Public Works Management & Policy
16(1) 40–58

DOI: 10.1177/1087724X10386622
http://pwm.sagepub.com
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Highway Expansion Effects on Urban Racial Redistribution in the Post–Civil Rights Period

Guangqing Chi[1] and Domenico "Mimmo" Parisi[1]

Abstract

A limited number of historical case studies document that highway construction produced significant consequences on racial relationships and redistribution in the early and mid-20th century. However, little is known about how the expansion of an existing highway system influences urban racial redistribution after the legal bases for social and environmental justice in highway construction were established. This research uses census data for 1970, 1980, 1990, and 2000 to examine the role that highway expansion plays in affecting the redistribution of Blacks and Hispanics at the census tract level within the Milwaukee-Waukesha-West Allis metropolitan area of Wisconsin. The results indicate that the concentration of Blacks and Hispanics in neighborhoods in close proximity to highways that were expanded between 1965 and 1970 increased substantially between 1970 and 2000. Highway expansion promotes Black growth in nearby neighborhoods through its role as an amenity by providing easy access to the transportation network. Highway expansion also promotes Hispanic growth but through its role as a disamenity by decreasing housing prices in immediate neighborhoods. The results have important policy implications for addressing the issue of racial relationships in urban America.

Keywords

urban racial redistribution, highway expansion, Blacks, Hispanics, environmental justice

[1]Mississippi State University, Mississippi State, MS, USA

Corresponding Author:
Guangqing Chi, Department of Sociology and Social Science Research Center, Mississippi State University, PO Box C, Mississippi State, MS 39762, USA
Email: gchi@ssrc.msstate.edu

Introduction

The effects of highways on racial relationships in the United States have been documented in a limited number of historical case studies (e.g., Bayor, 1988; Connerly, 2002; Dluhy, Revell, & Wong, 2002; Mohl, 1993; Silver, 1984). The aforementioned research focuses on the planning process in which decision makers in some metropolitan areas used highway construction as a tool to separate minority communities from White ones in the early and mid-20th century. The literature also describes how minorities responded to nearby new or improved highways. Nevertheless, highway impacts on urban racial redistribution of minorities have not been well understood. In addition, the literature focuses on a period before the legal bases for social and environmental justice in highway construction were established, such as Title VI of the Civil Rights Act of 1964, the National Environmental Policy Act of 1969, and administrative orders by the U.S. Department of Transportation. Little is known about highway effects on urban racial redistribution after these legal bases were established. This study fills the gap in the literature by contributing to the understanding of the role that highways in metropolitan areas play in affecting the redistribution of racial and ethnic groups in the post–civil rights period.

Presently, most highway and interstate systems in the United States have been completed. Current highway construction activities, therefore, primarily expand or improve existing highways rather than build new highways. According to the executive director of the National Academies' Transportation Research Board, "[m]uch of the existing highway systems, particularly interstates and primary arterial highways, must be reconstructed in the coming years" (Skinner, 2002, p. 34). Thus, because of the upcoming efforts in improving and expanding highways, it is more essential to know the impacts of highway expansion,[1] rather than the influence of highways in general, on racial redistribution. This study, therefore, investigates the effects that highway expansion has on urban racial redistribution. Specifically, we examine the impact of highway expansions completed between 1965 and 1970 on racial redistribution from 1970 to 2000 at the census tract level in the Milwaukee-Waukesha-West Allis (MWWA) metropolitan area of Wisconsin.

This article is organized into six additional sections. The role that highways play in affecting urban racial redistribution is first discussed. Following this are two sections describing the research data and measures. Findings are then reported regarding the effects of highway expansion on the redistribution of Blacks and Hispanics from 1970 to 2000 at the census tract level in the MWWA metropolitan area of Wisconsin. Finally, this article concludes with a summary and discussion section.

Literature

Research has shown that highways play an important role in stimulating population redistribution processes (Baum-Snow, 2007; Henry, Barkley, & Bao, 1997). The phenomenon has been explained by several theories and examined by a number of

empirical studies, which fall into diverse disciplines including planning, economics, geography, and sociology. The environmental justice and social inequality literature usually sees highway construction as a disamenity to local communities, but regional economic literature sees highway construction as an amenity because it promotes economic growth and provides easier access to transportation. This study brings together the two bodies of literature to examine the effect of highway expansion on the redistribution of Blacks and Hispanics.

Highway Expansion as a Disamenity

In environmental justice and social inequality literature, highways are interpreted as unfavorable infrastructure (e.g., Deka, 2004; Grineski, Bolin, & Boone, 2007; Mennis & Jordan, 2005). As unfavorable infrastructure, highways bring environmental pollution such as noise, dirt, and fumes to the right-of-away and nearby communities. In urban areas, highways also create "crime" spaces where people do not want to go (Deka, 2004). Thus, highways reduce the livability and lower the land values and real estate values of immediate neighbors, often causing White flight (Pastor, Sadd, & Hipp, 2001). The vacancies left by the White flight are more likely to be filled by minorities, who take advantage of lower real estate values in the affected communities (Been & Gupta, 1997).

The environmental justice literature often emphasizes the other direction—the presence of disproportional minorities as a cause of the site selection for unfavorable facilities (e.g., Atlas, 2002; Baden & Coursey, 2002; Been, 1995; Been & Gupta, 1997; Bullard, 1990). Many previous studies found that minority communities have a disproportional likelihood of hosting unfavorable facilities and that environmental injustice is a consequence of discriminatory siting practice (see Szasz & Meuser, 1997 for a review of the literature). In urban areas, highways tend to be developed in minority communities, where politically highway construction receives the least resistance because the minorities lack political power in affecting the decision-making process of construction site selection and are therefore less successful at preventing unfavorable facilities from being located in their communities, and where economically highway construction is more cost-efficient because of the relative low real estate values (Deka, 2004).

The unfair siting selection argument is parallel to some historical case studies describing that highway construction was used as a tool to separate minority communities from White communities in the first half of the 20th century. Planning tools such as the zoning law, public housing projects, and the federal urban renewal program were manipulated to prevent Blacks from moving into White communities and to maintain racial segregation (Connerly, 2002). The related planning and decision-making processes have been documented in a few historical case studies, such as in those concerning Birmingham, Alabama; Atlanta, Georgia; Richmond, Virginia; and Miami, Florida (Bayor, 1988; Connerly, 2002; Dluhy et al., 2002; Mohl, 1993; Silver, 1984). These studies describe how the interstate highway systems were employed by politicians and

planners to separate the Black communities from the White ones. Their strategy was to use highways as barriers and boundaries between racial groups—and they did it legally in the name of slum clearance and economic revitalization until the mid-1960s, when the legal bases for social and environmental justice in highway construction were established (Bayor, 1988). The legal bases include Title VI of the Civil Rights Act of 1964, which prohibits discrimination on the basis of race, color, or national origin; the National Environmental Policy Act of 1969, which enforces environmental justice in transportation constructions through a review of environmental impact assessments; and administrative orders by the U.S. Department of Transportation that require agencies to weigh and balance human health and environmental effects that may have a disproportionately high and adverse effect on minorities (Steinberg, 2000).

The debate about which comes first—unfavorable facility siting or disproportional minorities—has been addressed in a number of studies (e.g., Pastor et al., 2001). While knowing the causality has significant implications for urban and environmental planning (Been & Gupta, 1997), this study focuses on only one direction—highway expansion as a possible cause of racial redistribution; this study does not address the causal direction from the presence of disproportional minorities to unfair siting selection.

Highway Expansion as an Amenity

Environmental justice and social inequality literature as well as some historical studies see highway expansion as a disamenity—something unfavorable to immediate neighborhoods. In contrast, residents living in nearby neighborhoods that are a few blocks away from highway expansion segments can not only get away from the disamenity aspects of highways but can also take advantage of easier access to transportation. Most regional economic literature views highway expansion as an amenity (see Chi, Voss, & Deller, 2006 for a review of literature). For example, location theory interprets highways as a facilitator for the flow of raw materials, capital, finished goods, consumers, and ideas among central places and their neighborhoods (Thompson & Bawden, 1992). As such, highways provide a means for people to commute from one place to another. With improved transportation infrastructure and increased personal vehicle ownership, people can live in one place but commute to work in another place.

Clearly, the two roles that highways play in affecting urban racial redistribution seem contradictory. Although highways are unfavorable infrastructure for some, they facilitate commuting for others. It may be simply that highways affect urban racial redistribution both as a disamenity and an amenity. For residents living in the immediate neighborhoods of highway construction, highways act as a disamenity by producing environmental pollution and decreasing housing prices. For residents living in a few blocks away from highway construction, highways act as an amenity by providing easier access to transportation. The objective of this study, thus, is to examine the dual role that highway expansion plays in affecting urban racial redistribution after the legal bases for social and environmental justice in highway construction were established.

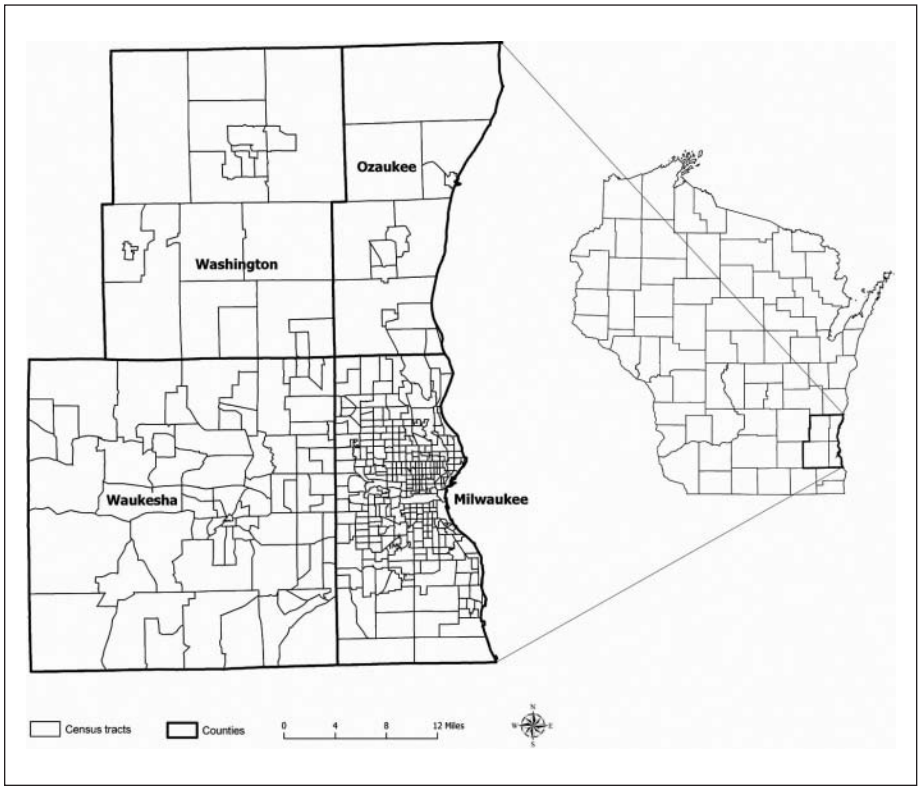

Figure 1. The Milwaukee-Waukesha-West Allis (MWWA) metropolitan area in Wisconsin

Data

This study analyzes the impact of highway expansion segments completed between 1965 and 1970 on racial redistribution from 1970 to 2000 at the census tract level in the MWWA metropolitan area of Wisconsin (Figure 1). The MWWA area occupies less than 3% of the total area of Wisconsin, but it included 417 of the 1,320 census tracts of Wisconsin in 2000. The MWWA area was chosen for this study for two reasons. The first is that the majority of Blacks and Hispanics in Wisconsin dominate in the MWWA area. Although the MWWA area had only 28% of the total population of Wisconsin in 2000, it had 80% of the total Blacks and 49% of the total Hispanics of Wisconsin (Table 1). The concentration of Blacks and Hispanics makes the MWWA area suitable for studying the impacts that highway expansion has on urban racial redistribution.

The second reason we selected the MWWA area is because it has a high density of highway expansion segments. Between 1965 and 1970, 23 highway segments with

Table 1. Racial Compositions in the Milwaukee-Waukesha-West Allis (MWWA) Metropolitan Area, 1970-2000

	1970		1980		1990		2000	
	Number	%	Number	%	Number	%	Number	%
Total population	1,403,491	31.77	1,396,889	29.69	1,432,149	29.28	1,500,741	27.98
Non-Hispanic Blacks	105,462	82.91	149,598	82.65	195,992	81.09	240,215	80.01
Hispanics	21,903	34.84	34,991	55.73	48,274	51.80	93,877	48.66
Non-Hispanic Whites	1,275,839	30.27	1,196,112	27.22	1,161,347	26.01	1,123,499	24.00

Note: Percentage refers to the percentage of the state population in each group that resides in the Milwaukee-Waukesha-West Allis (MWWA) metropolitan area.

263 miles total length were expanded in Wisconsin (Figure 2). More than half of these segments (14, with 91 miles total length) were in the MWWA area, although the MWWA area occupies less than 3% of the total Wisconsin area. Thus, the relatively high number of expansion segments in this area compared with the small proportion of the total area makes the MWWA area preferable for understanding the effects of highway expansion on urban racial redistribution.

The boundaries of census tracts in the MWWA area were not stable from 1970 to 2000; therefore, we derived data from the Census CD Neighborhood Change Database (NCDB) of Geolytics (2003), which recalculates and normalizes data from earlier decades to the 2000 census tracts. Population data of Blacks, Hispanics, and Whites in 1970, 1980, and 1990, as well as other data used in this study, have been adjusted to the 2000 tracts for this research.

The distribution of non-Hispanic Blacks and Hispanics from 1970 to 2000 are illustrated in Figures 3 and 4. Non-Hispanic Blacks were concentrated in the center of Milwaukee City in 1970 (Figure 3). The concentration sprawled into the north of Milwaukee City from 1970 to 2000. The Black population more than doubled from 105,462 in 1970 to 240,215 in 2000 in the MWWA area. Hispanics were also concentrated in the center of Milwaukee City in 1970 (Figure 4). The concentration sprawled into the south of Milwaukee City from 1970 to 2000. The Hispanic population increased dramatically from 21,903 in 1970 to 93,877 in 2000. The non-Hispanic Blacks and Hispanics together grew from the center of Milwaukee City to the entire city in 30 years. In contrast, there is clear evidence of White flight in the MWWA metropolitan area. The MWWA area lost 11.94% non-Hispanic Whites from 1970 to 2000, compared with an 11.07% gain in Wisconsin overall in the same period.

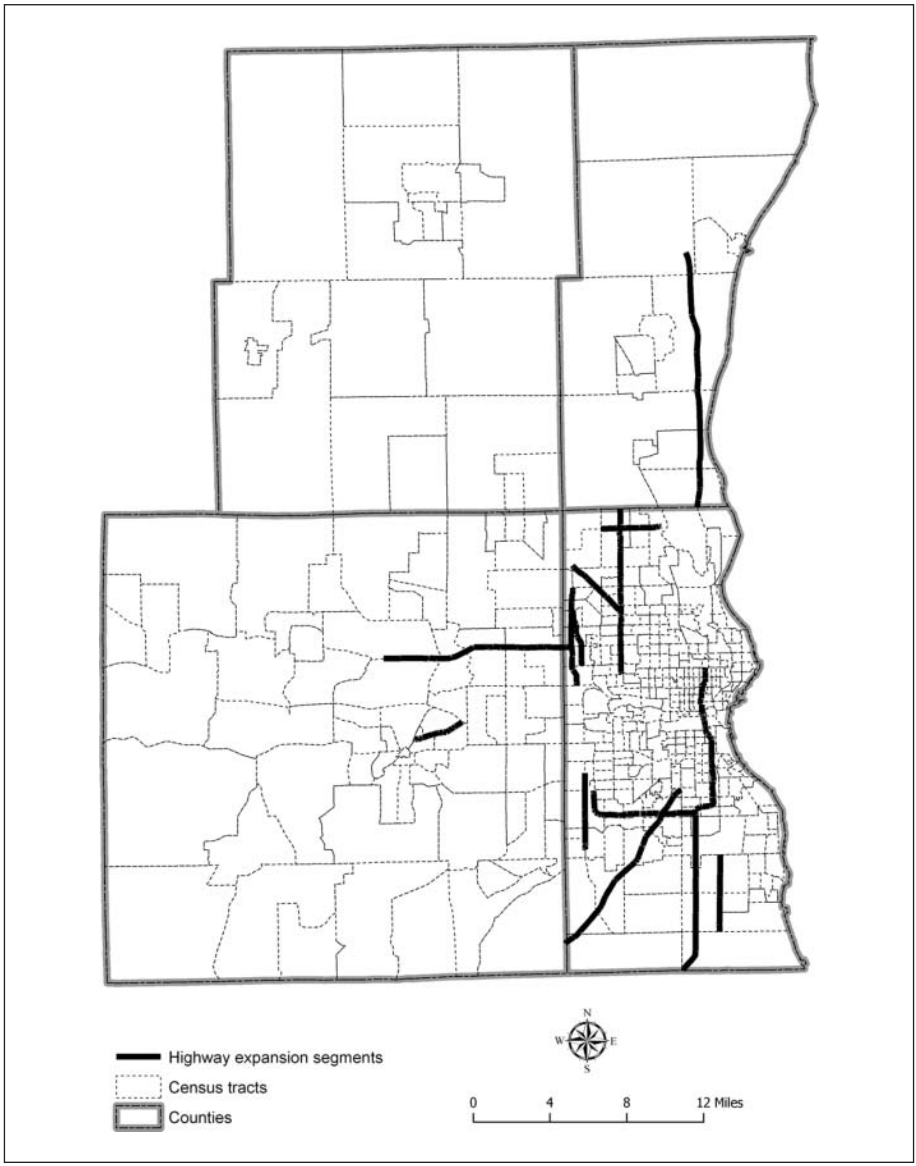

Figure 2. Highway expansion segments in the Milwaukee-Waukesha-West Allis (MWWA) metropolitan area from 1965 to 1970

Note: The highway expansion data were provided by the Wisconsin Department of Transportation. The data were initially available in a hard copy document listing the road segments that were expanded, in which periods they were expanded (in 5-year intervals; e.g., 1965-1970, 1970-1975, etc.), and where each expansion segment started and ended. These expansion segments were also highlighted on paper maps. Based on this information, I coded the road expansion segments into a geographically referenced file.

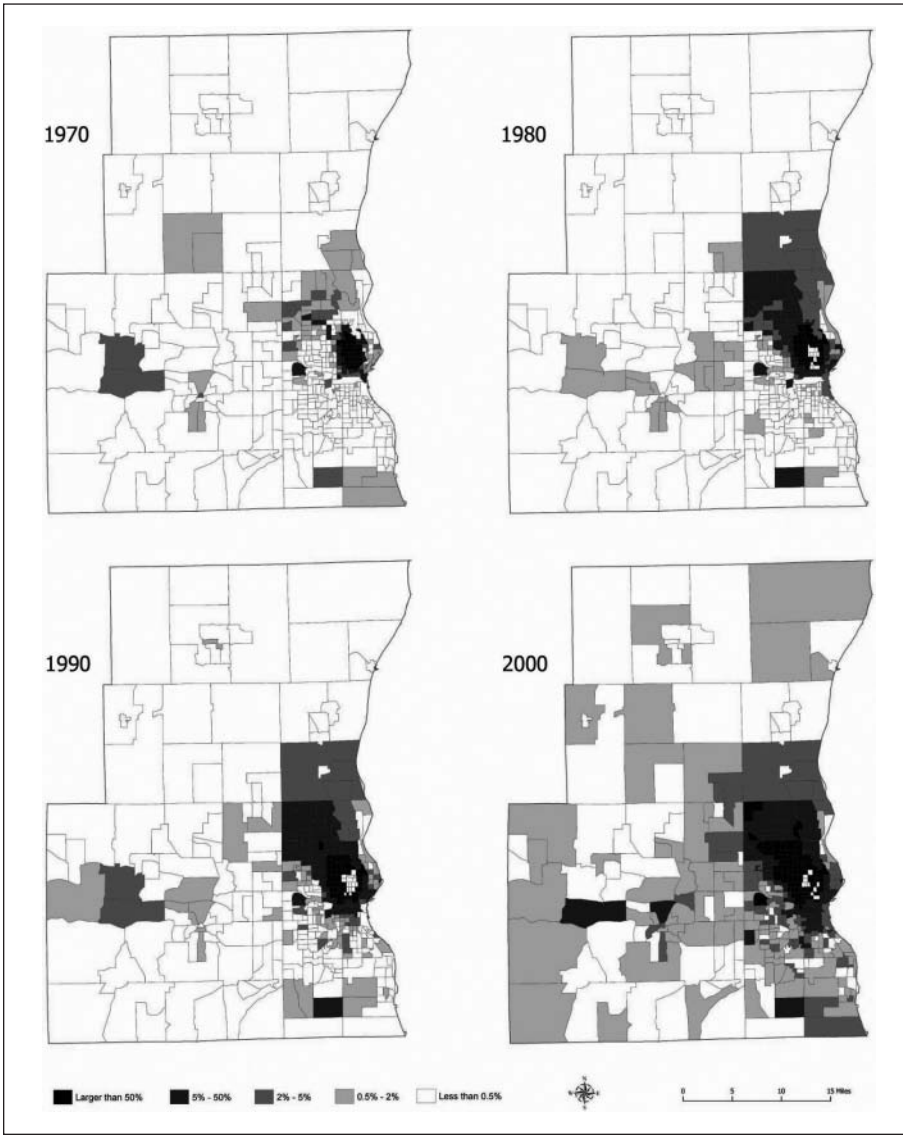

Figure 3. Proportions of non-Hispanic Blacks from 1970 to 2000 in the Milwaukee-Waukesha-West Allis (MWWA) metropolitan area

Measures

To study highway expansion impacts on urban racial redistribution, it is necessary to quantify the spatial relationship of census tracts to highway expansion segments.

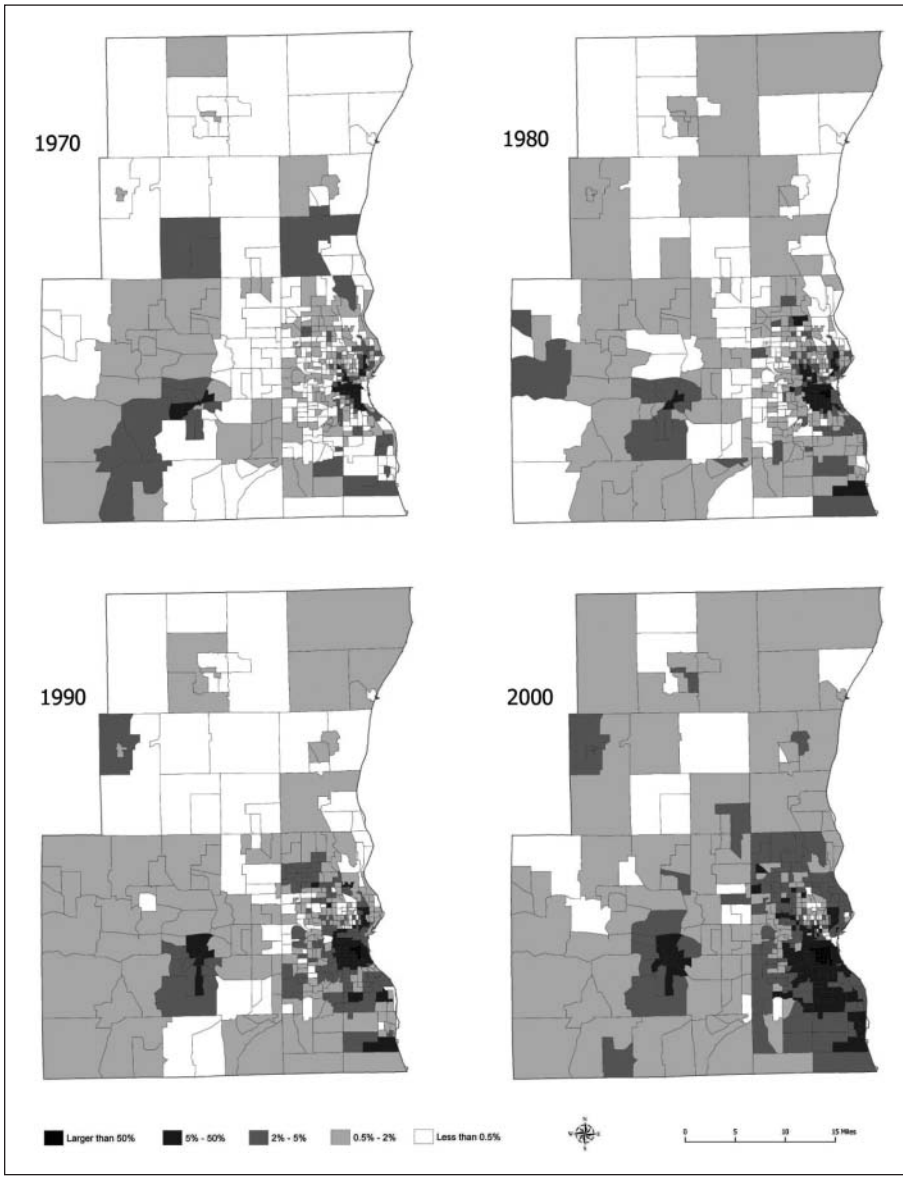

Figure 4. Proportions of Hispanics from 1970 to 2000 in the Milwaukee-Waukesha-West Allis (MWWA) metropolitan area

Existing urban planning literature illustrates highway effects on racial segregation based on whether the studied area is touched by (passed through, across, or by) highway construction segments (e.g., Connerly, 2002). Environmental justice literature

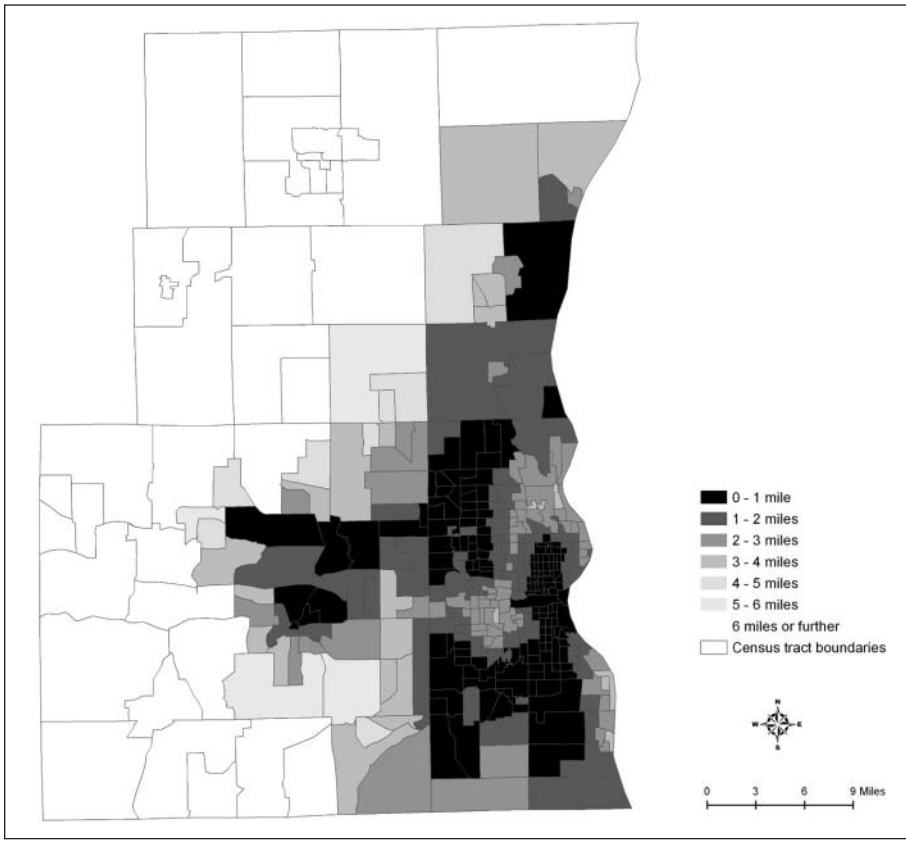

Figure 5. The division of Milwaukee-Waukesha-West Allis (MWWA) census tracts by distance to highway expansion segments

often separates the studied areas based on the distance of each studied area to its nearest highway expansion segment to study the decision-making process in selecting highway construction sites (e.g., Chakraborty, 2006). In this research, we adopt the environmental justice approach, as it allows for detailed examination of the highway segregation dynamics. However, there is no uniform rule in determining the choice of distance, as the distance extent to which highways affect local population dynamics is not known clearly. Thus, the distance should reflect the potential exposure of highways and is best selected by a series of distance buffer zones rather than a fixed distance threshold (Chakraborty, 2006). In this study, the census tracts are divided into seven groups based on their distance to the corresponding nearest expansion segments: within 1 mile, 1 to 2 miles, 2 to 3 miles, 3 to 4 miles, 4 to 5 miles, 5 to 6 miles, and more than 6 miles (Figure 5).

Table 2. The Pearson's Correlation Between Proportions of Each Racial Group and the Distance to Highway Expansion Segments in the Milwaukee-Waukesha-West Allis (MWWA) Metropolitan Area, 1970-2000

	1970	1980	1990	2000
Non-Hispanic Blacks	–.178***	–.198***	–.213***	–.246***
Hispanics	–.138**	–.156***	–.180***	–.193***
Non-Hispanic Whites	.183***	.241***	.272***	.332***

*$p \leq .01$. **$p \leq .001$.

The analysis includes two parts: an exploratory analysis of the relationships between urban racial redistribution and proximity to highway expansion segments, and an ordinary least squares (OLS) regression analysis of highway expansion effects on racial redistribution. The findings from the two perspectives are reported in the next two sections, which are structured so that each analysis builds on the results of the previous analysis. The methodology is discussed along with the corresponding analysis results.

Exploratory Analysis

The relationships between urban racial redistribution and proximity to highway expansion segments are examined in two ways by varying the measure of proximity to highway expansion segments. First, we calculate the correlations between proportions of each racial group and the distance to highway expansion segments in all four decennial years (Table 2). The correlations were negative for Blacks and Hispanics but positive for Whites. These findings suggest that Blacks and Hispanics tend to live close to highway expansion segments and Whites tend to live away from the segments. The absolute values of the correlations increased from 1970 to 2000 for each of the three racial groups, suggesting that highway expansion has a cumulative effect on urban racial redistribution over the 30 years.

Second, we divide census tracts into seven distance groups (within 1 mile, 1 to 2 miles, 2 to 3 miles, 3 to 4 miles, 4 to 5 miles, 5 to 6 miles, and more than 6 miles) based on their proximity to the nearest highway expansion segment. The relationship between urban racial redistribution and proximity to highway expansion segments is examined by plotting the latter on the *x*-axis and the former on the *y*-axis (Figure 6). Highway expansion segments were completed between 1965 and 1970, and the proportions of racial groups were measured in 1970, 1980, 1990, and 2000.

Figure 6 shows that as the distance from highway expansion segments increases, the proportions of both non-Hispanic Blacks and Hispanics decrease; in contrast, the

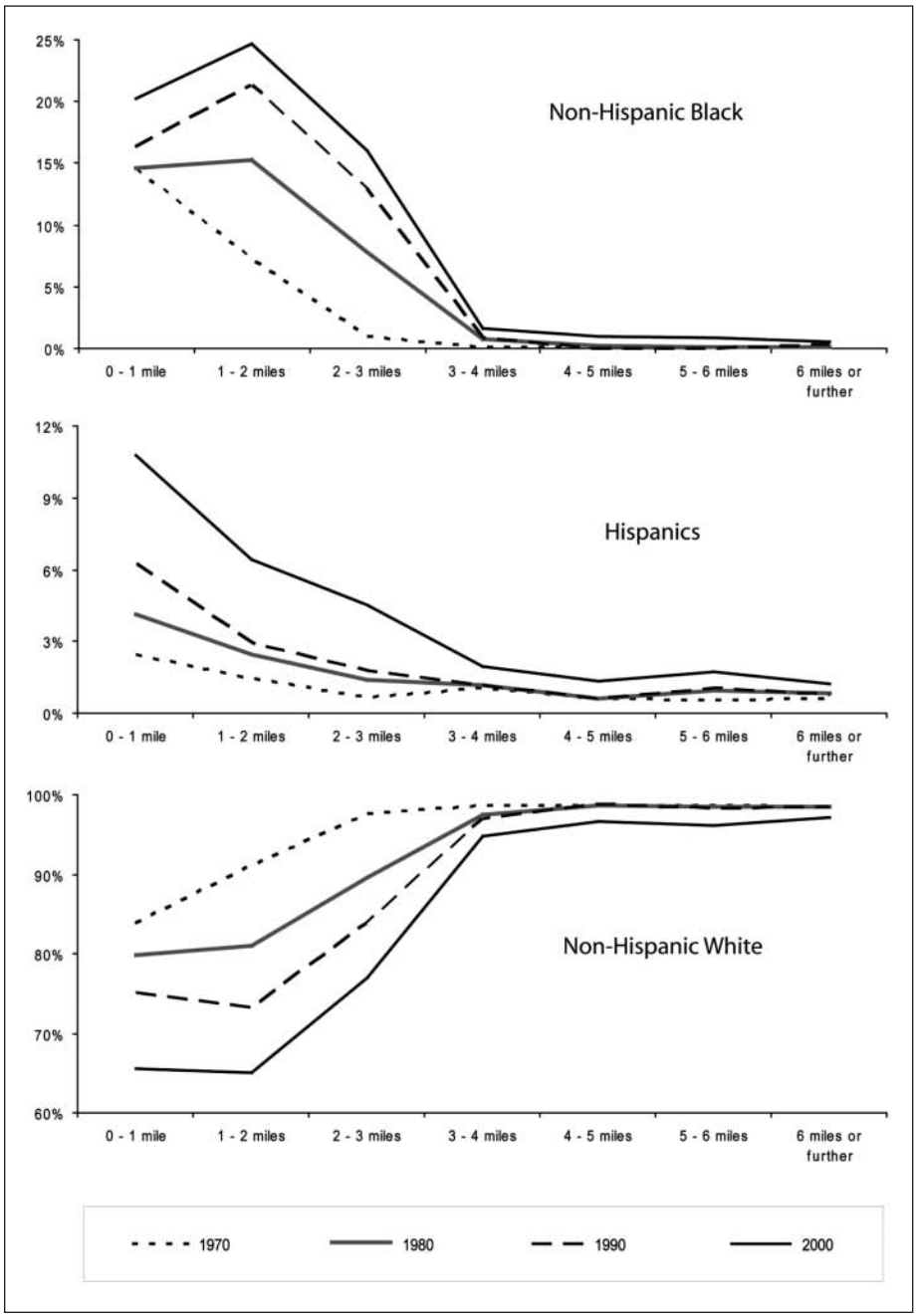

Figure 6. Three racial groups and distance to highway expansion segments, 1970-2000, Milwaukee-Waukesha-West Allis (MWWA) metropolitan area

proportion of non-Hispanic Whites increases. These findings suggest that highway expansion has a pull effect on the Blacks and Hispanics and a push effect on the Whites. The results also reveal that highway expansion impacts on the three racial groups are limited to census tracts within 3 miles of expansion segments. When the distance reaches 3 miles, the proportions of Blacks and Hispanics keep close to 0 and that of Whites keep close to 100%.

As the time goes from 1970 to 2000, the proportions of both Blacks and Hispanics near highway expansion segments increase and the proportion of Whites near the segments decreases. This indicates that highway expansion has a cumulative effect on the redistribution of each racial group. In 1970, the average proportion of Blacks was higher in census tracts within 1 mile of highway expansion segments than those in census tracts within 1 to 2 miles. In 1980, the proportion of Blacks became slightly lower in census tracts within 1 mile of highway expansion segments than in tracts within 1 to 2 miles. The differences in the proportions of Blacks in these two distance groups increased in 1990 and 2000. In contrast, the proportion of Hispanics in census tracts within 1 to 2 miles of highway segments was lower than those within 1 mile. The differences in the proportions of Hispanics in these two distance groups also increased from 1970 to 2000. These findings suggest that over time Hispanics moved to the immediate neighborhoods of highway expansion segments, where the Blacks used to be concentrated.

In all, the results suggest that (a) temporally, highway expansion has a cumulative effect on urban racial redistribution; (b) spatially, highway expansion has a pull effect on Blacks and Hispanics and a push effect on Whites; and (c) the impact is limited to census tracts within 3 miles of highway expansion segments.

Regression Analysis

We further investigate the impacts of highway expansion on urban racial redistribution in OLS regression models. There are two response variables: the difference of percentages of Blacks in 2000 and 1970 and the difference of percentages of Hispanics in 2000 and 1970. The previous section suggests that highway expansion has effects on urban racial redistribution in census tracts within 3 miles of highway expansion segments and negligible effects in tracts beyond 3 miles of expansion segments. Thus, we use three dummy variables to represent the explanatory variables indicating census tracts within 1 mile, 1 to 2 miles, and 2 to 3 miles of highway expansion segments.

A number of variables are controlled for in the regression analysis. First, highway segments expanded in periods other than 1965-1970 may affect racial redistribution. Highway expansion data prior to 1965 are not available, but expansion data from 1970 to 1995 are available. Thus, the distance to highway expansion during the period of 1970-1995 is controlled for in the regression. Second, racial redistribution in each tract is likely to be influenced by the overall growth in the same time period. The percentage change in population from 1970 to 2000 is used to represent the overall growth and is thus controlled for in the regression analysis. Third, racial redistribution may

Table 3. Regressions for Minority Changes in the Milwaukee-Waukesha-West Allis (MWWA) Metropolitan Area, 1970-2000

	Blacks	Hispanics
Distance to highway expansions, 1965-1970		
0-1 mile	–0.010 (0.040)	0.066*** (0.018)
1-2 miles	0.134*** (0.041)	0.019 (0.018)
2-3 miles	0.087* (0.044)	0.015 (0.020)
Distance to highway expansions, 1970-1995	–0.002 (0.004)	–0.002 (0.002)
% change of population 1970-2000	–0.005 (0.021)	0.027** (0.009)
% Blacks in 1970	–0.200** (0.074)	—
% Hispanics in 1970	—	0.483*** (0.119)
% using public transportation to get to work in 1970 (16 years +)	0.337* (0.159)	0.279*** (0.072)
% with bachelor's degree or higher in 1970 (25 years +)	–0.603*** (0.128)	–0.174** (0.058)
% in service and sale industries in 1970 (16 years +)	0.874 (0.499)	–0.320 (0.223)
% under poverty in 1970	0.003 (0.233)	–0.574*** (0.091)
% old housing units in 1970 (30 years +)	–0.121** (0.047)	0.113*** (0.021)
% housing units using public water in 1970	0.104* (0.042)	0.010 (0.019)
Constant	–0.010 (0.066)	0.029 (0.030)
Adjusted R^2	.19	.31

Note: Standard errors in parentheses.
*$p \leq .05$. **$p \leq .01$. ***$p \leq .001$.

also be affected by its percentage presence at the beginning of the change period. The percentage Blacks in 1970 is controlled for in the model examining Black population changes from 1970 to 2000, and the percentage Hispanics in 1970 is controlled for in the model examining Hispanic changes.

Several socioeconomic variables are also controlled for in the regression analysis, including percentage workers using public transportation to work (16+ years old), percentage college education and above (25+ years old), percentage workers in service and sale industries (16+ years old), poverty rate, percentage old housing units (30+ years old), and percentage housing units using public water system—all in 1970.[2] Previous studies show that these variables have significant effects on population redistribution (see Chi, 2009 for a summary of the literature). Other variables are not considered due to the difficulty in obtaining the data.

To examine highway expansion effects on the redistribution of Blacks, the response variable is the difference of percentages of non-Hispanic Blacks between 2000 and 1970 (Table 3). Highway expansion was found to have a significant positive effect on Blacks

in census tracts within 1 to 3 miles of highway expansion segments. That is, highway expansion promoted the concentration of non-Hispanic Blacks in census tracts at a distance of 1 to 3 miles from that expansion. Over the 30 years studied, the census tracts at a distance of 1 to 2 miles from highway expansion gained 13.4% more Blacks than others; the tracts at a distance of 2 to 3 miles from highway expansion gained 8.7% more Blacks than others. However, census tracts with 1 mile of highway expansion did not affect changes in the Black population. The results suggest that in the post–civil rights period, highway expansion affected Black redistribution as an amenity rather than a disamenity in the MWWA metropolitan area. Blacks took advantage of easier access to expanded highways and lived in neighborhoods 1 to 3 miles away from highways.

Black redistribution was also affected by several other factors. Census tracts with higher percentage Blacks in 1970 experienced loss of Blacks over the 30 years. In 1970, tracts with good public transportation facilities and more housing units using public water experienced Black growth, but tracts with higher educational attainments and more old housing units experienced Black decline.

To examine highway effects on the redistribution of Hispanics, the response variable is the difference of percentages of Hispanics between 2000 and 1970 (Table 3). Highway expansion was found to have a significant positive effect on Hispanics in census tracts within 1 mile of highway expansion segments. Over the 30 years studied, the census tracts within 1 mile of highway expansion gained 6.6% more Hispanics than others. Census tracts at a distance of 1 to 3 miles of highway expansion did not affect Hispanic changes. The results suggest that in the post–civil rights period, highway expansion affected Hispanic redistribution through its disamenity role rather than its amenity one in the MWWA metropolitan area. Lowered housing prices in immediate neighborhoods due to negative highway expansion impacts may have attracted Hispanics to move in.

Hispanic population changes were also affected by other factors. For example, census tracts that experienced overall population growth tended to experience Hispanic growth. Tracts with higher percentages of Hispanics in 1970 experienced Hispanic growth, suggesting that Hispanic migrants considered the social network when choosing their residency location. Tracts with good public transportation facilities and more old housing units in 1970 attracted Hispanics. Tracts with more well-educated people and higher poverty rates experienced Hispanic decline. That the poverty rate had negative effects on Hispanic growth may simply be due to that Hispanic growth in the studied areas was largely attributed to Hispanic migrants who came for job opportunities and thus preferred neighborhoods with lower poverty rate.

In sum, highway expansion affected Black redistribution through its amenity role by providing convenient access to highways, and highway expansion affected Hispanic redistribution through its disamenity role by providing lower housing prices. It seems that low housing prices and the presence of Hispanics were the main driving factors of Hispanic growth.

Summary and Discussion

Highway effects on racial redistribution in the United States have been documented in a limited number of historical case studies. However, these studies only describe the effects qualitatively and only focus on the early and mid-20th century, a period before the legal bases for social and environmental justice in highway construction were established. Little is known about the effects that highways have on population redistribution of racial and ethnic groups after these legal justice bases. This study fills the gap in the literature by contributing to the understanding of these effects in urban areas after the establishment of the legal bases. Specifically, this study focuses on the MWWA metropolitan area of Wisconsin to examine the impact of highway expansions completed between 1965 and 1970 on the population redistribution of Blacks and Hispanics from 1970 to 2000.

The findings indicate clearly an impact of highway expansion on urban racial redistribution in census tracts within 3 miles of expansion segments from 1970 to 2000. Highway expansion was found to promote Black growth in neighborhoods 1 to 3 miles from the expansions, where residents can get away from the disamenity aspects of highway expansion such as noise and lowered housing prices but can take advantage of easy access to highways. Highway expansion was also found to promote Hispanic growth in neighborhoods within 1 mile of the expansion segments, where housing prices were lower.

Although highway expansion is followed by increases in minority populations, the findings only show a correlation between them and do not suggest whether increases in minority populations are a consequence of highway expansion, which is a limitation of this study. The results are limited as the analysis does not include some important factors that could help address the causality issue between highway expansion and racial redistribution due to data unavailability. First, land use and zoning regulations may play an important role in affecting racial redistribution in the MWWA area of Wisconsin. Some previous studies such as in the city of Commerce in Los Angeles (Boone & Modarres, 1999) suggest that it is zoning plans rather than the unfavorable facility sitings practice that contribute to minority growth. Second, the change in minority populations in the previous decade could be used to control for the potential causality from disproportional minorities to highway expansion. Although it is easy to obtain demographic composition data for 1960, adjusting the data to 1970 census tracts would require substantial efforts. Third, highway expansion completed before 1965 may also affect racial redistribution from 1970 to 2000 in Milwaukee, but data on such expansions are not available. In addition, the results should be interpreted carefully and are not generalizable to all other cities in the United States. The results are likely to be more generalizable to cities with similar history, racial compositions, industries, and other characteristics.

Despite these limitations, there is ample opportunity for further research. First, although this study examines the effect of highway expansion on racial redistribution, racial composition may also be a causal factor of highway expansion decision as

discussed in the literature review section. It would be interesting to investigate the causality between highway expansion and racial dynamics, which could be achieved simultaneously within a two-stage least square context (e.g., Pastor et al., 2001).

Second, highway segments expanded from 1965 to 1970 are associated with Black growth from 1970 to 2000 in minor civil divisions (MCDs) located 1 to 3 miles from highway expansion segments, but not the immediate neighborhoods of highway expansion segments. Does this mean that the civil rights legislation successfully protected Blacks from the unfavorable impacts of highway construction in the MWWA area? It would be interesting to compare with the pre–civil rights period.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the authorship and/or publication of this article.

Funding

The author(s) received no financial support for the research and/or authorship of this article.

Notes

1. In this study, *highway expansion* refers to added travel lanes based on existing highway segments, for example, expanding a highway from two lanes to four or more lanes.
2. A correlation matrix for all the variables indicates high correlations ($r > .6$) between poverty and public transportation, poverty and Blacks, Blacks and public transportation, and public transportation and old housing. However, the variance inflation factor (VIF) statistics for all explanatory variables are less than five in the regression analysis, suggesting that the multicollinearity problem is not serious. Thus, the multicollinearity problem is not considered in this study.

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Bios

Guangqing Chi is an assistant professor of sociology, a research fellow at the Social Science Research Center, and a coordinator of the Computational and Spatial Analysis Laboratory at Mississippi State University. His work is focused on the social and spatial aspects of transportation infrastructure including highway-demographic dynamics and transportation and inequality.

Domenico "Mimmo" Parisi is the director of nSPARC and sociology professor in the Department of Sociology at Mississippi State University. His research interest is in racial relationships, poverty, workforce, and economic development. His work appears in journals such as *Demography*, *Rural Sociology*, *Social Science Quarterly*, *Community Development Society*, *Society and Natural Resources*, and *Journal of Poverty.*