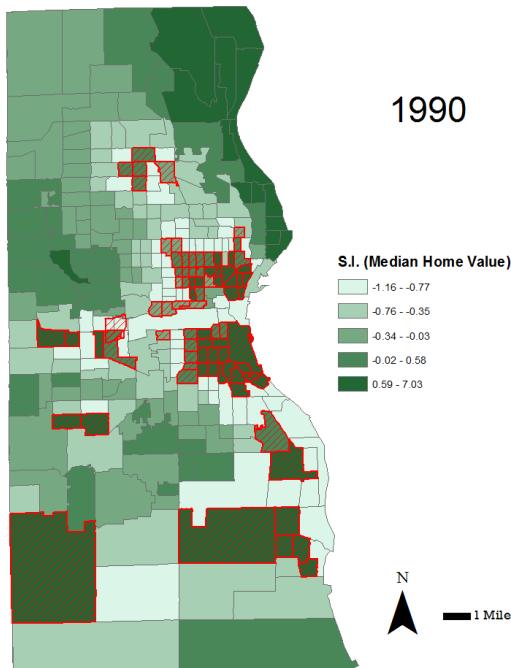
Map 16. Segregation Index of Home Ownership Rate, 2010.
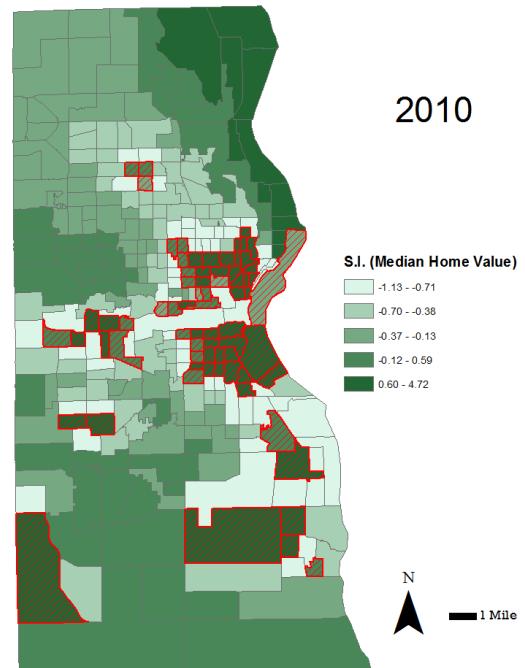
Map 17. Segregation Index of Median Home Value, 1950.
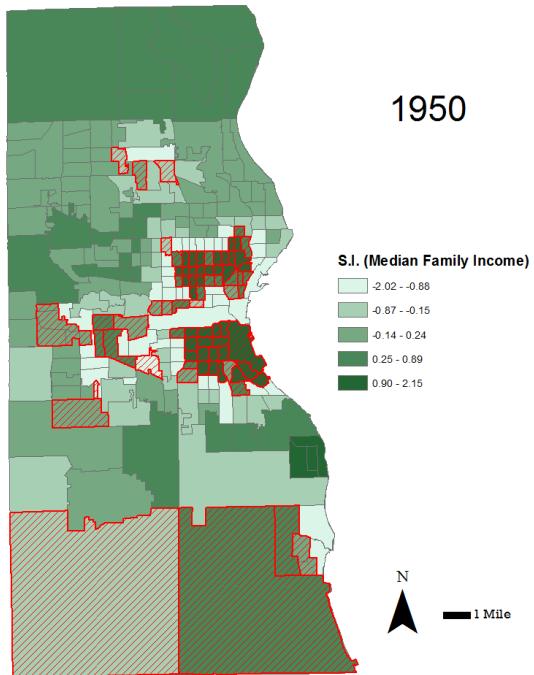
Map 18. Segregation Index of Median Home Value, 1970.
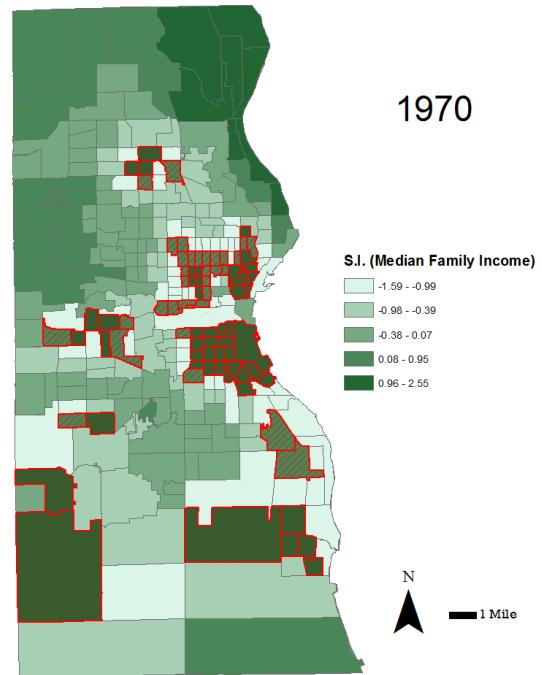
Map 19. Segregation Index of Median Home Value, 1990.
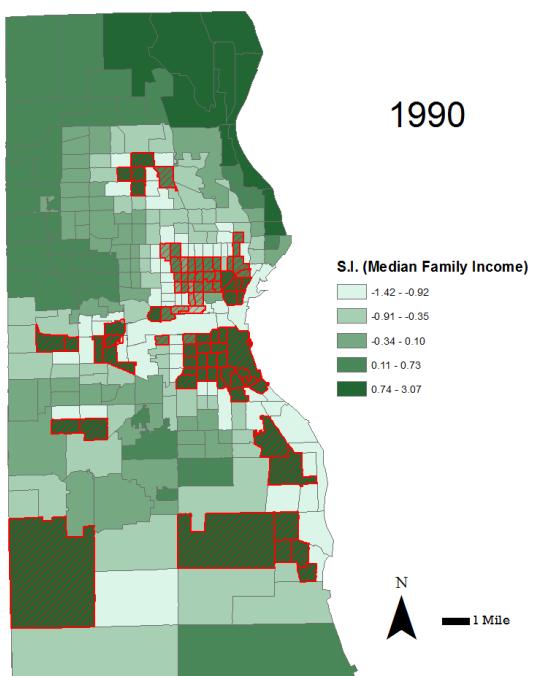
Map 20. Segregation Index of Median Home Value, 2010.
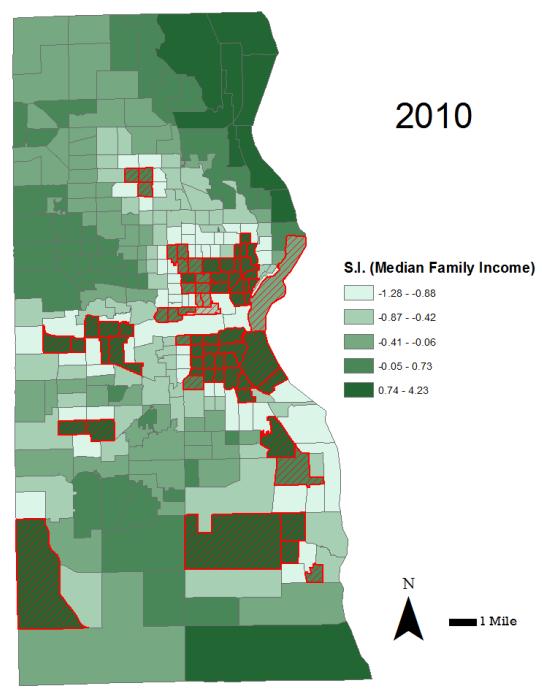
Map 21. Segregation Index of Median Family Income, 1950.
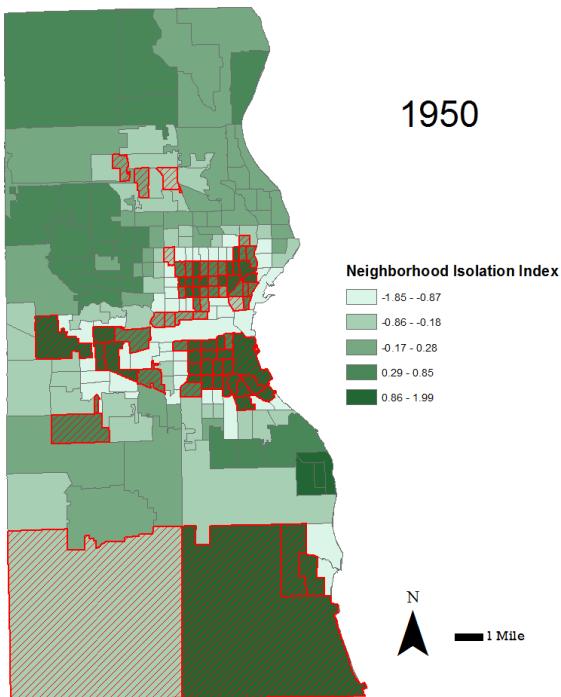
Map 22. Segregation Index of Median Family Income, 1970.
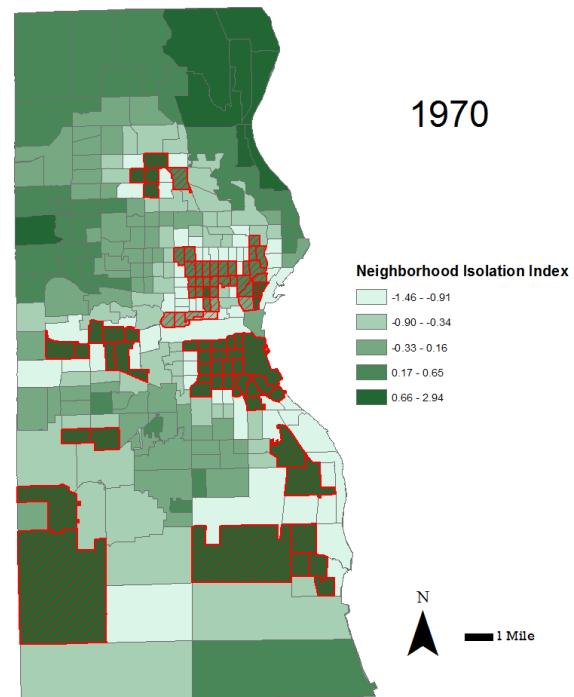
Map 23. Segregation Index of Median Family Income, 1990.
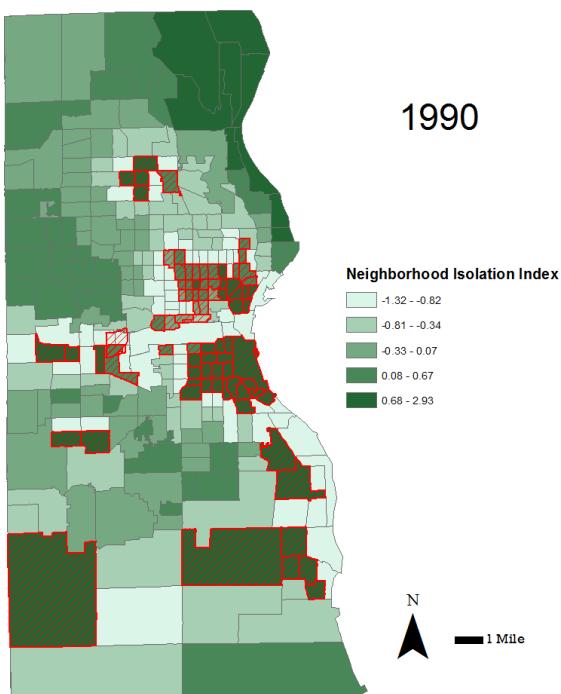
Map 24. Segregation Index of Median Family Income, 2010.
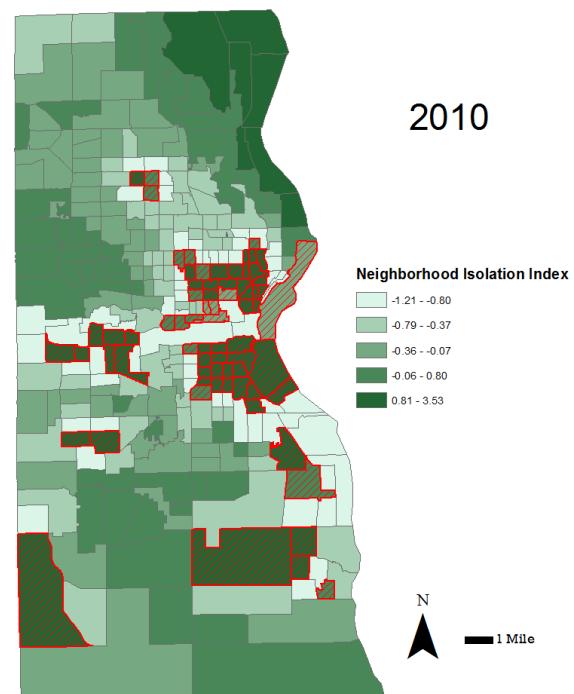
Map 25. Neighborhood Isolation Index, 1950.

Map 26. Neighborhood Isolation Index, 1970.

Map 27. Neighborhood Isolation Index, 1990.

Map 28. Neighborhood Isolation Index, 2010.

According to the results of the ANOVA tests, there is a significant difference in home ownership rate and median household income among the residential security grades (Table 2). The p-value associated with mean median home ownership rate was extremely low (*0.000*), as evidenced by a zero value at three decimal places specified by the test output. The p-value associated with mean median household income (*0.038*) is also low.   The p-value for mean median home value is (*0.529*), which indicates this test did not register a significant difference in home value among the residential security grades. It is clear that home ownership and household income vary significantly among residential security grade classifications. Historic residential security grade and resulting mortgage access is one of many factors that could contribute to the differences in the socioeconomic variables and neighborhood isolation that we explore in this research project.

Variable		Sum of Squares	df	Mean Square	F	p
Mean Median Home Value	Between Groups	3.15E+11	3	1.05E+11	0.777	0.529
	Within Groups	1.62E+12	12	1.35E+11		
	Total	1.93E+12	15			
Mean Home Ownership Rate	Between Groups	0.267	3	0.089	68.425	0.000
	Within Groups	0.016	12	0.001		
	Total	0.282	15			
Mean Median Household Income	Between Groups	5407828302	3	1802609434		0.038
	Within Groups	5599886915	12	466657242.9		
	Total	1.01E+10	15			

Table 2. ANOVA Test Output.

An understanding of the history that shapes cities is essential to meeting the contemporary challenges they face. In an era of increasing interest and awareness in inequality, many neighborhoods are becoming increasingly isolated from one another. Significant differences persist among neighborhoods that were once classified under different residential security grades. Research shows that inequality and isolation are often associated with a lack of opportunity. This has real consequences for the low-income residents of isolated neighborhoods. In an article that surveys the latest research on inequality and segregation, Bernstein and Spielberg point out,"...One thus would expect to see low-income families less able (relative to the wealthy ones) to invest in children's futures, more indebted if they tried to go to college, more likely to be stuck in neighborhoods that lack opportunity, and more likely to experience the stressors that do permanent damage to children's later educational and earnings outcomes...And that's exactly what happens" (2015).

The potential limitations of this research project are largely related to the scope of the study. We only evaluated three socioeconomic variables at four time points. This limits our conclusions and observed patterns to the years and variables we explore in this study. It is important to acknowledge the modifiable areal unit problem as it pertains to this study. The geography of census tracts can vary by each decennial census. Fortunately there are only minimal changes in the urban census tract geography that do not alter reclassification. We further mitigate this issue through the use of a single reference map and consistent rules for reclassification.

Conclusions and Future Research

The results of our analysis support the contention that neighborhood isolation and socioeconomic disparities exist in Milwaukee County and persist over time. The socioeconomic variables revealed distinct patterns of spatial dissimilarity among neighborhoods in Milwaukee County. Both low and high income neighborhoods are isolated from the community as a whole. However, the isolation is most significant in neighborhoods that were historically redlined. As evidenced by the neighborhood isolation index maps, surrounding neighborhoods clearly exhibit different levels of isolation form the historically redlined neighborhoods. The results of the ANOVA test confirm that there are significant differences in home ownership rate and median household income among the residential security grades.

Furthermore, our results suggest that the Federal Fair Housing Act (1968) and the Equal Credit Opportunity Act (1974) did not completely remedy the effects of historic housing discrimination. In fact, the socioeconomic conditions of the redlined neighborhoods in Milwaukee County became more isolated from the rest of the city in recent years. This suggests that the socioeconomic gap between the rich and poor is increasing over time.

This research project provides a firm foundation for future studies. Additional research can expand on the scope of this paper by using a similar methodology. Further studies can incorporate more socioeconomic variables and additional time points to capture more variation. In addition, integrating data enumerated by census block-group can enhance the spatial resolution of the analysis. This research project and future geospatial analyses can provide essential information to inform urban planning, advise policy decisions, and identify areas for community outreach programs.

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